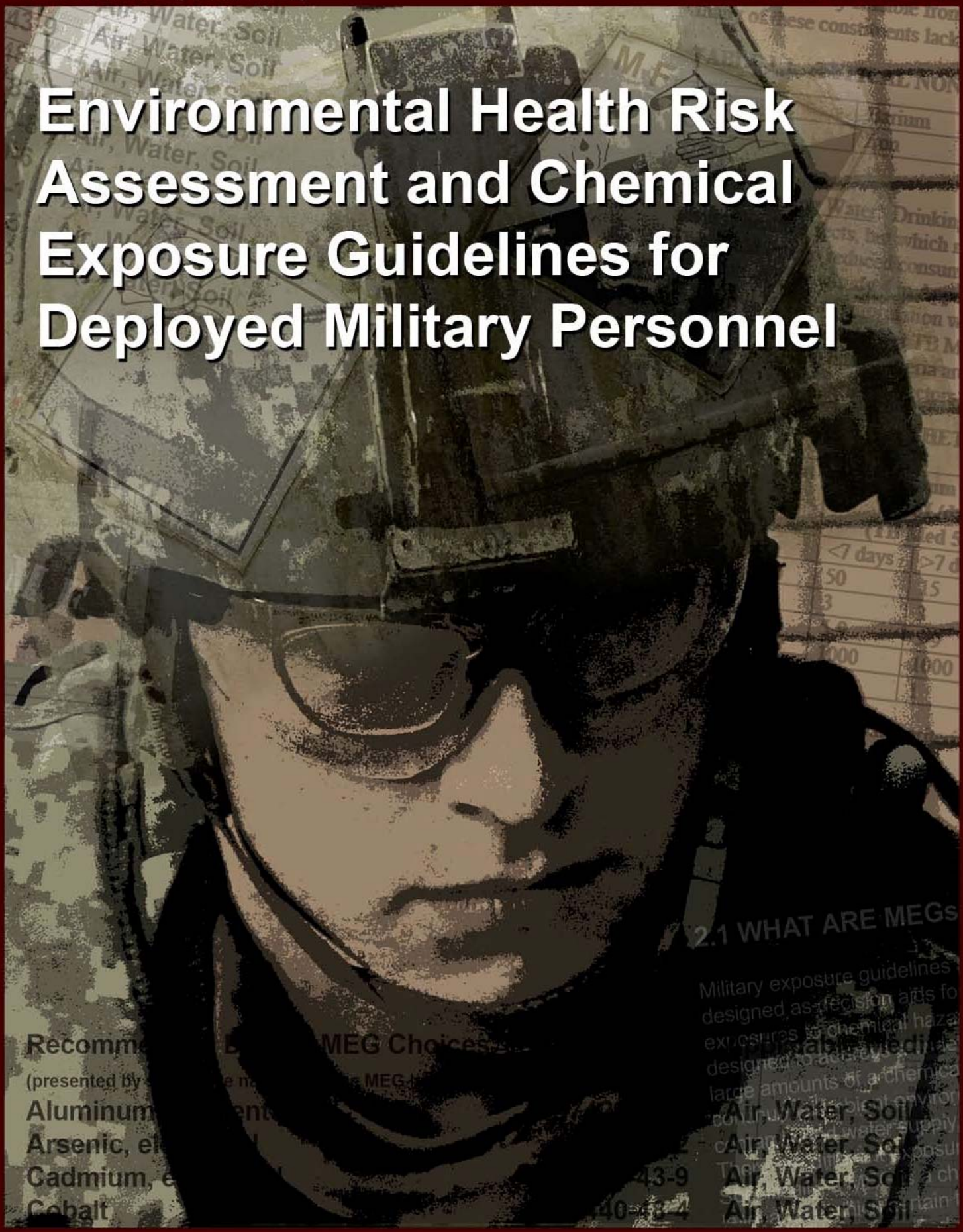
USAPHC (PROVISIONAL)

TECHNICAL GUIDE 230

Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel



JUNE 2010 REVISION

DEPARTMENT OF THE ARMY
US ARMY PUBLIC HEALTH COMMAND (PROVISIONAL)
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ABERDEEN PROVING GROUND, MD 21010-5403

MCHB-TS-R

14 July 2010

MEMORANDUM FOR RECORD

SUBJECT: June 2010 Revision, Technical Guide 230, Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel

1. With the publication of the subject document and the companion reference document, the U.S. Army Public Health Command (Provisional) has completed a major revision and improvement to our methods for assessing health risks associated with the deployment occupational and environmental health surveillance mission.

2. This guide provides a standard tool to assess and characterize environmental exposures to chemicals during deployments in a manner that is consistent with established joint military risk management doctrine. This guide provides a newly revised risk assessment methodology and a larger range of military exposure guidelines (MEGs) that are health-based, operationally relevant, chemical concentrations in air, water, and soil for various military exposure scenarios. These changes address new policy and doctrine and many of the recommendations of the 2004 National Research Council review of the previous version of the Technical Guide.

3. The June 2010 revision underwent a systematic developmental process that involved contributions from a multidisciplinary team of subject matter experts from several technical disciplines and across several organizations. The documents received a final review by members of the Department of Defense Joint Environmental Surveillance Work Group.

4. Questions on any related issues associated with this document and/or methodology should be referred to the Environmental Health Risk Assessment Program, commercial (410) 436-2953; 1 (800) 222-9698 or DSN (312) 584-2953.

JEFFREY S. KIRKPATRICK
Director, Health Risk Management

Technical Guide 230
Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel

June 2010 Revision

U.S. Army Public Health Command (Provisional)

Approved for Public Release; Distribution Unlimited

Realignment

In the fall of 2009, the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) was realigned to the U.S. Army Public Health Command (Provisional) (USAPHC (Prov)).

Preface

Department of Defense Instruction 6490.03 (Deployment Health), Joint Staff Memorandum MCM-0028-07 (Procedures for Deployment Health Surveillance), Joint Publication 4-02 (Health Services Support), and Army Regulation 11-35 (Deployment Occupational and Environmental Health Risk Management) represent some of the key policy and doctrinal references that describe the military position regarding identification and assessment of chemical exposures in deployed settings. These documents establish responsibilities that direct Commanders to ensure Force Health Protection (FHP) by using the military risk management process to control occupational and environmental health (OEH) hazards and to minimize total health and safety risk to personnel across the broad spectrum of military operations. This includes identifying, documenting, and reporting exposures to chemicals that may result in short- or long-term health effects to deployed military personnel.

The USAPHC (Prov) Technical Guide (TG) 230 is provided as a standard tool to assess and characterize chemical exposures during deployments in a manner that is consistent with established joint military risk management doctrine (described above). This guide provides a range of military exposure guidelines (MEGs) that are health-based chemical concentrations in air, water, and soil for various military exposure scenarios during deployments.

The June 2010 Revision of TG 230 is the first major revision since 2003. Previous updates and addendums have been published primarily to address new and revised MEG values. This revision not only updates and adds many MEGs but provides updated guidance on conducting health risk assessments. These changes address new policy and doctrine and many of the recommendations of the National Research Council Committee on Toxicology from May 2004.

Additional Information, Updates, and Revisions

Chemical risk assessments for deployments have been performed on a regular basis since 1995 by this organization, as well as other Service organizations. The USAPHC (Prov) approach to characterizing chemical-related risks has evolved over the years. Our goal has been to learn through experience and establish a standardized, supportable methodology that can be used by reach-back support as well as applied directly "in the field" by appropriate military medical/health personnel. This guide and its supporting Reference Document 230 (RD 230) present our most current recommended guidance and supporting methodology. Due to scientific advances and expanding operational needs, our methods and documents will be updated as necessary. The most current version of TG 230 and supporting reference materials and guidance can be obtained electronically at: http://phc.amedd.army.mil/tg.htm

The USAPHC (Prov) Environmental Health Risk Assessment Program is the proponent of this Technical Guide. Questions, comments, and recommendations can be forwarded to—

U.S. Army Public Health Command (Provisional)
Environmental Health Risk Assessment Program
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1 INTRODUCTION

1.1 PURPOSE

The U.S. Army Public Health Command (Provisional) (USAPHC (Prov)) Technical Guide 230 (TG 230) presents military exposure guidelines (MEGs) for chemicals in air, water, and soil; risk assessment methods; and risk communication guidance for use in evaluating and communicating exposure risks during deployments.

This USAPHC (Prov) TG 230 Revision was developed as a standard tool to support established joint military risk management doctrine—specifically, it supports Department of Defense (DOD) Instruction 6490.03 (Deployment Health), Joint Staff Memorandum MCM-0028-07 (Procedures for Deployment Health Surveillance) (CJCS 2007), Joint Publication (JP) 4-02 (Health Services Support), and Army Regulation (AR) 11-35 (Deployment Occupational and Environmental Health Risk Management). These policies establish the requirement to reduce potential and actual exposure from occupational and environmental hazards encountered during military operations to as low as practicable to minimize immediate, delayed, and long-term health effects within the context of mission parameters and military risk management principles. The military risk management process requires the identification of hazards, a standardized categorization of the risks, and a decision process that appropriately balances these risks to minimize adverse impacts on the mission and personnel. Commanders should be made aware of and consider the acute and chronic health risks associated with occupational and environmental potential and actual exposure during all phases of military operations and over the broad spectrum of military activities.

While this guide has been developed by USAPHC (Prov) to address Army-specific requirements, it is consistent with the requirements of the DOD and the Joint staff. Thus, it provides a consistent basis for all Services to conduct chemical risk assessments during deployments.

The MEGs are intended to be used as a preventive medicine tool to identify and assess chemical occupational and environmental health (OEH) hazards faced by military personnel within the deployment environment. It is essential that the impact of exposures be translated in this fashion so that Commanders at the field- or theater-level can compare risks from chemical hazards against a myriad of other mission- and personnel-related risks and make appropriate risk management decisions. The MEGs and the associated risk assessment process outlined in TG 230 are intended to support Commanders decisions to manage and minimize OEH risks to personnel in the deployed environment.

The MEGs are health-based chemical concentrations for various deployed military exposure scenarios representing levels at which no, some, or significant health effects could occur within the exposed, deployed population. While MEGs are derived in large part from existing Federal standards and guidelines, the MEGs themselves are not presented as "standards" or "action levels." The USAPHC (Prov) TG 230 also presents a standard risk assessment process that uses the MEGs to characterize chemical exposure risks during deployments in a manner that is consistent with established joint military risk management doctrine. In addition, specific information is also provided regarding the type and severity of health effects resulting from exposures to varying chemical concentrations, the primary organs affected, odor/taste threshold information, and cancer classification when available.

While health risk assessments must rely on expert judgment and are intrinsically uncertain, the goal of USAPHC (Prov) TG 230 is to provide trained personnel (such as public health and preventive medicine officers, environmental staff officers, industrial hygienists, health risk assessors, or other medically trained personnel) with a tool to characterize operational risks from chemical exposures as consistently as possible, by use of a standardized process that is both scientifically supportable and militarily feasible. Appendix A contains complete reference information, and Appendix B contains acronyms, health effects descriptions, and target organs and systems.

1.2 SCOPE

The USAPHC (Prov) TG 230 addresses chemical hazards to include chemical warfare agents (CWAs), acutely toxic industrial chemicals (TICs), and a wide array of general environmental pollutants. The guide does not address biological or nuclear/radiation hazards. Also, it does not specifically address environmental sampling methods, hazard control methods, nor does it address medical treatment procedures.

The TG 230 provides two key types of information: (1) health-based MEGs for chemicals found in air, water, and soil (see Appendices C, D, and E); and (2) risk assessment guidance on how to translate environmental data collected from deployment sites into the qualitative military risk management framework. Based on the nature of the underlying toxicological and epidemiologic data and the inherent uncertainties and variability in that data, the MEGs are designed for assessing risks for populations and are <u>not</u> designed for assessing risks or specific health outcomes for individuals.

This revision of TG 230 provides MEGs for thousands of chemicals for which information was readily available or that were otherwise identified as key hazards of concern by USAPHC (Prov). However, MEGs are not available for every chemical potentially encountered during a deployment since toxicity information is unavailable for many chemicals. Future revisions will provide updated MEGs and MEGs for new chemicals as data becomes available (see the website cited in the Preface for accessing updates). Specific technical material has been limited in TG 230 to keep the guide relatively compact to facilitate field use. The USAPHC (Prov) RD 230 provides the technical information relating to the rationale and methodology to derive MEG

values (USAPHC (Prov) 2010). These documents and future updates can be found at the USAPHC (Prov) technical guide website (see inside the front cover).

The TG 230 risk assessment process is not designed for typical garrison operations and should not be used for environmental compliance, preservation, or site-clean up decisions within the continental United States (CONUS) or outside the continental United States (OCONUS). These programs are covered under existing Department of the Army (DA) occupational health and environmental regulations. However, TG 230 can have limited applicability in catastrophic CONUS scenarios such as those associated with terrorist events or large natural disasters.

1.3 AUDIENCE

This guide is written for preventive medicine and medical personnel trained to identify and evaluate environmental health hazards. Within the Army, these individuals function at or above the Health Service Support Level II, according to Department of the Army Pamphlet (DA Pam) 40-11, Section 3–2 (DA Pam 2006). Although these personnel are likely not expertly trained risk assessors, they may be called upon to provide recommendations to Commanders regarding the potential mission impact from air, water and/or soil contaminants. Regardless of the level of skill and/or experience, preventive medicine and medical personnel can always reach back to USAPHC (Prov) for assistance in evaluating environmental health hazards using this TG.

The TG 230 guidance serves as an objective base from which to make educated determinations based on subject matter expertise experience and knowledge. Risk assessors should have a basic understanding of the underlying toxicological and health basis for the MEGs. They should be familiar with basic methods of exposure assessment for chemicals in the environment. Finally, it is necessary that the risk assessor appreciate the uncertainties associated with sampling and with the assumptions used for estimating representative exposure levels as well as possessing an understanding of basic risk communication principles. This guidance does not replace the need for basic technical training in these areas, nor does it provide guidance for sample planning or collection.

It is noted that previous versions of the TG 230 have been reviewed, approved, and used for years by the other Services. It is the intent that appropriately trained preventive medicine and medical personnel from the other services can also use this TG. Although military health services personnel will need to use professional judgment when applying the standardized information in TG 230, this guidance will more adequately prepare them to determine the operational severity of health hazards within a framework that is consistent with military risk management procedures. Additional information regarding the basis of MEGs can be found in USAPHC (Prov) RD 230. Personnel can also contact USAPHC (Prov) for additional materials or training, to include assistance with risk communication efforts related to MEGs in specific situations.

1.4 MILITARY HEALTH RISK MANAGEMENT POLICIES

The military, scientific, and political communities have acknowledged the need to identify and consider (as identifiable military "threats") all toxic chemicals or radiological hazards that pose delayed, chronic health risks to military personnel (Institute of Medicine (IOM) 1999, National Research Council (NRC) 1999, Department of Defense (DOD) 1999, DOD 1998, and National Science and Technology Council (NSTC)/Presidential Review Directive (PRD) 1998). Military leaders and their staff elements are responsible for monitoring, assessing, and minimizing OEH hazards to ensure Force Health Protection (FHP). A listing of policies, procedures, and guiding principles for the management of such hazards are listed in RD 230.

Exposures to chemicals during deployments and other operations are inevitable due to mission location and military activities. Operation-related OEH hazards include climate conditions (e.g., excessive heat, cold, and noise), infectious diseases, physical threats (including those associated with accidents, explosions, and certain forms of ionizing radiation), chemical and biological warfare agents, and a large number of chemicals in air, water, food, and soil. Source of these hazards can be host nation customs and activities (e.g., local industry and community activities, and local contamination), military operations (e.g., equipment maintenance, solid waste disposal operations, enemy military operations); and the natural environment (e.g., hot, cold, dust). Personnel might be exposed to these hazards intermittently, continuously, or simultaneously. In some situations, chemicals may be present for only a short time but at high enough levels that exposures could immediately impact individual health or even degrade the mission. In other situations, continuous but less extreme levels of chemicals in the environment could put military personnel at increased risk of delayed, permanent health problems.

Deployment scenarios can involve a range of operations from sustaining peace and stability to direct combat. While risk tolerance thresholds and OEH hazards may be different during these operations, the risk management process should be the same. Making decisions to accept, minimize, or altogether prevent OEH risks must be made in conjunction with assessments of other operational hazards that put the Commander's mission and personnel at risk. The Army Field Manual (FM) 5-19, (FM 5-19, 2006) provides the risk management doctrine that defines this process.[1] The USAPHC (Prov) TG 248 (USACHPPM 2001a) provides a general framework for addressing all deployment OEH hazards (i.e., chemical, radiological, biological, entomological, endemic disease) in a way that implements the Army risk management process, as defined at the time FM 100-14. This Revision of USAPHC (Prov) TG 230 was developed following the TG 248 framework, but adapts to the updated risk management concepts provided in FM 5-19, which superseded FM 100-14. It is military policy (DODI 6490.3; DOD, 2006a; CJCS, 2007; AR 11-35, DA, 2007) to address the health and mission risks associated with chemical exposures within the overall risk management process presented in FM 5-19 (2006).

> Note: Section 3 reviews the FM 5-19 process and provides guidance for conducting OEH chemical hazard health risk assessments using MEGs within the military risk management framework.

[1] FM 5-19 was published in August 2006 and supersedes FM 100-14, Risk Assessment, (FM 100-14, 1998).

Appropriate consideration of OEH chemical hazards is a part of FHP, and proper assessment and surveillance should be used to minimize immediate health and mission impacts, as well as any potential delayed health effects that adversely affect the long-term health of military personnel. The objective is to minimize overall health risks while achieving successful mission completion. War-time operations will inevitably yield higher acceptance of casualties, while peacekeeping missions will require greater need to minimize non-severe health effects associated with what has been referred to as "low-level" exposures. Low-level exposures are those that do not significantly impact the current mission or result in any function-impairing effects (CJCS, 2007). In general, low-level exposures do not pose a notable known risk for delayed health effects except for certain chemicals (USACHPPM 2004).

1.5 KEY ASSUMPTIONS AND DECISIONS

Development of USAPHC (Prov) TG 230 guidance required several up-front risk management decisions that cannot be answered by science. To the extent possible, these reflect existing military policy/directives, but some issues are not adequately determined by current policy or regulation. The following decisions and assumptions are critical concepts underlying the guidance provided by this guide.[2]

1.5.1 Use of Existing Military and Federal Guidelines and Health Criteria

Existing exposure and health criteria published by other organizations provide the primary basis for MEG values. This includes an array of federal standards, guidelines, peer-reviewed toxicological estimates, and previously published source toxicity data. No toxicological or epidemiological studies were performed by USAPHC (Prov) to specifically provide data for development of MEGs. All the available information was collected and reviewed in accordance with the hierarchy and methods described in Reference Document (RD) 230. Example sources of existing guidelines include, but are not limited to, the following:

- U.S. Environmental Protection Agency and the National Research Council – Acute Exposure Guideline Levels (AEGLs) for chemical warfare agents and highly toxic air pollutants

- National Research Council – Emergency Exposure Guidance Levels for Military Smokes and Obscurants

- U.S. Environmental Protection Agency Integrated Risk Information System and externally reviewed toxicity values from EPA program offices – reference values and slope factors for cancer and non-cancer health endpoints.

[2] The National Research Council's Committee of Toxicology (NRC/COT) was asked to review a previous version of TG 230 in 2002 and published its review in May 2004 (NRC 2004). A summary of the issues raised during the NRC/COT review addresses some of these key assumptions and decisions; see USAPHC (Prov) Reference Document (RD) 230 Section 8.

This approach allowed for the broadest array of chemicals to be addressed in a time-efficient and cost-efficient manner. It also ensured that the selection of guidelines was consistent with how other federal guidelines are developed (e.g., for workers and the general population), and that the selected guidelines had already gone through scientific peer-review. The use of previously peer-reviewed guidelines and estimates combined with accepted methodologies provides added quality. The target population and subpopulations that most of the existing guidelines address are different from the military population; however, the MEG development process attempted to make appropriate population-specific adjustments. This overall approach is scientifically defensible and is the most timely and cost-effective means by which to provide guidance for already on-going field assessments.

1.5.2 Revisions and Process Improvements

The USAPHC (Prov) continues to review and formulate improvements to the MEG values themselves and the USAPHC (Prov) TG 230 guidance to reflect lessons learned and changes to military policies and procedures, risk assessment methodologies, and toxicological information.

It is important to note that MEG values may change over time to reflect updated toxicity information. Users should use the most current MEGs presented in the latest published version or as posted on USAPHC (Prov) websites. USAPHC (Prov) is working to address some limitations on the existing information; for example, this version does not yet fully address aerosol particle size issues and there are additional MEG derivation approaches being considered. USAPHC (Prov) may add MEGs for new chemicals as additional information becomes available and as specific requests for new MEGs are received, interim values may be developed.

The USAPHC (Prov) is currently merging the existing MEG development database into a larger chemical database to service multiple risk assessment needs for both deployment and garrison settings. This larger and more comprehensive database will allow for the pooling of resources and more efficient updating of risk reference data, such as health criteria, used to develop MEGs. These redesign efforts will increase the speed at which MEG updates can be published, so that the MEGs can be kept as current as possible relative to the changing toxicity information used in their development. Improved web-based access to the most current MEGs is forthcoming.

1.5.3 Immediate vs. Delayed Health Effects

Whether health effects caused by chemical exposures occur immediately during a deployment (e.g., acute effects) or are delayed and do not occur until months or even several years post deployment (e.g., chronic effects), current military policy requires that the risk of any adverse health effect is to be considered in military operations (CJCS 2007). Use of the guidance in USAPHC (Prov) TG 230 allows the user to characterize risk for both short and long term effects.

1.5.4 The Healthy and Fit Population Assumption

The military population is largely assumed to be "healthy and fit" and is often believed to be less susceptible to the adverse health effects caused by chemical exposures compared to the general civilian population. However, this assumption has been debated and a USAPHC (Prov) assessment of susceptibility traits among the military population concluded that for many health effects the military population is of equivalent variability as the general population (see Weese 2001). Subpopulations within the deployed military population may be more susceptible to some effects of certain chemicals. These subpopulations may be identifiable or unknown. In cases where adequate information was available, the MEGs accommodate a susceptible group within the military population (e.g., asthmatics, who are included in deployment operations, or females who have been shown to be significantly more susceptible to organophosphates then males). Although pregnant women are not considered deployable, there are potential scenarios where a woman may be deployed without realizing her pregnant status, or she may become pregnant during a deployment. Since developmental effects caused by chemical exposures are often associated with first-trimester exposures, such exposures are considered during the development of some, but not all, of the exposure guidelines. Such considerations are relevant for long-term MEGs. Additional details are provided in Section 2.3 and Section 2.4 and in RD 230.

1.5.5 Population Health Thresholds

Current scientific methods for deriving protective health-risk based guidelines focus on establishing 'population threshold' concentrations. These are estimated by using the available toxicological or epidemiological data along with safety (aka uncertainty) factors to account for lack of information and uncertainties. Most of the MEGs presented in this guide are Negligible MEGs and they are generally based on the 'population threshold' approach for exposure scenarios typical for deployed military personnel.[3] This provides the risk assessor with an idea of when the most susceptible individuals may begin to be affected. The Negligible MEGs, therefore, do not represent exposure levels at which many personnel or the majority of personnel will demonstrate such effects, as the selected reference sources do not provide this information. This is the recommended approach for FHP requirements, whereby the Negligible MEGs are the most relevant type of MEG. However, operational requirements incorporate higher hazard levels (as may be anticipated in high-threat conditions). Therefore, it is necessary for Commanders to have more specific estimates of health outcomes and which are not necessarily 'protective.' For this reason, population threshold estimates were not used as the basis for Marginal, Critical, and Catastrophic MEGs.

[3] Strictly speaking, the 'population threshold' approach is based on 'non-cancer' health effects, where it is assumed that exposure above some threshold level is required in order to initiate toxicological responses. Some effects, usually cancer, are assumed to have an increased risk, albeit small, for any level of exposure, whereby no threshold is presumed to exist. The long-term (1 year) Negligible MEGs are based on holding the excess cancer risk to below 1 in 10,000. See Section 2.5.3 for the rationale.

1.6 REVISION AREAS

This 2010 Revision of TG 230 is the first major revision to the document since its initial two-part series (TG 230A and TG 230B) was combined in 2003. This revision incorporates additional chemicals, updates MEGs, and modifies risk assessment guidance. While many changes are based on the accumulated experience and lessons learned, several changes were also necessary to specifically address changes in military deployment health policy, to include DODI 6490.03 (DODI 2006a) and Joint Staff Memorandum MCM-0028-07 (CJCS 2007), as well as the recommendations of a committee of the National Research Council (NRC 2004).[4] The primary revision areas are summarized below. Additional details are provided in USAPHC (Prov) Reference Document (RD) 230.

1.6.1 Policy Changes

- Health and medical threat terminology and operational hazard severity definitions for health effects have been updated according to current joint policy (e.g., CJCS 2007).

- More specific guidance is provided on how to address potential chronic (long-term) health effects in addition to acute (short-term) health effects that have immediate operational impact according to new requirements of joint policy (CJCS 2007).

- Guidance on conducting deployment risk assessments has been updated to reflect changes to the risk management doctrine presented in FM 5-19 (FM 5-19, 2006).

1.6.2 Changes to the List of MEGs and Derivation Methods

- The MEGs for many new chemicals have been added, and previous MEGs have been updated to reflect changes to health criteria data.

- The definitions and terminology used to describe short-term MEGs have been modified to represent the thresholds between specific operational hazard severity levels (Negligible, Marginal, Critical, and Catastrophic). Therefore, previous Minimal, Significant, and Severe MEGs have been replaced with Negligible, Marginal, and Critical MEGs.

- The short-term Air MEGs for CWAs were updated according to the USACHPPM report *Acute Toxicity Estimation and Operational Risk Management of Chemical Warfare Agent Exposures* (USACHPPM 2004) and procedures described in USAPHC (Prov) RD 230.

- The CWA, as well as certain TICs of key military concern, are addressed in greater detail to include provision of 10-minute Negligible, Marginal, and Critical Air MEGs

[4] See RD 230 Section 8 for a summary of the issues raised during the NRC Committee of Toxicology.

(Catastrophic levels are also developed for the CWA). The 10-minute MEGs address the potential for brief, one-time vapor exposures for these volatile chemicals.

- Changes have been made to the derivation methods for the long-term MEGs to reflect the use of subchronic, rather than chronic toxicity values where adjustments to uncertainty factors (UFs) could be clearly made.

- The method for assessing airborne particulate matter (PM) exposures and associated MEGs has been changed.

- The MEG exposure durations (EDs) for water have been slightly adjusted so that the terminology is consistent with the 7 and 14 day exposure duration terminology presented in the 2005 version of Technical Bulletin, Medical 577 (TB MED 577).[5]

- The process for developing the long-term water MEGs now directly considers Federal drinking water and bottled water standards.

- Methods for developing the soil MEGs were updated to be consistent with exposure scenarios and revised dermal risk assessment guidance used by the U.S. EPA.

- Nutrients, minerals, and related compounds detected in routine laboratory analyses were described in previous versions of TG 230 as 'non-hazards' with MEG values. Because other Federal agencies have developed screening values for these often beneficial and ubiquitous constituents, the USAPHC (Prov) was compelled to provide some similar criteria for screening laboratory results.

- Appendix tables and supporting information for the MEGs are now obtained from a central database resulting in changes to the table formats and presentation. Additional chemical information (i.e., physical/chemical data, health criteria details, synonym listing, and so forth) may be available electronically in the future. Notification will be provided via the USAPHC (Prov) technical guide website (see inside front cover for address).

1.6.3 Enhanced Tools for Risk Assessment

- Guidance for comparing MEGs with laboratory data and establishing the hazard severity and hazard probability levels has been revised. The revisions are designed to minimize tendencies to over-simplify the process and to allow important scenario-specific aspects to be factored into the risk assessment process.

[5] The new 2010 TB MED 577 revises the short and long term standards previously published in 2005. The revision includes the establishment of Short-term Potability (STP) Standards for up to 30 days of exposure and Long-term Potability (LTP) Standards for more than 30 days of exposure. The water MEGs have not yet been adjusted to these new exposure durations. For additional details, refer to the comment in the TB MED 577 citation in Appendix A.

- Specific guidance for assessing PM exposures in deployments is provided. Also, guidance is provided on use of MEGs for assessing water supplies that are being used for non-drinking uses only (such as for personal hygiene).

- Answers to frequently asked questions, new risk assessment reference tools, and updated case studies are provided in Appendices F, G and H.

1.7 RISK COMMUNICATION CHALLENGES

Defining health risks from chemical exposures in a deployed environment will often present technical communication challenges. The application of MEGs versus more familiar "guidelines" or "standards" (such as those used in civilian applications and CONUS garrison activities, such as those promulgated by the U.S. Environmental Protection Agency (EPA) and the Occupational Safety and Health Administration (OSHA)) can also pose unique risk communication challenges within the technical community (e.g., derivation and/or application of MEGs) and when communicating risk assessment information to the layperson (see Section 1.5.1). The tools of risk communication founded in social science research can therefore be irreplaceable in minimizing unnecessary concerns about chemical exposure.

Regardless of whether environmental/exposure data is well-defined, science and quantitative data alone cannot always effectively address concerns about possible chemical exposure. Risk communication goes beyond using the right words at the right time. Although risk communication "tools," such as fact sheets or town hall briefings can be helpful in increasing awareness of the complexities associated with MEGs, the context in which concerns and misperceptions are discussed is known to either escalate or decrease them. Therefore, risk communication should be viewed as another preventive measure—when implemented effectively, risk communication processes can assist in building a useful dialogue amongst technical experts, Command leaders and the layperson so that social trust increases and productive discussions about health risks can take place. Risk communication processes can increase the layperson's understanding of MEGs and the risk management process; minimize misperceptions of risk while garnering support for Command decisions; and over time strengthen the social trust necessary to productively discuss MEG values and/or associated risk management decisions. Therefore, those performing the preventive medicine mission must possess excellent risk communication skills in order to effectively communicate about the risk assessment process and OEH health risks, both real and/or perceived, while minimizing unnecessary concerns.

Note: Section 4 provides additional risk communication guidance.

2 MILITARY EXPOSURE GUIDELINES

2.1 WHAT ARE MEGs?

Military exposure guidelines are concentrations of chemicals in air, water, and soil that are designed as decision aids for health risk assessors to evaluate the significance of field exposures to chemical hazards during deployments. The USAPHC (Prov) TG 230 MEGs are designed to address a variety of deployment scenarios such as a single catastrophic release of large amounts of a chemical, temporary exposure conditions lasting hours to days, or continuous ambient environmental conditions (such as, regional pollution, use of a contaminated water supply, or persistent soil contamination where there is regular contact). There are different exposure scenarios of concern for each environmental medium.

Specifically, a MEG is a chemical concentration which represents a safe-sided estimate of the level above which certain types of health effects may begin to occur in individuals after an exposure of the specified duration. The severity of the health effects and percentage of the exposed population that might demonstrate the health effects may increase as concentrations increase above the MEG. However, the degree to which severity and/or incidence of health effects increase as exposure increases above the MEG is chemical-specific. The MEGs are preventive medicine guidelines and are not specifically designed for generating casualty estimates.

Note: Appendix F provides answers to Frequently Asked Questions (FAQs).

2.2 HOW ARE MEGs DEVELOPED?

Existing peer-reviewed exposure guidelines and toxicological estimates (i.e., existing health criteria) published by reputable public health and scientific organizations provide the primary basis for MEG values. Such organizations include the National Academy of Science's NRC, the U.S. EPA, the Agency for Toxic Substances and Disease Registry (ATSDR) among others. For the long-term MEGs, previously published source toxicity data were evaluated and used with existing Federal methodology for developing exposure guidelines.

No toxicological or epidemiological studies were performed by USAPHC (Prov) to specifically provide data for development of MEGs. This approach allowed for the broadest array of chemicals to be addressed in a time-efficient and cost-efficient manner. It also ensured that the selection of guidelines was consistent with how other Federal guidelines are developed (e.g., for

Note: USAPHC (Prov) RD 230 presents the data and methods used to develop the MEGs.

workers and the general population) and that the selected guidelines had already gone through scientific peer-review. To this extent, the use of previously peer-reviewed guidelines and estimates, combined with accepted methodologies provides added quality. This approach is scientifically defensible and is the most timely and cost-effective means by which to provide guidance for already on-going field assessments. Since existing toxicological databases and health criteria were utilized to develop the MEGs, the quality and extensiveness of toxicological information underlying the MEGs is comparable and as variable as that used by Federal agencies for worker and civilian applications.

2.3 WHAT KIND OF MEGs ARE AVAILABLE?

The available set of MEGs includes chemical concentrations for air, water, and soil for several different EDs arranged along differing OEH hazard severity levels from Negligible to Catastrophic. For example, for a given chemical, there are four possible Air MEG values for the 1-hour ED. Each of the hypothetical MEGs in Table 2-1 represent the airborne concentration of the chemical that marks the threshold for entry into the hazard severity category found in the name of the MEG. In other words, each MEG represents a hazard severity category threshold.

Table 2-1 Example of the Potential Types of Air MEGs for a 1-Hour Exposure Duration for a Hypothetical Chemical and the Standard Interpretation of the Hazard Severity Level Associated with Various Field Exposures

Exposure Estimate*	MEG Name	MEG Value	Hazard Severity Designation ‡
† 5 – 29 mg/m^3	1-hour Negligible MEG	5 mg/m^3	Negligible
30 – 149 mg/m^3	1-hour Marginal MEG	30 mg/m^3	Marginal
150 – 339 mg/m^3	1-hour Critical MEG	150 mg/m^3	Critical
≥ 340 mg/m^3	1-hour Catastrophic MEG	340 mg/m^3	Catastrophic

* This exposure estimate represents an average 1 hour exposure. Analytical error associated with measurements at the boundaries of the categories (e.g., 29 vs. 30 mg/m^3) must be acknowledged.
† Field exposures < 5 milligrams per cubic meter (mg/m^3) would not be considered to be a deployment hazard and would not be evaluated in a formal risk assessment.
‡ In reality, hazard severity blends together at the margins between each category, which reflects a graded series of health responses as exposure increases. For example, there is no practical measurement and toxicological distinction between 29 and 30 mg/m3 even though the selected severity categories will be different. The risk assessment method addresses exposures near the borders of the categories.

This standard approach for setting hazard severity levels within a risk assessment sets a useful framework; however, it does not highlight the chemical-specific knowledge and the scientific uncertainties associated with the underlying data for any given assessment. Additional details on what data the MEGs are based on and what it means to exceed a MEG (i.e., where a field exposure is greater than a MEG) are provided in Section 2.5. The specific methodology for evaluating field exposures using the MEGs is presented in detail in Section 3.

For any given chemical, the MEGs that have been developed are limited to the exposure timeframes and hazard severity levels for which there were readily available health criteria published by regulatory or other agencies (as described in Section 2.2). Figure 2-1 presents a conceptual diagram of the available MEGs.

2.3.1 Air MEGs for Inhalation of Chemicals in Ambient Air

The air MEGs are defined in Table 2-2, and the chemical-specific MEGs are presented in Appendix C. Air MEGS were developed for assessing deployment exposures to chemicals in ambient air. A variety of types of Air MEGs were developed because contaminants in air are difficult to avoid or control and may produce immediate and severe health effects. Some of the short-term air MEGs represent concentrations that are likely to have real-time, direct impacts on personnel performance and mission accomplishment.

2.3.2 Water MEGs for Ingestion of Chemicals in Water

The water MEGs are defined in Table 2-3, and the chemical-specific MEGs are presented in Appendix D. Water MEGs were developed for assessing deployed personnel exposures to chemicals in water that is used for consumption. The water MEGs were derived for drinking water ingestion rates of 5 L/day (for temperate climates) and 15 L/day (for dry/arid climates), for each of the three different exposure durations (7 day, 14 day, and 1 year) in order to be generally consistent with the TB MED 507, the CASCOM water planning report (CASCOM 2008), and the 2005 version of TB MED 577[6] descriptions of increased water intake based on operational conditions and individual variability. Direct use of water MEGs to make decisions regarding bathing, dishwashing, or other non-potable water applications that may result in indirect ingestion are overly protective applications, but at this time no other guidelines have been derived for these specific scenarios due to data limitations. Methods for assessing water for purposes other than consumption are provided in Section 3.

2.3.3 Soil MEGs for Exposure through Skin Contact, Ingestion, and Inhalation

The soil MEGs are defined in Table 2-4, and the chemical-specific MEGs are presented in Appendix E. Soil MEGs were designed to assess exposure to chemicals in soil through direct contact with exposed skin, incidental ingestion from hand-to-mouth contact, and/or inhalation of dust particles or volatiles originating from contaminated soil. The soil MEGs were developed considering all three of these potential routes of exposure and are based on specific exposure assumptions that are expected to be typical for military deployment operations. The soil MEGs were generated assuming continuous exposure for 1-year (i.e., long-term exposure). Soil MEGs for short-term exposures were not developed; unless obvious odors, dead or discolored vegetation, or free chemical product are observed, soil contamination is not anticipated to be an immediate or severe hazard. If such conditions are observed, the areas that may contain contaminated soils should be avoided.

[6] Refer to the comment in the TB MED 577 citation in Appendix A.

Air MEGs

Boxes represent potential MEGs.
A shaded box indicates that a MEG was developed for one or more chemicals.

	Negligible	Marginal	Critical	Catastrophic
1 year	A	B		
14 day	C			
24 hour	D	D	D	E
8 hour	F	G	G	E
1 hour	F	H	I	E
10 minutes	G	G	G	E

A – Includes general air pollutants, $PM_{2.5}$, and key toxic industrial chemicals.
B – Includes only $PM_{2.5}$.
C – Includes general air pollutants and key toxic industrial chemicals.
D – Includes chemical warfare agents, key toxic industrial chemicals, PM_{10}, and $PM_{2.5}$.
E – Includes only chemical warfare agents.
F – Includes general air pollutants, key toxic industrial chemicals, military smokes and obscurants, and chemical warfare agents.
G – Includes key toxic industrial chemicals and chemical warfare agents.
H – Includes general air pollutants, key toxic industrial chemicals, military smokes and obscurants, and chemical warfare agents.
I – Includes general air pollutants, key toxic industrial chemicals, and chemical warfare agents.

Water MEGs

	Negligible	Marginal	Critical	Catastrophic
1 year	A			
14 day	A			
7 day	A			

A – Includes the general pollutant list and the TB MED 577 chemicals (which includes chemical warfare agents).

Soil MEGs

	Negligible	Marginal	Critical	Catastrophic
1 year	A			

A – Includes the general pollutant list and the chemical warfare agents.

Figure 2-1 Conceptual Diagram of Available Military Exposure Guidelines

Table 2-2 Standard Air MEG Types and Associated Health Effect and Performance Degradation Descriptors

• **Type of MEG(s)** The descriptors apply to the deployed military population generally. Sensitive individuals may be predisposed to toxic effects and, therefore, maybe more susceptible. If available scientific evidence regarding such subpopulations exists for a particular chemical, then this information is provided with the chemical-specific MEG.
• **10-minute, 1-hour, 8-hour, or 24-hour CATASTROPHIC Air-MEG** A continuous exposure to airborne concentrations (for 10 minutes, 1 hour, 8 hours, or 24 hours) above the MEG is anticipated to result in deaths and/or many personnel with severe incapacitating effects (overall greater than 50 percent mission/performance capability loss). Effects are likely to require medical treatment.
• **10-minute, 1-hour, 8-hour, and 24-hour CRITICAL Air-MEG** A continuous exposure to airborne concentrations (for 10 minutes, 1 hour, 8 hours, or 24 hours) above the MEG (but below the Catastrophic MEG) could begin to result in serious health effects. This MEG is a conservative population threshold estimate of potential life-threatening or lethal effects; whereby, these effects are expected initially in personnel with underlying susceptibility factors.
• **10-minute, 1-hour, 8-hour, and 24-hour MARGINAL Air-MEG** A continuous exposure to airborne concentrations (for 10 minutes, 1 hour, 8 hours, or 24 hours) above this MEG (but below the Critical MEG) could begin to produce effects that may result in some performance degradation, especially for tasks requiring extreme mental/visual acuity or physical dexterity/strength amongst a portion of individuals.
• **10-minute, 1-hour, 8-hour, and 24-hour NEGLIGIBLE Air-MEG** A continuous exposure to airborne concentrations (for 10 minutes, 1 hour, 8 hours, or 24 hours) above this MEG (but below the Marginal MEG) could begin to produce mild, non-disabling, transient, reversible effects. Such effects, if any, will typically be mild irritant types of effects and/or initially be expected in personnel with underlying susceptibility factors (e.g., asthmatics). Effects are not expected to impair performance.
• **14-day NEGLIGIBLE Air-MEG** A continuous exposure to airborne concentrations above this MEG for up to 14 days (24 hours/day) (but below the Marginal MEG*) is not anticipated to result in acute performance degrading effects or specific long-term health consequences. The potential for adverse health outcomes increases within the exposed population as the exposure increases above the MEG.
• **1-year NEGLIGIBLE Air-MEG** A continuous exposure to airborne concentrations above this MEG for up to 1 year (365 days, 24 hours/day) (but below the Marginal MEG†) is not anticipated to result in any adverse health effects to include acute performance degrading effects or long-term health consequences. This MEG is considered protective against the development of chronic diseases and an increased cancer risk greater than 1 in 10,000. The potential for adverse health outcomes increases within the exposed population as the exposure increases above the MEG.

* Currently, there are no available 14-day Marginal Air-MEGs.
† Currently, there is only one 1-year Marginal Air-MEG, for PM2.5. It is defined in Table 3-11.

Table 2-3 Standard Water MEG Types and Associated Health Effect and Performance Degradation Descriptors

• **Type of MEG** The descriptors apply to the deployed military population generally. Sensitive individuals may be predisposed to toxic effects and, therefore, may be more susceptible. If available, scientific evidence regarding such subpopulations exists for a particular chemical, then this information is provided with the chemical-specific MEG.
• **7-day NEGLIGIBLE Water-MEGs for consumption rates of 5 and 15 liters per day** Daily consumption at or below this concentration for up to 7 days should not impair performance and is considered protective against significant non-cancer effects. As duration and/or concentration increases above this MEG, the potential is increased for performance degradation, need for medical intervention, or the potential for delayed/permanent disease (e.g., kidney disease or cancer).
• **14-day NEGLIGIBLE Water-MEG for consumption rates of 5 and 15 liters per day** Daily consumption at or below this concentration for up to 14 days should not impair performance and is considered protective against significant non-cancer effects. As duration and/or concentration increases above this MEG, the potential is increased for performance degradation, need for medical intervention, or the potential for delayed/permanent disease (e.g., kidney disease or cancer).
• **1-year NEGLIGIBLE Water-MEG for consumption rates of 5 and 15 liters per day** Daily consumption at or below this concentration for up to 1 year should not impair performance and is considered protective against development of chronic disease to include increased cancer risk greater than 1 in 10,000. As duration and/or concentration increases above this MEG, the potential is increased for delayed/permanent disease (e.g., kidney disease or cancer).

Table 2-4 Standard Soil MEG Type and Associated Health Effect and Performance Degradation Descriptors

• **Type of MEG** The descriptors apply to the deployed military population generally. Sensitive individuals may be predisposed to toxic effects and, therefore, maybe more susceptible. If available scientific evidence regarding such subpopulations exists for a particular chemical, then this information is provided with the chemical-specific MEG.
• **1-year NEGLIGIBLE Soil-MEG** Continuous, daily exposure (from ingestion, dermal absorption, and inhalation) to soil with concentrations at or below this level should not impair performance and is considered protective against development of chronic disease and an increased cancer risk greater than 1 in 10,000. As duration and/or concentration increases above this MEG, the potential is increased for delayed/permanent disease (e.g., kidney disease or cancer).

2.4 POPULATION ASSUMPTIONS

The deployed military population includes Active Duty, Reserve, and National Guard personnel and is composed mostly of relatively healthy and fit adults, 18 to 55 years of age, with an average weight of approximately 70 kilograms (kg) (i.e., approximately 154 pounds). While this description addresses the majority of personnel (e.g. estimated 90 percent or greater), demographic and other data show that there are personnel that fall outside this description. For example, particularly with increased reliance on National Guard and Reservists, more older personnel are now deployed. In addition, it is known that a small percentage of females become pregnant right before or during deployment. The assumption that deployed military individuals will have no predisposing physical or mental factors that could exacerbate exposure to environmental chemicals does not appear to be entirely supported through scientific evidence. While there are basic health and fitness requirements that must be met and maintained by military personnel, an assessment of the factors that can lead to chemical-specific susceptibilities suggests that many of the same primary susceptibility factors exist for the deployed military population. Predisposing factors such as age (> 40 years), illness (e.g., asthma), physical and emotional stressors, life-style choices (e.g., smoking or alcohol use), physiological state (e.g., fatigue, hypothermia, underlying cardiovascular disease), or unique genetic traits may alter susceptibility to some toxicants. In some cases, where adequate information is available, susceptible subgroups (e.g., asthmatics, which are included in deployments) can be considered during MEG development.

Various population characteristics were used to determine the standard hierarchy of health criteria sources and to select and/or adjust underlying toxicity values used in some MEG calculations. Available information shows that a small portion of the deployed population consists of susceptible individuals who, upon exposure to certain chemicals or classes of chemicals, are likely to first experience chemical exposure effects or will experience more severe effects. Nonetheless, in general, risk analysts are typically not likely to know: (1) who those individuals are, (2) what portion of the population is susceptible, and/or (3) the extent of the susceptibilities within the population. What is known are the various types of factors that may increase susceptibility. This general knowledge served as the basis for developing MEGs that address a relatively heterogeneous population among which there are some susceptible groups (without addressing hyper-susceptible groups/persons with extreme chemicals sensitivities).

Selected characteristics relevant to exposure and response within the deployed population are reviewed in more detail in RD 230 Section 2.1.

2.5 DIFFERENT MEGS REFLECT DIFFERENT EFFECTS

2.5.1 Meaning of Exposures Greater than the MEGs and Predicted Health Effects

To the extent possible, the MEGs were developed in a manner to consistently represent designated levels of toxicological severity. However, since the quantity and quality of scientific data upon which the MEGs are based vary substantially, the accuracy with which the MEGs represent the same severity level varies. In some cases (e.g., a 1-hour Marginal MEG), exposures to levels greater than the MEG can induce immediate adverse health effects that may impact upon the ability of personnel to accomplish their mission. In other cases (e.g., a 14-day Negligible MEG), exposures greater than the MEG simply indicate that there is an increased likelihood that a health problem could arise either during or after the deployment is completed. In general, environmental concentrations equal to, or slightly greater than, the specified MEG, are expected to result in the specified type and degree of health effect in a given portion of individuals in the exposed military population. In some cases, however, the MEG represents a purely protective level where health effects should not be observed at all when field exposures are at or just above the MEG.

Though the MEGs are based on generally protective interpretations of toxicological data, there are variations among the chemicals in the degree of protectiveness. The degree and duration of potential health effects experienced will depend on: (1) the inherent toxicity of the chemical, (2) the sensitivity and characteristics of the individual exposed, (3) the duration and frequency of exposures, (4) the chemical concentration, (5) the rate at which the individual takes in the chemical (such as breathing rate or water ingestion rate), and (6) the levels of other chemicals and hazards present and their interaction. In addition, the MEGs and the TG 230 risk assessment process do not incorporate the potential impacts of multiple deployments with similar or variable chemical exposures, or the inevitable exposures that occur pre- and post-deployment during CONUS-based activities and/or personal time (e.g., related to hobbies or home activities).

2.5.2 Acute and Systemic, Non-cancer Health Effects

For non-cancer health effects, it is assumed that there is a threshold dose that defines the minimal amount of a chemical necessary to cause a specific adverse health effect. Below the threshold dose, a chemical is not expected to cause any biologically adverse change. The MEG values for non-carcinogenic effects represent the best estimates of the exposure concentrations under deployment conditions corresponding to the threshold doses. Above these concentrations, it is possible that a variety of adverse symptoms of exposure may occur.

The types of health effects associated with exposure to levels greater than a MEG for each chemical are provided in the MEG tables in Appendices C, D, and E. Human health effects information was primarily obtained from data on occupational and accidental human exposures. Under these conditions, it is difficult to determine the exposure concentration and many times the route of exposure as well, so this information is not specified in the health effects data

provided in the appendices. It is important to note that some potential health effects might not be identified in the appendices due to limited toxicological data on the chemical. Similarly, there are uncertainties with ascertaining whether any, some, or all of the effects may actually occur. Due to human variability and uncertainties in the available toxicological data, it is also very difficult to quantify the percentage of exposed individuals that may be impacted. Therefore, trained personnel should interpret with caution any exposures to levels above the MEGs. Understanding the types of effects and ascertaining whether exposure concentrations are greater than the short-term MEGs is very important in determining the severity of the hazard.

Noting the types of organs/systems that a chemical may affect is particularly important when there are multiple chemicals present above their MEG and when some have the same types of effects. Table B-3 in Appendix B presents a standardized list and description of target organs and corresponding target systems upon which chemicals may have an adverse impact. The target organs are also notated along with each guideline in the MEG tables in Appendices C, D, and E.

2.5.3 Cancer

Chemicals that are identified as cancer-causing (i.e., carcinogenic) can also cause local and/or other systemic health effects that are non-carcinogenic. In such cases, both health effects were addressed for the selection of the final MEG. With the exception of 1-hour Critical air-MEGs, the majority of the MEGs are protective against local, systemic, and significant excess cancer risk. The significance of cancer risk is unique from other toxic effects in that it is a non-threshold effect; therefore, exposure at any level may be considered to increase the risk of cancer development. To address this in setting chemical exposure levels, Federal organizations such as the EPA and OSHA have established “acceptable” excess cancer risk levels. For purposes of USAPHC (Prov) TG 230, the MEGs represent levels that are protective of excess cancer risks greater than 1 in 10,000 (i.e., 1×10^{-4}). An excess cancer risk of 1×10^{-4} means that an extra risk in the amount of 1×10^{-4} (0.0001) is added to the existing baseline cancer risk in the population due to exposure from the chemical at the site. For example, if the baseline cancer risk was 5×10^{-1} (also expressed as 0.5, 5 in 10, or 50 percent), then exposure to the chemical at the given concentration would add 1×10^{-4} (also expressed as 0.0001), resulting in a total risk of 5.001×10^{-1} (also expressed as 0.5001, 5.001 in 10, or 50.01 percent). An excess cancer risk of 1×10^{-4} is within the range of acceptable risk noted by other Federal agencies and has previously been indicated an acceptable risk level for DOD (NRC 1986). Further discussion is provided in the USAPHC (Prov) RD 230.

Uncertainty must be considered when characterizing the risk contributed by a chemical carcinogen. This includes consideration of the certainty with which the scientific community believes the chemical to be a human carcinogen. The EPA’s Weight-of-Evidence (WOE) classifications are provided in the long-term MEG tables in Appendices C, D, and E when available. The EPA recently updated their WOE classifications in 2005, but many chemicals are still listed using the categories from the previous 1986 classifications. If EPA did not list a chemical, the International Agency for Research on Cancer (IARC) was consulted to obtain a cancer class. The cancer classifications should be incorporated into the overall risk

characterization and confidence-estimation process. For example, a chemical that is considered a Possible Human Carcinogen may be considered to pose less risk than one classified as a known Human Carcinogen.

2.6 GENERAL APPLICATIONS AND LIMITATIONS

The MEGs and the USAPHC (Prov) TG 230 risk assessment process should be used to characterize health hazards and the risks they pose to military personnel within the military risk management framework. Section 3 provides a standard risk assessment process by which the MEGs are used with professional judgment to evaluate field sampling data and other information (e.g., modeled data). Due to the uncertainties that are inherent in the toxicological data underlying the MEGs, as well as the variations in human response to chemical exposure and the exposure estimates that go into establishing health-based guidelines, the MEGs should not be used as strict, bright-line decision points (i.e., go/no-go standards) unless there is a doctrinal exception.

2.6.1 Use with Caution: Scientific Uncertainties

Uncertainties involved in the development of the MEGs are principally those related to exposure parameters and toxicological data. Uncertainties in the toxicological data may result from data gaps, insufficient quality or quantity of data, and/or lack of human data. Exposure assumptions used in developing the MEGs include inhalation and ingestion rates, body weights, and frequency and duration of exposure. These assumptions may or may not represent those in actual deployment scenarios. Furthermore, the environmental exposure levels estimated through sampling are often not likely to remain constant. Risk assessors must consider these uncertainties when making risk estimates and recommending risk management decisions. At time, the consideration of the competing uncertainties must be based on professional judgment that attempts to balance the most protective approach with real-world conditions. These same uncertainties and how they are considered can contribute to personnel perception of health risk, therefore reinforcing the need for excellent risk communication skills.

Use of USAPHC (Prov) TG 230 should not be construed as a “definitive quantification of health outcomes.” In most deployment scenarios, it will be difficult to make definitive statements as to the absolute degree of risk or specific type of health effect that may be caused by an exposure to environmental chemicals. Even findings regarding whether a risk is present or not must be carefully stated to ensure that the uncertainty inherent in any risk assessment is accurately considered and weighed.

In addition to effectively communicating a level of risk associated with a chemical hazard, a user should be prepared to describe the degree of confidence in his/her assessment (such as, high, medium, or low confidence). An estimate of a “high” risk that has low confidence (i.e., uncertainty is high) may significantly influence Command decisions, especially if there are other high risks for which there are greater levels of certainty. Communicating confidence levels to the Commander and affected personnel—particularly low confidence—presents another risk

communication challenge, and should be approached with proven risk communication principles in mind (see Section 4).

Due to limitations in toxicity data, the nature of chemical exposures and human variability, chemical risk assessments should rarely be ranked with high confidence. For the most part, the MEGs are designed to be protective for deployment exposures so that confidence in estimated *low risks* will tend to be greater than those for estimated *high risks*.

Section 3 provides guidance for assessing the confidence in a risk assessment that is based on the application of the MEGs.

2.6.2 Use in Different Types of Deployment Scenarios

During deployments, it is Army policy (AR 11-35) to comply with U.S., Army-unique, and host nation OEH standards, whichever are more restrictive. When the mission parameters or overall health of deployed personnel warrant risk management decisions that may modify the application of peacetime health standards, such decisions will be made by the Brigade Commander or above, as far as practicable, or as specified in operational plans and order.

Pursuant to this policy, for certain types of deployment operations (such as direct combat), it is possible that chemical exposures will be a limited Command priority. That is, physical hazards such as artillery fire from armed adversaries will present much greater risks and, therefore, be of greater priority. For other scenarios where the overall risks to troops and mission are low, the considerations of chemical exposures, including long-term health risks, will play a more critical role in risk management decisions. Accordingly, these guidelines are to be used at the discretion of the Commander.

When assessing deployment exposures contained within industrial-type operations (e.g., exposures occurring while spray painting, welding, or performing vehicle maintenance), existing industrial hygiene occupational exposure limits (e.g., OSHA Permissible Exposure Limits (PELs), American Conference of Governmental Industrial Hygienists (ACGIH®) Threshold Limit Values (TLV®s), and so forth) are more appropriate to use than the MEGs to assess the risks within these industrial areas. (ACGIH® and TLV® are registered trademarks of the American Conference of Governmental Industrial Hygienists.) Other standards (e.g., guidelines from the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)) can be used to assess indoor air quality (e.g., offices buildings, etc.). The Army applies a military-unique carbon monoxide standard for military-unique workplaces and operations and is based upon carboxyhemoglobin blood content (DOD 1999b).

Some of the acute MEGs (i.e., 10-minute, 1-hour, and some 8-hour MEGs) are based upon civilian exposure guidelines designed for non-repetitive, once-in-a-lifetime, or rare exposures. Their use is not generally appropriate for continuous, repetitive, or regularly intermittent exposures. In some limited instances and where exposures are repetitive and occurring on a routine, regular basis, occupational exposure limits may be more appropriate to apply; however,

their applicability must also be balanced with the realities and constraints of the mission circumstances or operations.

2.6.3 Multiple Deployments

The current scope of TG 230 is the risk assessment methodology and associated MEGs for assessing deployed military exposures at sites for exposure durations matching the length of deployment. This duration is generally up to 1 year; nonetheless, the TG 230 risk assessment method allows an assessment for site exposures as long as 3 years (Section 3.4.4.2 paragraph 3b). The TG 230 does not address multiple deployments because TG 230 was envisioned as a tool to be used for making operational decisions at the site level, whereby the hazards being managed are single, repeated, or continuous exposures at a location under control of a Commander or for a unit at any given time during a specific operation.

2.6.4 Other Technical Guidance Pertaining to Chemical Hazards

A wide variety of occupational, environmental, and military health criteria or standards have been considered and incorporated into the development of the MEGs. There is a substantial amount of technical information on various chemicals that can be obtained from other sources. Personnel are encouraged to review additional information if they have the resources, accessibility, and time available as it will likely increase overall confidence in the assessment and risk characterization. However, it is anticipated that there will be situations where there are inconsistencies in information or guideline levels. The USAPHC (Prov) RD 230 describes how the MEGs were developed and the information source that was used for each individual MEG. If there are questions regarding the inconsistencies of the MEGs with other guidelines that are not addressed by USAPHC (Prov) RD 230, then USAPHC (Prov) should be contacted for consultation.

2.7 CHEMICALS WITH UNIQUE CONCERNS

2.7.1 Chemical Warfare Agents

The CWAs addressed by USAPHC (Prov) TG 230 include the nerve agents (GA, GB, GD, GF and VX) and the vesicants or blister agents (sulfur mustard (HD) and Lewisite). Currently, military risk management decisions regarding CWAs are somewhat unique in comparison to that of other TICs addressed by this guide. In part, this is because various Army, DOD and Joint Staff policy and doctrinal documents establish procedures and standards to address potential military exposure to CWA. Until recently, most operational chemical, biological, radiological, and nuclear (CBRN) policies and procedures focused on the wartime scenario; however, doctrine has been changing over the last few years to include other chemicals. Much of the responsibility is assigned to the Chemical Corps or designated CBRN personnel. Previous doctrine and equipment has focused on “presence/absence” identification of CWA as opposed to the quantification of amounts and estimation of the associated degree of risk. Medical CBRN responsibilities have historically been limited to casualty management with

preventive medicine aspects focused on antidote development and administration. Today, with varying types of deployments and increased attention to health effects that may be more subtle and/or long lasting, the policies, doctrine, and even equipment (such as, detection and monitoring devices) are undergoing evaluation and change. Doctrine and policy (CJCS 2007, DODI 2006a) to address mild or delayed health effects in operational risk management—including scenarios involving potential residual or low-level CWA concentrations—now require more information than what has been previously incorporated into doctrine. Most scenarios involving CWA will still require chemical/CBRN personnel involvement. Follow-up and/or joint evaluation by medical/preventive medicine personnel is necessary to ensure that the potential for residual CWA contamination is appropriately considered and documented.

2.7.1.1 Air MEGs for chemical warfare agents

The air MEGs for CWAs were developed differently than for other chemicals. The MEGs for CWAs were updated according to procedures described in the USACHPPM report *Acute Toxicity Estimation and Operational Risk Management of Chemical Warfare Agent Exposures* (USACHPPM 2004). The purpose of that report was to provide implementation guidance on the use and interpretation of the December 2001 Deputy Assistant to The Secretary of Defense Chemical and Biological (Warfare Agent) Defense ((DATSD-CBD) interim-certified acute toxicity values for GA, GB, GD, GF, VX, and HD (DATSD-CBD 2001). The report demonstrated how the interim-certified acute toxicity values can be incorporated into operational risk management (ORM) terminology and how toxicity information and corresponding health impacts can be translated into the different OEH hazard severity categories. This was an ideal method for developing air MEGs because the toxicity data presented in the report are specifically intended for assessing military personnel exposures for the time periods of interest. The USAPHC (Prov) RD 230 provides additional explanation and rationale for development of the air MEGs for CWA. They were developed for EDs of 10-minutes, 1-hour, 8-hours, and 24-hours in each of the four hazard severity categories (Negligible, Marginal, Critical, and Catastrophic). This resulted in a total of 16 different air MEGs for each CWA. Air MEGs were not developed for longer exposure durations (i.e., 14-day and 1-year) because scenarios involving CWAs do not reasonably involve such extended air exposures.

2.7.1.2 Water MEGs for chemical warfare agents

The water MEGs for CWAs are extracted directly from the doctrinal requirements of TB MED 577. These water MEGs are, therefore, Military Field Water Standards (MFWS) which, if exceeded, require the Commander's approval prior to water consumption. As with the air exposure pathway, extended exposure to small amounts of CWA in a drinking water source is not a plausible scenario (due to physical/chemical characteristics of the agent as well as the military requirements that would prohibit extended use of such a water source); therefore, only short-term Water MEGs for CWA are provided.

2.7.1.3 Soil MEGs for chemical warfare agents

Despite the general non-persistent nature of CWA in air and even water, binding to soil or other solid media can potentially extend the presence of CWA in a deployment setting. This is particularly true for the agents HD and VX. Cold temperatures and dry climates will tend to extend the persistence of these chemicals; on the other hand, rain and heat are natural mechanisms of degradation.

Decisions concerning reentry and post-decontamination scenarios (i.e., after air monitoring has cleared the immediate airborne hazard concern) may need to be validated through specific analysis of soil or other solid material. Soil MEGs have been developed using the same model used to derive 1-year soil-MEGs for other chemical hazards.

2.7.2 Key TICs of Military Concern

The TICs are commercially produced chemicals that may (depending on the toxicity and exposure) pose risk of severe, potentially lethal, immediate acute adverse health effects from a single exposure event. The key TICs of concern to the military are those that are especially toxic and readily accessible in large amounts. The TIC exposures can result from accidental releases, leaks, explosions or intentional releases including attacks near stored chemicals or release with improvised explosive devices (IEDs) (for example, see USACHPPM 2006). Environmental settings, where the presence of TICs is likely, include: industrial production and manufacturing facilities, water and waste water treatment plants, waste storage facilities, and laboratories.

The USACHPPM participated in an international military effort to identify and prioritize TICs of military concern for the health, safety, and operational success of deployed troops. The basis (methodology) for the priority "list" of TICs is discussed in USACHPPM technical report, *Industrial Chemical Prioritization and Determination of Critical Hazards of Concern, Technical Annex and Supporting Documents for International Task Force (ITF)-40 (FOUO),* (USACHPPM 2003) and also summarized in a peer-reviewed publication (Hauschild and Bratt 2005). The resulting report identified key TICs for three categories: acutely toxic airborne hazards (via inhalation/ocular), critical physical hazards (flammable/instable), and critical acute ingestion hazards (via drinking water). The MEGs for these chemicals were developed using the same standard methods as the other chemical MEGs in USAPHC (Prov) TG 230. However, additional Negligible, Marginal, and Critical short-term air MEGs (for 10-minute as well as 1-hour, and 8-hour exposures) are now provided for a list of 34 key TICs of particular concern. Just as with the CWAs, this is considered necessary since many scenarios would involve a single, very brief exposure to TIC vapors.

Additional preventive medicine resources for handling TICs include the USAPHC (Prov) Deployment Health Guide: Toxic Industrial Chemicals (TIC) Release Response Staying Health Guide (SHG) # 044–0106 and the companion Hazardous and Toxic Industrial Chemicals Tables (last update: Oct 2007). Both are available on the USAPHC (Prov) website.

Because these criteria were needed as decision criteria for acquisition specifications, the issues and methodology were recently addressed in USACHPPM technical report, *Health-Based Chemical Vapor Concentration Levels for Future Systems Acquisition and Development,* (USACHPPM 2008).

2.7.3 Airborne Particulate Matter

Particulate matter air pollution is a complex mixture of extremely small particles and liquid droplets in the air. When breathed in, some of these particles can reach the deepest regions of the lungs. Exposure to excessive particle pollution is linked to a variety of significant health problems. Particulate matter pollution can be, or can be perceived as, a major health and operational risk concern in some deployment environments.

A specific methodology was developed for the setting of the PM MEGs, which are based, in part, on guidelines provided by the EPA and recent USAPHC (Prov) experience assessing PM risks in deployment settings. Guidance for assessing airborne PM exposures is provided in Section 3. The RD 230 provides the details behind the derivation of the PM MEGs.

Although PM may emanate from many sources, fossil-fuel combustion is the predominant source of particulate in areas with high population density, such as in the United States and the European Union. However, in some deployed settings, blowing dust can be a major contributor to the total PM concentration. The size and composition of measured PM in deployment settings is directly relevant to the accurate assessment of PM health risks for deployed personnel. For this reason, the accurate health assessment of PM measurements must be accompanied by evaluations of the likely sources and composition of the measured particles.

In addition, airborne PM in some regions of the world can result in personnel perceptions of adverse health risks, distrust, and a high level of emotion about military risk assessment conclusions that indicate that exposures pose a low risk. Some personnel will be concerned that PM (possibly in conjunction with other TICs) will cause adverse health effects, despite the absence of airborne TICs above a MEG. Personnel outrage related to perceived health risks (vs. actual) as a result of airborne exposures can further complicate communication of OEH assessments, and should be factored into risk communication efforts related to airborne PM.

2.7.4 Other Chemicals of Special Interest

The risk assessment process and/or the MEG development process provides for additional considerations and deviations from the standard methodology for some other chemical groups. These include dioxin-like compounds, military smokes and obscurants, and diesel fuels and related compound mixtures. Details are provided in either Section 3 for risk assessment process considerations and RD 230 for special MEG development methods.

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3 RISK ASSESSMENT APPLICATIONS

3.1 INTRODUCTION

3.1.1 Purpose

This section provides guidance on how to properly use MEGs within risk assessments supporting ORM decisions. The guidance provides a defensible, logical, and consistent framework for characterizing health risks associated with OEH hazards encountered during deployments. While this section attempts to provide a level of standardization and transparency to what is inherently both an art and a science, it should be understood that any given risk assessment involves case-specific considerations and some degree of subjective, professional judgment.

3.1.2 Audience and Scope

This guidance is written for Preventive Medicine (PVNTMED) personnel trained to identify and evaluate environmental health hazards functioning at or above the Health Service Support Level II, according to DA Pam 40-11, section 3–2, (DA Pam 40-11, 2006). Appropriate application of MEGs requires a basic understanding of health risk assessment concepts and models (e.g., exposure assessment) and of key scientific limitations associated with the MEGs (e.g., dose response and toxicology). This guidance does not replace the need for basic technical training in these areas, nor does it provide guidance for sample planning or collection. Additional information regarding the basis of MEGs can be found in USAPHC (Prov) RD 230. Personnel can also contact USAPHC (Prov) for additional materials, training, or assistance in application of the MEGs.

3.1.3 Summary of Change

While the risk assessment process described herein remains embedded within the overarching military risk management framework (FM 5-19), it has been updated and expanded to address changes in DOD and Joint deployment health surveillance policy. Specifically, the resulting risk assessment process must now address acute (short-term) and chronic (long-term/latent) health effects potentially associated with deployment exposures to OEH hazards. In addition, methods for ranking hazard probability have been improved and procedural clarifications and rules of thumb are provided. These are based on the experiences of USAPHC (Prov) personnel who have been conducting deployment health risk assessments.

3.2 MILITARY RISK MANAGEMENT PROCESS

Note: Section 1.4 provides a broad overview of military health risk management policies.

3.2.1 Background

Commanders are responsible for protecting and preserving personnel and equipment against injury, damage, or loss that may impact to the military mission and force readiness. Risk is an expression of the possible mission impacts (either tactical or lifecycle) that a hazard may have in terms of both the consequences of its occurrence (severity) and the probability that it may occur. Determining the risk that is acceptable for a given threat must be done through an iterative process that evaluates changing conditions and balances decisions with other ongoing risks.

Composite Risk Management is the current term used in Army doctrine to describe the process used to identify and control hazards across the full spectrum of Army missions, functions, operations, and activities (FM 5-19). Composite risk management is conceptually in line with the risk management process described in past multiservice doctrine (FM 3-100.12, which has now been rescinded), but emphasizes additional details. The military risk management process is reflected by Figure 3-1. In USAPHC (Prov) TG 230, risk management refers to the overall process of assessing risk and managing risk to now include risks to military personnel from health effects that can occur during and/or after the mission.

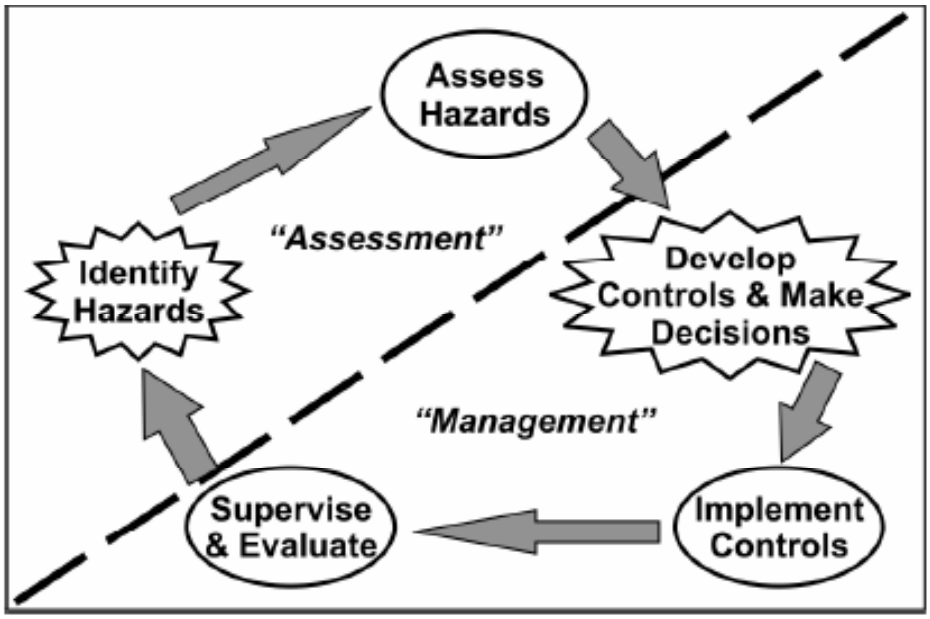

Figure 3-1 Military Risk Management Process (FM 5-19)

The risk matrix shown in Table 3-1 is the qualitative ranking tool described in the military risk management doctrine (FM 5-19, FM 4-02) that is to be used to characterize the risks. Use of this standardized matrix facilitates comparison of risks and risk decision making. The severity and probability of identified hazards are converted into the specified risk levels in the matrix.

Table 3-1 Military Risk Assessment Matrix (FM 5-19 and FM 4-02)

HAZARD SEVERITY	HAZARD PROBABILITY				
	Frequent (A)	Likely (B)	Occasional (C)	Seldom (D)	Unlikely (E)
Catastrophic (I)	Extremely High	Extremely High	High	High	Moderate
Critical (II)	Extremely High	High	High	Moderate	Low
Marginal (III)	High	Moderate	Moderate	Low	Low
Negligible (IV)	Moderate	Low	Low	Low	Low

3.2.2 Tactical Risks and Lifecycle Risks

Previous deployment health policy and guidance required the use of the established risk management process as the framework to characterize risks associated with chemical exposures in deployment settings. This has not changed since the previous publication of USAPHC (Prov) TG 230. However, the established doctrinal definitions of the four risk levels in Table 3-1 are actually based on direct (tactical), real-time mission impacts. While these direct 'tactical' mission consequences are still the key focus of the military risk management process, there is now greater realization that there are potentially significant post-deployment impacts to military resources and force readiness that need to be factored into operational decision making.

In 2007, The Joint Staff concluded that military risk management doctrine did not adequately characterize post-deployment military health impacts, resource, or force readiness consequences. It established procedures in a Joint Staff Memorandum (MCM 0028-07; CJCS 2007) to address OEH issues but did not explicitly define risks levels consistent with the doctrinal process. In the interim, this guide provides recommended risk level definitions for interpreting the significance of lifecycle consequences due to potential latent/long-term health impacts to personnel. The risk level definitions for tactical risk (due to immediate health effects) are the doctrinal definitions, while the recommended risk level definitions for use with lifecycle risks (due to delayed or long-term health effects) are proposed here for the first time.

3.2.2.1 Tactical Risk Definitions

Tactical risk estimates reflect the direct risks to the mission. Acute health effects from environmental exposures can pose direct risks to the mission. Current doctrinal risk definitions are presented in Table 3-2, which also identifies (in italics) the possible medical and PVNTMED risk management responses that may be anticipated. In addition to the medical resources needed to treat and document acute effects, certain exposures that result in acute health effects may also be associated with effects that require post-deployment medical surveillance/follow-up. The potential for any post-deployment medical follow-up and surveillance should be addressed as part of the risk management response triggered by “lifecycle” risks (see next subsection).

3.2.2.2 Lifecycle Risk Definitions

Lifecycle risk estimates reflect long-term risks to Force Readiness and are described in terms of the degree of impact to the medical support system following deployment. Risk definitions are presented in Table 3-3, which also identifies (in italics) the possible medical and PVNTMED risk management responses that may be anticipated. These definitions were developed by USAPHC (Prov) based on current DOD deployment policy objectives. The consequences associated with lifecycle risks are less oriented on “treatment” than those associated with the tactical risks. Instead they reflect the anticipated broad, long-term resource responsibilities of the military medical system to ensure overall Force Readiness. The policies for lifecycle surveillance activities related to these risk definitions continue to be developed.

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Table 3-2 Tactical Risk Definitions (FM 5-19) and Possible Medical Responses Associated with Real-Time or "Acute" Health Effects

Risk Level	Consequences to Military Operations and Force Readiness [1, 2, 3, 4]
Extremely High	Loss of ability to accomplish the mission if hazards occur during mission. *Notable in-theater medical countermeasures and resources anticipated. For example, protection, treatment, and exposure documentation*.
High	Significant degradation of mission capabilities in terms of the required mission standard, inability to accomplish all parts of the mission, or inability to complete the mission to standard if hazards occur during the mission. *Some in-theater medical countermeasures and resources anticipated. For example, protection, treatment, and exposure documentation*.
Moderate	Expected degraded mission capabilities in terms of the required mission standard and will result in reduced mission capability if hazards occur during the mission. *Limited in-theater medical countermeasures and resources anticipated. For example, protection, treatment, and exposure documentation*.
Low	Expected losses have little or no impact on accomplishing the mission. *Little to no in-theater medical resources anticipated for protection and treatment. However, a summary of any negative or low level sampling results should be documented and archived particularly if some personnel express concerns.*

[1] The italicized phrases are not part of the doctrinal definitions but are the types of anticipated medical and PVNTMED responses associated with the expected health outcomes associated with these risk levels.

[2] In addition to the medical resources needed to treat and document acute effects, certain exposures that result in acute health effects may also be associated with effects that require post-deployment medical surveillance/follow-up. The potential for any post-deployment medical follow-up and surveillance should be addressed as part of the risk management response triggered by the "chronic" risk estimate.

[3] For certain chemical exposures, the risk outcomes may be especially pronounced in certain people. For example, moderate risk exposures to sulfur dioxide may be very irritating to most and cause some mild impairment, but may significantly exacerbate the condition of asthmatics and require medical countermeasures.

[4] Exposure documentation (per DODI 6490.03, 2006) includes any applicable medical treatment documentation as well as exposure data incident information (to include field data and incident descriptions). In addition to required in-theater reporting channels, documentation should also be submitted through the designated DOD OEH Surveillance (OEHS) Data Archive (oehs@apg.amedd.army.mil) or secure e-mail (oehsdata@usachppm.army.smil.mil). Environmental exposure data archive data reports can be viewed through the DOD OEHS Data Portal (https://doehsportal.apgea.army.mil/doehrs-oehs/).

Table 3-3 Recommended Lifecycle Risk Definitions and Possible Medical Responses Associated with Post-Deployment "Chronic" Health Effects

Risk Level	Consequences to Military Operations and Force Readiness [1, 2]
Extremely High	Significant future medical surveillance activities and medical provider resources anticipated. *Documentation of environmental data in designated DOD archive and designate a registry to actively track the exposed personnel. Conduct specific active surveillance and/or medical follow-up procedures for life cycle of identified group.*
High	Notable future medical surveillance activities and related resources anticipated. *Documentation of environmental data in designated DOD archive. Specific identification and documentation of the exposed personnel. Possible passive medical surveillance-related activities*.
Moderate	Limited future medical surveillance activities and related resources anticipated. *Documentation of environmental data in designated DOD archive. Consider documenting exposed groups or personnel of surveillance interest.*
Low	No specific medical action required. *Documentation of environmental data in designated DOD archive.*

[1] The definitions are based on the USAPHC (Prov) interpretation of DOD and Joint Staff policies and requirements. The italicized phrases are the types of anticipated medical and PVNTMED responses associated with the expected health outcomes associated with these risk levels.

[2] Environmental documentation (per DODI 6490.03, 2006) should be submitted through the designated DOD OEHS Data Archive (oehs@apg.amedd.army.mil) or secure e-mail (oehsdata@usachppm.army.smil.mil). Environmental archive data reports can be viewed through the DOD OEHS Data Portal (https://doehsportal.apgea.army.mil/doehrs-oehs/).

3.3 KEY RISK ASSESSMENT CONCEPTS FOR ASSESSING CHEMICAL HAZARDS

The primary application of the USAPHC (Prov) TG 230 is to provide the means to interpret scientific data regarding the toxicity of a chemical along with field monitoring results to estimate health and operational risks of excessive chemical exposure. The process of assessing and characterizing deployment-related risks from chemical exposures inherently involves significant data limitations, uncertainty, variability, and professional judgment. Therefore, the PVNTMED professionals using USAPHC (Prov) TG 230 need to be aware of these inherent limitations. Additionally, MEGs are not "go/no-go standards" that must be strictly followed. The MEGs are one of the risk assessment tools to be used by trained PVNTMED personnel who may be required to inform their Commanders of potential adverse health effects caused by chemicals and to identify potential impacts on the mission.

If appropriately used, the risk assessment process in USAPHC (Prov) TG 230 will aid risk managers in making sound risk decisions. This guidance focuses on the *Identify Hazards* and *Assess Hazards* steps of the MRM process illustrated in Figure 3-1. The USAPHC (Prov) TG 230 risk assessment process that implements these steps is summarized in the bullets below. Detailed procedures are described in Section 3.4. Within this process, both acute and chronic exposure hazards are initially identified. Once identified, the severity and probability of the hazards are assessed to determine operational risk.

- Define the purpose of the risk assessment.
- Collect data and describe exposure setting.
- Prescreen detected chemical substances.
- Generate the risk assessment data set.
- Conduct an acute risk assessment.
- Conduct a chronic risk assessment (if appropriate).
- Provide a risk characterization summary.

3.3.1 Hazard Definition

The USAPHC (Prov) TG 230 risk assessment process addresses OEH chemical hazards in deployment settings. The USAPHC (Prov) TG 230 process defines a hazard as follows—

> An OEH chemical hazard is a deployment-related exposure to a chemical substance at a concentration level that has the potential to cause an adverse acute and/or chronic health outcome within the exposed population.

A chemical is only considered to be an OEH hazard if it is determined to be present for adequate periods of time in a form and at concentrations that could be associated with adverse effects in an exposed population. Even if a sample result shows a concentration above a MEG, an OEH hazard may not be present. An appropriate determination involves a data-screening

process that considers all the available data in context with one or more relevant MEGs. Even if a chemical exposure is determined to be an OEH hazard, then the significance of the hazard still must be determined through the military risk assessment process. This TG provides the methodology necessary to appropriately evaluate field data in context with the MEGs to ascertain whether an acute and/or chronic hazard is present. This TG also provides the methodology necessary to further assess the hazards in order to determine the acute and/or chronic risks associated with the hazard.

3.3.2 Ranking Hazard Severity

3.3.2.1 Hazard Severity Definition

The hazard severity of any given deployment-related exposure refers to the extent of potential injury, illness, disease, or other adverse health effects within the population under assumed exposure conditions, integrated with the significance of the health consequences to the tactical and lifecycle missions.

3.3.2.2 Acute and Chronic Health Effects

The significance of the potential health outcomes are ranked differently for tactical versus lifecycle hazards. Ranking health outcomes differently is a major change from previous guidance. Current military policy (Joint Staff Memorandum MCM-0028-07; CJCS 2007) now provides distinct and separate health-based hazard severity level definitions for acute and chronic (long-term/latent) health effects. While the severity categories (e.g., Catastrophic, Critical, Marginal, and Negligible) correspond to the four hazard severity levels established by the doctrinal risk management matrix in Table 3-1, the Joint policy definitions provide a unique interpretation pertinent to implications of acute or chronic (long-term) health effects.

The policy definitions from the Joint Staff Memorandum (CJCS 2007) are presented in Table 3-4. The difference between “acute” and “chronic” health effects, as it pertains to the military risk assessment process, is described below—

- **Acute Health Effects.** These are health effects that develop immediately or shortly after an exposure. Generally speaking, acute/short term *effects* occur after single, relatively brief or short-term *exposures* (minutes to days). Acute health effects can degrade the ability of personnel to conduct real-time deployment, required mission tasks and, thus, have direct (tactical) consequences to military operations. The overall risks posed by acute health effects include the direct impacts to success of the specific tactical mission resulting from both the degradation of Soldier/unit capabilities as well as any required medical or PVNTMED resources.

- **Chronic Health Effects.** These are health effects that develop or continue post-deployment (e.g., months or years later). While it is possible for certain single, short-term exposures to result in a latent health effect (e.g., permanent damage to lung tissue leading to long term respiratory disease), chronic, long-term, or latent health effects are

generally associated with continuous/repeated chronic or long-term exposures (e.g., exposures that last many months or for years). While chronic effects themselves do not pose significant tactical risks, the impacts on morale (physiological considerations) and resulting resources required for risk communication can impact unit effectiveness. In addition, according to the current policy, field Commanders must consider the future consequences of chronic health effects on the full-force-readiness life cycle. The force-readiness 'life cycle' includes personnel accession through retirement or separation and beyond. Future consequences include the DoD resources that may be required to address soldier and family concerns that escalate post-deployment through risk communication processes; and for medical documentation, surveillance, and potentially the follow-up of personnel if chronic, long-term effects are associated with exposures encountered during deployments.

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Table 3-4 Health Effects Descriptions for Each Hazard Severity Category (CJCS 2007)*

Negligible Severity	Marginal Severity	Critical Severity	Catastrophic Severity
Acute Effects Few exposed personnel (if any) are expected to have noticeable health effects during mission. Exposed personnel are expected to be able to effectively perform all critical tasks during mission operations. Minimal to no degradation of abilities to conduct complex tasks are expected.	Acute Effects Many exposed persons are expected to have noticeable but not incapacitating health effects. Observable effects require minimal, if any, medical attention but may reduce some individual physical capabilities and/or may enhance stress-related casualties. Exposed personnel able to perform most critical tasks. Note: Ability to accomplish complex tasks may be degraded.	Acute Effects Personnel are expected to have incapacitating health effects that require immediate medical treatment or support (e.g., are considered 'casualties'.) There may be limited numbers of fatalities. Personnel not experiencing these more serious effects are expected to have at least noticeable, but not incapacitating health effects. Exposed personnel will have limited ability to perform most critical tasks. Note: Ability to accomplish complex tasks likely to be degraded.	Acute Effects Casualties with severe incapacitating effects requiring immediate and significant medical attention and/or additional support for survival. Increasing number of fatalities is expected. Exposed personnel unable to perform critical tasks.
and/or	and/or	and/or	not a driver
Chronic Effects Few exposed personnel (if any) are expected to develop delayed onset, irreversible effects	Chronic Effects Many exposed personnel are plausibly expected to develop delayed onset, irreversible effects. While this may not affect the immediate physiological capabilities of individuals, Commanders must consider long-term implications and appropriately communicate the potential risks. Operational stress related implications may adversely impact operations particularly over-extended, operational periods.	Chronic Effects Majority to all exposed personnel are plausibly expected to develop delayed onset, irreversible effects due to the specified exposure. While this may not affect the immediate physiological capabilities of individuals, Commanders must consider long-term implications and appropriately communicate the potential risks. Psychological implications may adversely impact operations particularly over extended operational periods.	Chronic Effects This level of hazard severity is reserved for the most serious of conditions where immediate survivability against acute effects is the priority. Those that survive may be at increased risk for certain chronic effects.

Note: This matrix applies to all health hazards encountered during deployment. Health effects associated with chemical exposures are typically either acute or chronic but in some cases may be both. In general, short-term, one-time chemical exposures are primarily associated with acute effects, while repeated long-term exposures are associated with chronic effects.

***** Format modified from the original Joint Staff Memorandum MCM-0028-07 (CJCS 2007) version for ease of presentation, to include the elimination of the 'no effects' category.

3.3.2.3 Methodology for Ranking Hazard Severity

For tactical or "acute" hazards, hazard severity is ranked relative to the ability of the field unit to complete the mission or maintain tactical readiness and is associated with potential "acute" health effects. For lifecycle or "chronic" hazards, hazard severity is ranked relative to the medical and related resources required to address personnel health outcomes post-deployment and into retirement and is associated with the potential for "chronic" (or latent) health effects.

Determining the severity level requires an estimate of potential health outcomes given knowledge about the population's exposure. Ranking the severity of a given exposure in a population essentially involves answering questions related to whether the health outcomes described for each severity level from Table 3-4 are likely to occur in some segment of the population deployed in the suspected exposure location.

For example, to rank an exposure at the Critical severity level for chronic effects means that, given the data and the knowledge about the exposure event, it is plausible that a majority to all of the exposed personnel will develop delayed onset, irreversible effects. Unfortunately, with the limits in human toxicological and epidemiological data, it is not possible to predict with good precision the actual extent of effects or the number of exposed personnel that will demonstrate such effects. Even with substantial animal laboratory data, human response variability and genetic susceptibilities to most chemicals make it difficult to know specifically what health effects to anticipate or, even more difficult, to ascertain the percentages of an exposed population that will exhibit certain effects. The expression of potential health outcomes within a population depends on several factors including the magnitude of the chemical concentration, the degree (or rate) of contact, the duration of contact, and the susceptibility of the population. However, to the extent possible, the following factors should be considered when ranking hazard severity for a given chemical exposure:

1. **Nature of the Health Effects**. This factor relates to the range of potential effects, from temporary irritation to disease development to death. The nature of the effects will play a role in whether or not personnel will be able to complete mission tasks and what level of medical resources will be needed in response. Typically, the short-term MEGs address both the degree and severity of an increasing array of acute effects and symptoms (e.g., from mild irritation/odor to more serious respiratory problems or difficulty breathing). In contrast, the long-term MEGs directly address cancer and the single most sensitive non-cancer health endpoint (e.g., kidney disease, low birth weight, or deficit in psychomotor function). The long-term MEGs reflect a safe-sided estimate of the point above which the frequency of the effect among the population becomes increasingly likely rather than an increase in the 'severity' of the health outcome.

2. **Incidence of Health Effects within the Population**. The extent or portion of exposed personnel that are anticipated to exhibit effects given an exposure (evaluated in qualitative terms such as none, few, many, most) also plays a role in the significance of the impacts to the military unit in terms of accomplishing the operational mission and in

the scope of potential medical follow-up of exposed personnel. As indicated above, this is often the primary 'severity' parameter for assessing the risks for long-term chronic effects.

3. **Confidence in the Available MEG to Approximate Factors 1 and 2 from Above**. Confidence in the available data and scientific WOE that a specific health outcome will occur if a MEG is exceeded should be considered when ranking hazard severity. This consideration has been incorporated into the MEG development process. The quality of the WOE can vary significantly among MEGs because the quality of the toxicological and/or epidemiological data underlying the MEGs can be quite variable. For most MEGs, there are some data limitations, so to be protective, the values are generally adjusted downward to estimate the levels at which certain health outcomes may be anticipated. For certain MEGs, the degree of uncertainty is much more substantial than others and may vary by orders of magnitude. In some cases, the means to protectively address these uncertainties involved including a subjective, semi-quantitative reduction of the estimated effect level when setting the value used for the MEG. This uncertainty adjustment is often made by use of quantified 'UFs.' Sometimes terms such as 'modifying factor' or 'safety factor' are used. Typically, specific UFs are assigned for different types of uncertainties to include: (1) animal-to-human extrapolation, (2) interspecies variability, (3) sub-chronic to chronic exposure extrapolation, (4) database completeness, and (5) use of a Lowest-observable-adverse-effect-level (LOAEL) in the absence of a No-observable-adverse-effect-level (NOAEL). Each of these UFs are assigned a value of 0, 3 or 10, and the factors are multiplied by each other to get a final 'total UF' value. For a few MEGs, the total UF is between 10 to 30, most are between 100 to 1000, and a few are higher (e.g., 3000). In general, there is typically less uncertainty (and smaller UFs) in the short-term acute MEGs than compared with long-term MEGs. The resulting MEGs themselves, therefore, do not generally represent the exact exposure threshold for the specific extent and severity of the anticipated health effect(s) in the population. While the MEGs and the associated assessment methodology in this guide can be used to estimate the hazard severity, an evaluation of the chemical-specific types of effects, the actual dose-response data, and the underlying WOE and UFs underlying the MEG values may be useful when assigning hazard severity levels higher than Negligible. This is especially recommended for ranking hazard severity within a chronic health risk assessment. Such evaluations should be performed by appropriately trained PVNTMED personnel.

3.3.3 Ranking Hazard Probability

3.3.3.1 Hazard Probability Definition

Within the USAPHC (Prov) TG 230 process, the hazard probability is the likelihood that the population exposure will result in the hazard severity outcome.

Based on this definition, USAPHC (Prov) has developed definitions (see below table) for the five probability levels in context with OEH hazards assessed by the TG 230 methodology. Under this framework, hazard probability is ranked after hazard severity is ranked.

Table 3-5 USAPHC (Prov) TG 230 Hazard Probability Levels

Rank	Interpretation
Frequent	Personnel will continuously experience exposures that are greater than that required to produce the health effect outcomes associated with the hazard severity level.
Likely	Personnel will likely experience exposures that are greater than that required to produce the health effect outcomes associated with the hazard severity level.
Occasional	Personnel will occasionally experience exposures that are greater than that required to produce the health effect outcomes associated with the hazard severity level.
Seldom	Personnel will seldom experience exposures that are greater than that required to produce the health effect outcomes associated with the hazard severity level.
Unlikely	Personnel are unlikely to experience exposures that are greater than that required to produce the health effect outcomes associated with the hazard severity level.

3.3.3.2 Methodology for Ranking Hazard Probability

Ranking hazard probability involves developing a ranking score that assigns a probability based on joint consideration of the degree, duration, and rate of exposure. The resulting ranking score will scale the "likelihood of personnel encountering a health hazard" (CJCS 2007, p. B-6) according to the intentions articulated in doctrine (FM 5-19) and also match USAPHC (Prov) TG 230 ranking definitions in Table 3-5. While the duration of the assessed exposure events are different for acute versus chronic assessments, the same probability ranking approach is recommended for each assessment. The four hazard probability factors are defined below. Section 3.4 (specifically Exhibit 3-3) provides a decision-logic for ranking hazard probability using these factors.

1. **Degree of Exposure**. This factor is a measure of how much greater the population exposure estimate is compared to the MEG. The higher an exposure is above a MEG, the higher the probability that the severity level health outcomes will occur. As an environmental concentration increases, so does the amount of chemical or material absorbed by those exposed. The probability of an effect being seen in the population is related to the magnitude of the exposure. Depending on a person's susceptibility, effects will be seen at higher or lower levels of absorbed dose. As a result, for any given population, there will be a gradual increase in the number of people showing effects as exposure increases. These effects can increase in both the severity of individual effects and/or in the number of effects expressed. The types of effects and the level of severity do not necessarily increase linearly above a specific MEG. In fact, the dose-response relationship is unique for each chemical and type of MEG.

2. **Representativeness of Field Data**. This factor is a measure of how representative the field-collected data is of the true exposure concentration. In other words, this measures the degree to which the field data may under or over estimate the population exposure. An understanding of the quality of the dataset, which is impacted by measurement error, sample size, data variability, and temporal and spatial scales, is critical in assessing this factor. The intent of the risk assessment will also aid in evaluating this factor. For example, was the data collected to estimate exposure to a whole base camp or just a segment of the camp's population? Also, different data-quality considerations may apply for acute versus chronic risk assessments. Biased sampling designs, sample collection protocols, analytical method detection uncertainties, inadequate data collection (e.g., too few samples), and high spatial and/or temporal variability can all contribute to either an overestimation or underestimation of actual exposures. Professional judgment and exposure assessment principles are needed to evaluate this factor.

3. **Duration of Exposure**. This factor is a measure of how different the population's ED is relative to the assumed ED used to develop the MEG. In many cases, the effects expressed in a population are the result of an exposure over time. For example, some effects—such as cancer—generally require that a person be exposed to a chemical or material over a sustained period of time. In these cases, the probability of an effect being expressed is directly related to the amount of time that population is exposed to a material; as ED increases, so does the probability of these effects occurring.

4. **Rate of Exposure**. This factor is a measure of how different the population's rate of exposure (e.g., inhalation rate (IR), water consumption rate, soil contact rate) is relative to the assumed rate used to develop the MEG. The probability of effects being expressed in a population is dependent on the rate of exposure for a population. (Two examples: a population that is very physically active will have an increased breathing rate and will inhale more of an airborne contaminant, and personnel who maintain vehicles in contaminated soil will have higher contact with that soil). As these rates of contact go up, so will the probability of the expression of effects.

The MEGs represent the bottom of the hazard severity concentration range, where exceeding the MEG means that the concentration has crossed the threshold into that severity category. For example, exposure to a concentration equal to the 1-year Negligible MEG for 1 year assumes that at a corresponding concentration, few exposed personnel will develop delayed onset, irreversible effects. However, as the exposure concentrations increase above the MEG or personnel are exposed for more than 1 year to that level (or both), the probability that more personnel will develop delayed onset, irreversible effects, or these effects will become more serious, will increase.

3.3.4 Articulating the Level of Confidence (or Uncertainty) in the Risk Estimate

The best decisions are made based on obtaining the best data and considering the uncertainties associated with that data. Data quality, including both sampling data, information that informs exposure parameters, and available health effects data will have a direct impact on the confidence in the risk assessment. The discussion below provides some considerations in determining the confidence in the assigned risk. While some guidelines are presented, there are no "standard" definitions for levels of confidence. The risk assessor should consider all of the information at hand and should communicate to the decision maker the level of confidence they have in the data underlying the risk level being presented. Indicators of confidence are given in Table 3-6 .

- High Confidence. High confidence in a risk level implies significant understanding of all the variables used to determine the risk. It results from sampling data that is adequate to characterize typical exposures and the range of those types of exposures, as well as a good understanding of the exposure patterns of the population being characterized.

- Medium Confidence. Medium confidence in a risk level implies some understanding of most of the variables used to determine the risk. It results from sampling data that is plausibly adequate to characterize typical exposures and the range of those types of exposures.

- Low Confidence. Low confidence is assigned when sampling data may not be adequate to characterize the situation, and when the assessor is making a best scientific assessment in the absence of complete information.

There are other uncertainties that may need to be considered other than data quality. For example, there will be various situations where actual exposures are not consistent with assumptions used to develop MEGs. Two of these situations are discussed below.

3.3.4.1 Multiple Chemical Exposures

Each MEG has been established to be protective against exposure to a single chemical (or a specific mixture as defined by the chemical name, e.g., particulate matter). The complex issue of multi-chemical exposures and effects of chemical interactions is beyond the current scope of USAPHC (Prov) TG 230, but such effects should be considered in the overall evaluation of

environmental exposures, especially if several chemical hazards present have similar adverse effects on the human body. A specific, quantitative technique for assessing multiple contaminants in a deployment setting is not recommended at this time (with the exception of assessments for dioxin-like compounds, see Section 3.5.6). Instead, analysts are encouraged to note the possibility of added hazards, particularly where chemical exposures have similar health effects or affect the same target organs. If two or more chemicals have the same target organs or systems, then it may be considered that their effects can be additive or synergistic. For some specific chemicals, such as total petroleum hydrocarbon (TPH) compounds or carcinogens (particularly those with an A or B cancer classification), it is generally assumed that effects of the different chemicals when combined are at least additive.

Table 3-6 Example Criteria for Assigning Confidence Levels

Confidence	Criteria
High	- Field Sampling data quality is very good – substantial samples over time/space. - Field activity patterns are well known. - True exposures are reasonably approximated. - No critical missing information. - The predicted health outcomes are highly plausible (strong toxicological weight of evidence/human data) or already demonstrated.
Medium	- Field data quality is relatively good. - Estimates of field exposure are likely to be greater than true exposures due to incomplete data coverage relative to actual exposure durations. - Detailed information is lacking regarding true personnel activity patterns in the field. - Predicted health outcomes are plausible; there is toxicological data, but limited WOE/human data is lacking.
Low	- Important data gaps and/or inconsistencies exist. - Exposure conditions are not well defined. - Field personnel activity patterns are basically unknown. - Predicted health outcomes are not plausible because it is not consistent with real-world events/experience.

3.3.4.2 Multiple exposure pathways

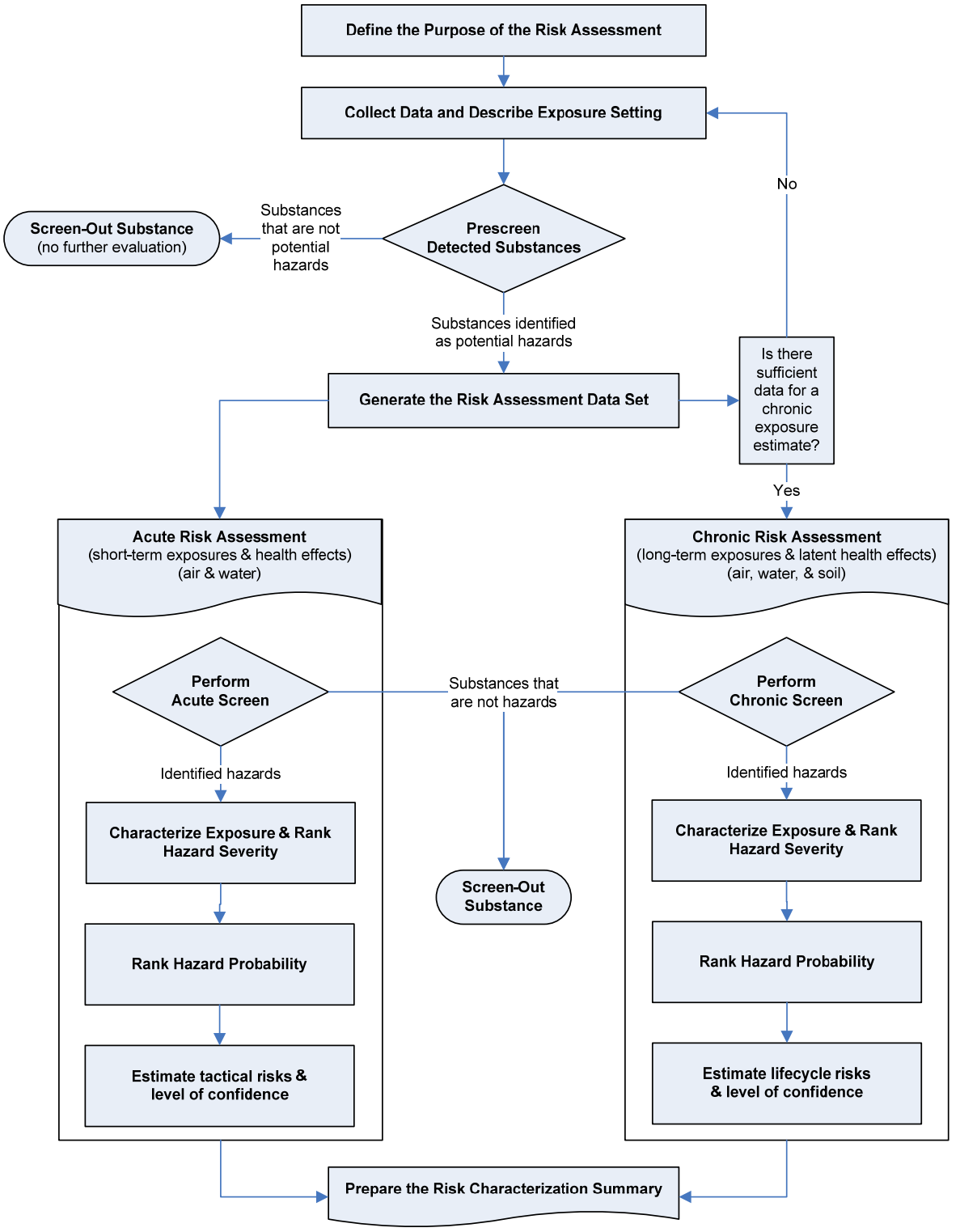
Military personnel may be exposed to the same chemicals via multiple environmental media (e.g., air, water, and soil) and multiple sources (e.g., industrial pollution, vehicle exhaust, waste disposal practices, motor pool spills, and/or agricultural practices). The effects of exposure to the same or similar chemicals through different media should be considered additive. Risk assessors are encouraged to note that exposure (through multi-media) may increase overall exposure. This information can be used when ranking OEH hazards if control measures are more difficult to implement for some hazards than others.

3.4 CONDUCTING A RISK ASSESSMENT

The TG230 risk assessment method consists of the following phases (see Figure 3-2).

- Define the purpose of the risk assessment
.
- Collect data and describe exposure setting.
- Prescreen detected chemical substances.
- Generate the risk assessment data set.
- Conduct an acute risk assessment—
    - Screen for hazardous exposures that may lead to acute effects (acute screen).
    - Characterize exposure, and rank acute hazard severity.
    - Rank acute hazard probability.
    - Estimate tactical and lifecycle risks and level of confidence.
- Conduct a chronic risk assessment (if appropriate)—
    - Screen for hazardous exposures that may lead to chronic effects (chronic screen).
    - Characterize exposure and rank chronic hazard severity.
    - Rank chronic hazard probability.
    - Estimate life-cycle risk and level of confidence.
- Provide a risk characterization summary.

Note: Appendix G provides quick reference tools for conducting a risk assessment using this process.



Section 3.4 provides details associated with each process step.

Figure 3-2 Risk Assessment Process Diagram

3.4.1 Define the Purpose of the Risk Assessment

The purpose of the risk assessment needs to be explicitly stated along with a description of the exposure being assessed. That is, it should articulate, in context with the timeframe under consideration, the population at risk, and what exposure events or environmental conditions are being assessed. The population at risk should be clarified. For example, is it the entire base camp population or a specific unit using a particular water source?

The relevant exposure events and conditions under consideration can include one-time events (e.g., accident, use of a particular water source for 3 months), potentially intermittent events (e.g., high-dust days or air quality associated with temperature inversions), or long-term or continuous exposure events or conditions (e.g., soil contamination or annual average air quality). Some environmental chemical hazards are present at very low levels for the majority of the time but may be intermittently present at notably higher levels (e.g., ambient air quality). In these cases, it is important to evaluate the data in different ways. For example, the assessment should characterize the overall, long-term exposure to determine potential for long-term health risk as well as to evaluate any time periods where acute exposures may pose unique, short-term health risks. Multiple approaches to organizing and evaluating the data prior are discussed in Section 3.4.4.

Whether the risk assessment will address acute exposures or chronic exposures or both should be clearly stated. This is important because there may be situations where insufficient environmental monitoring data exists in order to conduct a chronic risk assessment. Good risk management and medical decisions cannot be made using chronic assessments based on insufficient environmental monitoring data. There is an expectation that there is a minimum standard for data quality related to determining a reasonably reliable estimate of long-term (or annual) exposure levels. Trustworthy estimates of chronic risk in particular must integrate good risk communication principles in order to decrease unnecessary concern while accurately communicating the resulting risk estimate.

3.4.2 Collect Data and Describe Exposure Setting

Collect site data via sampling and analysis or compile available data. Guidance for site characterization and sampling can be found in USAPHC (Prov) TG 317, *Technical Guide for Collection of Environmental Sampling Data Related to Environmental Health Site Assessments for Military Deployments*, (USACHPPM 2009) and other references (i.e., Navy and Marine Corps Public Health Center (NMCPHC) 2008; ASTM 2003).

Based on the purpose of the risk assessment, explicitly describe what is being assessed and how exposure may occur. The exposure pathways that are possible, probable, or already complete should be identified. Additional guidance includes—

- **Water**. Describe the water source or sources being assessed and the potential for exposure. Distinguish between drinking water sources (including ice) and sources used for purposes other than drinking water.

- **Air**. Describe whether site-wide exposure is being assessed, if subareas are being assessed, or if a specific activity within the site is being assessed. Any given assessment can do all of these, but data reduction procedures will need to be clear to avoid confusion and to ensure the best exposure assessment possible (to include calculations).

- **Soil**. Describe whether a specific, potentially contaminated area is being assessed or if the assessment will address site-wide soil conditions. Any given assessment can do both, but clarity will be needed on how exposure to subareas within a site will be handled relative to site-wide exposures and to ensure the best exposure assessment possible (to include calculations).

Given what is determined from the above, a definition of the exposure pathways—from source to human contact—that are under consideration in the assessment should be listed. The end product of this phase should be a description of the source(s), the exposure event(s), the ED(s), the environmental condition(s), and exposure pathways that the risk assessment is addressing.

3.4.3 Prescreen Detected Chemical Substances

As a means to quickly eliminate chemicals from any further evaluation, a pre-screening step is recommended to avoid the evaluation of chemicals where no plausible acute or chronic health effects are expected even under worst-case conditions. Apply these standard rules—

- **Air and Soil**. Eliminate from consideration all chemical substances that do not have a single sample concentration greater than the 1-yr Negligible MEG.

- **Drinking Water**. Eliminate from consideration all chemical substances that do not have a single sample concentration greater than the 1-yr Negligible MEG for the 15 L/day consumption rate.

- **Non-drinking Water (e.g., used for hygiene or cooking)**. Eliminate from consideration all chemical substances that do not have a single sample concentration greater than 2.5 times the 1-yr Negligible MEG for the 5 L/day rate.[7]

When there is no 1-yr Negligible MEG for prescreening purposes, then do not eliminate the substance—carry it through to the next steps.

[7] See Section 3.5.2 for the basis of this criterion.

3.4.4 Generate the Risk Assessment Data Set

At this point in the process, there will be one or more chemical exposures identified as possible hazards requiring further assessment. For these chemicals, a risk assessment data set needs to be constructed. The data set needs to address all exposure events and exposure pathways relevant to the chemicals and time period being assessed. Once the data set is constructed, chemical-specific population exposure point concentrations (PEPCs) will need to be calculated for each exposure event and exposure medium.

3.4.4.1 Population Exposure Point Concentrations (PEPCs)

The PEPC concept is described here, and the following subsections provide a method for generating quantitative PEPC estimates.

> A PEPC is a numerical estimate of the chemical exposure experienced by the population at risk for a given exposure event, time period, and environmental medium. PEPCs are designed to be compared to the MEGs within the context of a health risk assessment. In general, there are peak PEPCs and "average" PEPCs.

An important aspect of this definition is the term "average." In statistical terms, what is meant here by "average" is actually the estimate of the central tendency exposure within the population. Thus, "average" conceptually refers to the mean or median concentration. For risk assessments, the mean is usually most relevant. Depending upon the number of samples and the distribution of the sample data, various estimation procedures can be used to calculate the "average" other than the simple arithmetic mean. Other estimation procedures should be considered for skewed data distributions, which can be common for environmental contaminant data. For example, a geometric mean may be preferred for relatively large sample sizes with lognormal distributions (Gilbert 1987). The proper method for calculating the mean will depend on the professional opinion of the risk assessor given the distribution of the data and what is known about the exposure event. In general, the arithmetic mean is recommended when the size of the data set is limited.

One or more PEPCs are required for each potentially hazardous chemical exposure under evaluation. There are two main types of potentially hazardous exposures (defined as follows) and, therefore, two main types of PEPCs are needed to assess these exposures—

- **Potentially hazardous acute exposures** are those that are short-term and/or time-limited to a specific duration, where the health effects of primary interest are those that may occur during the mission. Health effects of secondary interest are those that may arise after the mission is complete. **Acute PEPC estimates** are concentrations that characterize peak and average acute exposures.

- **Potentially hazardous chronic exposures** are those that are long-term and that may result in latent health effects that may arise after the deployment. **Chronic PEPC estimates** are concentrations that characterize average chronic exposures.

Acute and chronic PEPCs are needed for each chemical not "pre-screened" out of the process in the previous step. These PEPCs are then compared to one or more relevant MEGs in order to evaluate the exposures associated with the site. Multiple PEPCs for the same chemical are usually needed in order to perform a risk assessment. The following table identifies the standard types of PEPCs.

Table 3-7 Standard Types of PEPCs

Type of Exposure	PEPC Type	PEPC Definition*
Acute	Peak PEPC	The measured or expected maximum exposure experienced by the population. It is the maximum-detected concentration during the exposure event or the maximum-detected concentration for a given sample averaging time associated with the data. This concentration represents an estimate of the peak value of the concentration–time curve.†
	Average PEPC or Event-length PEPC	The expectation of the average exposure experienced by the population during the exposure event. It is usually the arithmetic mean or geometric mean concentration of the exposure event.
Chronic	Average PEPC or Deployment-length PEPC	For air and soil only: The expectation of the average exposure experienced by the population during site operations. It is usually the arithmetic-mean or geometric-mean concentration across 1 year or across the length of the deployment.
	Average PEPC or Source PEPC	For water only: The expectation of the average exposure experienced by the population while using the water source (including ice). It is usually the arithmetic-mean concentration for the water source averaged across the duration of use of the water.‡

* Several of the definitions refer to the arithmetic-mean or geometric-mean concentration. In general, the proper method for calculating the mean and confidence intervals around the mean will depend on the professional opinion of the risk analyst given the distribution of the data and what is known about the exposure event (see text above the table).

† It should be understood that even the maximum-detected concentration represents an average across the sampling duration (this is not necessarily the same as across the entire duration of the exposure event). This is most important for air concentrations because water and soil concentrations are less dynamic over time. Thus, a maximum air concentration is actually a time-averaged sample concentration across the duration of time the sample was collected. The following example illustrates the concept. Air is continuously sampled for 10 minutes at two adjacent locations, and those air samples are analyzed in the laboratory with results of 5 and 15 mg/m^3. The overall 10-minute average concentration is 10 mg/m^3. The maximum concentration is 15 mg/m^3, but this maximum is still a 10-

minute average. For example, during that 10-minute period, the concentration could have been higher for 2 minutes and lower for 8 minutes.

‡ In some cases it may be desirable to generate a chronic-average PEPC that is developed as a weighted average across multiple water sources. This preference may arise when the focus of the assessment is on managing total exposure to a specific military unit.

3.4.4.2 Methodology for Generating PEPCs

All PEPCs should be calculated directly from the risk assessment data set. The following step-wise process is the standard method for creating the data set and generating PEPC estimates.

1. **Identify all valid samples** that are relevant to the exposure event and population at risk. This includes a consideration of time, location, and data quality. The data set should include all sample results to include those that are less than the limits of quantitation (or reporting limits)—this includes non-detects (U-flagged data) and estimated concentrations (J-flagged data). Refer to Section 3.4.4.3 for a description of the kinds of quantitation and detection limits and data qualification flags.

    a. Samples outside the date/time range under consideration should be excluded.

    b. Samples outside the exposure area or that do not otherwise characterize the exposure event conditions at the site should be excluded.

    c. Invalidated samples, due to sampling, analytical, or other errors or problems should be excluded.

2. **Compile peak PEPCs for each chemical**. Methods are slightly different for air and water exposures.

    a. **Air**. One or more peak PEPCs can be selected directly from the data set. They are the maximum-detected concentrations of each chemical for each of the available sample averaging times. If a data set contains samples for only one sample averaging time (e.g., 24 hours), then there will be only one peak PEPC for each chemical. However, if multiple sample averaging times are available in the data set (e.g., 1-hour data and 24-hour data), then there is likely to be more than one peak PEPC for a chemical (e.g., a 1-hour peak PEPC and a 24-hour peak PEPC). The highest peak PEPC is considered to be the overall peak PEPC, and it is usually associated with the shortest available sample averaging time.

    b. **Water**. The peak PEPC for a water source is simply the maximum-detected concentration of the chemical.

3. **Calculate average PEPCs for each chemical**. Methods are slightly different for calculating acute (short-term) and chronic (long-term) average PEPCs. Average PEPC calculations require an explicit definition of the ED with start and stop times. The ED of the exposure event or ambient condition under evaluation is pre-defined at this point in the process. Average PEPC calculations may need to involve procedures for handling results that are less than the limit of quantitation (see Section 3.4.4.3).

    a. **Air (acute-average PEPCs)**. The acute-average (or event-length) PEPC across the duration of the exposure event is calculated for each chemical. While there may be multiple peak PEPCs for a chemical (i.e., one associated with each sample averaging time), there will be only one average PEPC for a chemical.

    If the duration of the exposure event is longer than that covered by the sampling data or the available sample averaging times, then assumptions about the concentration–time profile must be made in order to reliably estimate the average PEPC. For example, this can occur if an exposure event associated with an airborne release lasts 5 days and data exists for only the first 3 days. In this case, the average concentration across the first 3 days can be calculated directly from the data. However, if in actuality the concentration (time profile of the event has a peak on the first day and then tapers off to 0 by the end of day 5), then the 3-day-average concentration will be higher than the true-average exposure across all 5 days. It will be conservative (i.e., health protective) to assume that the 3-day average is the average event-length PEPC. In some cases, the risk analyst may have sufficient knowledge of the exposure event to be able to estimate surrogate values for missing time periods. In general, however, average PEPCs should be calculated directly from the sample data and assumed to best represent the true average event-length PEPC. If the risk analyst believes that this PEPC estimate significantly over or under estimates true exposure, the risk assessment methodology incorporates this professional opinion when the hazard probability is ranked later in the process (see probability factor 2 in Section 3.3.3.2 and in Exhibit 3-3).

    b. **Air (chronic-average PEPCs)**. The chronic average (or deployment-length) PEPC is calculated by averaging across the length of deployment (or the length of time of site operations). This duration is usually 1 year but should not exceed 3 years for risk assessment purposes, because such long exposures will require another assessment methodology. Given that the only chronic MEGs are 1-year MEGs, if the ED is greater than 1 year, then the risk assessment methodology incorporates this difference when the hazard probability is ranked later in the process (see probability factor 3 in Section 3.3.3.2 and in Exhibit 3-3). However, if the duration is longer than 3 years, then a unique risk assessment design may be required because the chronic MEGs were not designed for longer exposure times.

Invariably, sampling data will not exist for some time periods between the start of the deployment and the end of the deployment. There is an expectation that there is a minimum data-collection standard for generating reliable estimates of long-term (or annual) exposure levels to ambient airborne chemical hazards. When there is adequate data available to characterize typical every day exposures, intermittent high-end exposures, and intermittent low-end exposures, then there should be sufficient data from which to calculate a reliable average deployment-length PEPC. What is also needed is an estimate of the frequency and duration of the intermittent high- and low-end exposures. With this level of information, it can be assumed that the time periods with missing data are represented in periods with data and that calculated average PEPCs will be reliable. Even in these situations, the use of weighted averages may need to be considered to generate a reliable, overall average deployment-length PEPC.

However, there may be situations where insufficient environmental monitoring data exists and/or those data extrapolations for missing time periods becomes too uncertain in order to reliably estimate the long-term average exposure. Additional data collection is recommended in these situations. If additional data collection is not possible prior to when the risk assessment is needed, then the best estimate of the average PEPC should be produced. Then if the risk analyst believes that this PEPC estimate significantly over- or under-estimates true exposure, the risk assessment methodology can incorporate this professional opinion when the hazard probability is ranked (see probability factor 2 in Section 3.3.3.2 and in Exhibit 3-3).

c. **Water (acute- and chronic-average PEPCs)**. In both cases (acute and chronic), the average PEPC is the average concentration across the exposure duration (i.e., the duration of use of the water source). These values are calculated or chosen directly from the data set.

(1) For many water sources, only one sample will be available and statistical averages are not possible. In those cases, the results from the single sample should be used to represent the average PEPC. In these cases, the peak and average PEPCs will be equal.

(2) In many cases, the acute- and chronic-average PEPCs will be equal because the concentration-time relationship is constant for potable water sources. However, there may be cases where the two PEPCs are different, especially if a non-potable water source is being used.

(3) In some cases it may be desirable to generate a chronic-average PEPC that is developed as a weighted average across multiple water sources. This preference may arise when the focus of the assessment is on managing total exposure to a specific military unit.

d. **Soil (chronic-average PEPCs)**. The chronic-average (or deployment-length) PEPC is calculated by averaging across all the collected samples within the exposure area during the time of site operations (or during the deployment). For deployment risk assessment purposes, it is assumed that there is no variability in the concentration-time relationship for soil contaminants unless there is a specific soil release (e.g., spill or leakage). That is, it is expected that a single round of soil samples can be used to estimate the long-term average chemical concentration in soil at a site. Specific soil-contamination events, such as leaks and spills, should be characterized independently.

3.4.4.3 Detection Limits and Surrogate Values for Non-detected Chemicals

There is often a lack of understanding as to the meaning of and distinctions between the various terms used by laboratories to define analytical method sensitivity and how they should be handled in a risk assessment. There are three kinds of analytical limits most relevant to the risk assessment process—

- **Detection Limit (DL).** The lowest concentration or amount of the target analyte that can be identified, measured, and reported with confidence that the analyte concentration is not a false positive value.[8] This is the smallest concentration that can be demonstrated to be different from zero or a blank concentration at the 99 percent level of confidence (DOD 2009). The DL is the statistical determination that nearly all laboratories perform on a per-method, per-matrix, and sometimes per-instrument basis. At the DL, the false-positive rate is 1 percent (DOD 2009); however, the DL does not sufficiently protect against false negatives. At the DL, the false-negative rate can be as high as 50 percent.

- **Limit of Detection (LOD).** An estimate of the minimum amount of a substance that an analytical process can reliably detect. An LOD is analyte- and matrix-specific and may be laboratory-dependent. This is the smallest concentration that must be present in a sample in order to be detected at a high level of confidence (99 percent). At the LOD, the false-negative rate is 1 percent (DOD 2009).

- **Limit of Quantitation (LOQ)**. The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. It is the lowest concentration that produces a quantitative result within specified limits of precision and bias. For DOD projects, the LOQ shall be set at or above the concentration of the lowest initial calibration standard (DOD 2009).[9]

[8] The method detection limit (MDL) can be considered equal to the DL. The process to determine the MDL is one way to establish a DL.

[9] The client-specified reporting limit (RL) is often equal to the LOQ, but it can be higher. The RL is the client-specified, lowest-concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix (DoD 2009).

Note: Some laboratories will still use terms such as quantitation limit, reporting limit, practical quantitation limit, or other alternatives when it has the same definition as the LOQ (as defined above). These alternative terms may be used if a laboratory is not DOD accredited, which is currently only technically required of a laboratory running samples for DoD cleanup projects. Such laboratories will also not likely report the LOD.

Laboratory analytical results of environmental field samples often report values that are below the LOQ. These numbers need to be flagged and treated appropriately. When an analyte is detected between the DL and the LOQ, the data should be flagged with a "J." This means that the reported concentration is an estimated value. When an analyte is not detected, it should be flagged with a "U." This means that the true concentration is less than the LOD, which should be reported to the client. However, some laboratories do not report the LOD in these cases. Some laboratories report non-detect results with a "U" flag at the LOQ. Non-detect results should not be reported at the DL because of the insufficient protection against false negatives.

The following table illustrates the relationship between these limits, the qualification flags, and the reporting of results.

Table 3-8 Relationship between Detection Limits, Data Flags, and Reported Results

Possible Laboratory Outcomes		Laboratory Reported Results		
		Reported Data Flag	Reported Value	
Result	The concentration is…		Method A	Method B
Not detected	Less than the DL	U	LOD	LOQ
Detected	Between the DL and the RL	J	Measured value	Measured value
Detected	Equal to or greater than the RL	No flag	Measured value	Measured value

At this time, some laboratories do not report the LOD. In these cases, non-detect values are reported with a "U" flag at the RL (alternative B). Note that some laboratories may not even report estimates below the LOQ as a default reporting procedure. This may have to be specially requested.

For risk assessment purposes, all detected values (even estimated J-flagged values) should be used in calculation of PEPC estimates. When a chemical is not detected in every sample, then sample values reported as not detected (i.e, U-flagged) should be assigned surrogate values equal to ½ of the LOD or ½ of the LOQ for the purposes of calculating average PEPCs (see the exception in the paragraph below). The USAPHC (Prov) recommends use of ½ of the LOD when the LOD is known, as it is a more accurate reflection of the information at hand.

In a chronic risk assessment (see Section 3.4.6), chemicals that are detected in only 5 percent or less of the samples are usually screened out of the process. These detected chemicals are screened out by convention (EPA 1989) whereby the rationale is that they are unlikely to contribute to significant, long-term chronic exposure. However, infrequently detected chemicals

can pose acute health risks, which are evaluated in the acute risk assessment process (see Section 3.4.5).

For illustration purposes, consider the following example where the analytical limits for chemical A are as stated below:

DL = 1 mg/m^3
LOD = 3 mg/m^3
LOQ = 5 mg/m^3

Results of 5 mg/m^3 or above would be reported with no flags.

Results between 1 and 5 mg/m^3 would be reported with a J-flag as estimated values.

Results below 1 mg/m^3 would be reported in one of two ways.

Under method A, the preferred approach, the results would be reported as < 3 mg/m^3 since the LOD has been determined to protect against false negatives. The report may actually present the result as "3 mg/m^3 U."

Under method B where the LOD is not reported by the laboratory, the results would be reported as < 5 mg/m^3. The report may actually present the result as "5 mg/m^3 U."

3.4.4.4 Dealing with a Detection Limit that is Higher than a MEG

Many of the deployment sampling protocols were developed in order to minimize the logistical footprint of PVNTMED assets and maximize the ability to characterize the ambient environment with limited resources. One of the results of this balance is that for a handful of chemicals, the long-term 1-yr Negligible MEG (which is used for screening purposes) is lower than the DL. This results in an increased false negative error rate, meaning that there is (for those chemicals) an increased chance that a potential health hazard will not be detected. Current efforts to improve the methods and protocols are ongoing, but this problem will remain for some chemicals for the foreseeable future.

Addressing chemicals in a data set that are reported below the DL will be a matter of professional judgment. However, USAPHC (Prov) provides three general recommendations below—

- If there are no detections and there is no indication that the chemical would be present based on knowledge of the local and regional sources, then do not consider the chemical to be a potential OEH hazard. That is, screen the chemical out of the process. For example, if the MEG for antimony is below the DL and antimony is (a) not detected at all and (b) typically not found in the water in the area, then it should not be considered to be a hazard. No further actions

would be needed other than to document the high detection limit in the confidence discussion.

- If the data set has sporadic detections (≤ 5 percent of total samples, for example, 1 detection in 20 or more samples), then consider the detections individually as unique acute events; identify hazards and assess the acute risk accordingly. Document the high-detection limit in the confidence discussion, and discuss the exclusion of data in the confidence section.

- If there are multiple detections (> 5 percent of total samples, for example, 2 or more per 20 samples), then consider the chemical to be a potential hazard for screening purposes. For the purpose of calculating averages, replace non-detects with a surrogate value equal to ½ LOD or ½ LOQ according to guidance provided in Section 3.4.4.3.

3.4.5 Conduct an Acute Risk Assessment

3.4.5.1 Screen for Hazardous Exposures that May Lead to Acute Effects (acute hazards)

Potential acute hazards are exposures that are short-term and/or time-limited to a specific duration, where the health effects of interest are those that may occur during the mission. In this step, hazardous acute exposures are identified for each previously identified exposure pathway.

This screening is performed by comparing PEPCs for each chemical not eliminated by the prescreen to acute screening criteria. Those chemicals with a PEPC less than or equal to the screening criteria are eliminated from further consideration. Remaining chemical substances are then considered to be acute hazards associated with the exposure event or ambient environment. More formally, the remaining chemicals contribute to an identified hazardous acute exposure, meaning that more than one chemical can be associated with a hazardous exposure event. Risk assessors need to be aware of a limitation with the current risk assessment process when multiple chemicals are present. Currently, the process addresses each as a single hazard, and additive effects are not addressed directly. The acute screening algorithm is defined as follows.

- **Soil**. Currently, sampling data for soil is not evaluated in an acute risk assessment.

- **Air**. Compile the peak PEPC for available sample averaging times from the risk assessment data set (see Section 3.4.4). Eliminate from further consideration all chemical substances with a peak PEPC that is less than or equal to the 14-day Negligible MEG, with the following exceptions:

For most chemicals—

- When a 14-day Negligible MEG is equal to the 1-year Negligible MEG, then use the 8-hour Negligible MEG to eliminate chemicals from consideration. This will occur when there is a lack of confidence in the 14-day MEG.
- When a 14-day Negligible MEG is unavailable, then use the 8-hour Negligible MEG.
- If an 8-hour Negligible MEG is unavailable, then use the 1-hour Negligible MEG.

For PM and CWAs—

- Use the 24-hour Negligible MEG for elimination.

- **Drinking Water**. Compile the peak PEPC for each water source from the risk assessment data set (see Section 3.4.4). Eliminate from further consideration all chemical substances with a peak PEPC that is less than or equal to the 14-day Negligible MEG for the 15-L/day consumption rate.

- **Non-drinking Water (e.g., used for hygiene or cooking)**. Compile the peak PEPC for each water source from the risk assessment data set (see Section 3.4.4). Eliminate from further consideration all chemical substances with a peak PEPC that is less than or equal to 2.5 times the 14-day, 5-L/day Negligible MEG. (See Section 3.5.2 for the basis of this screening criterion). If this MEG is unavailable, then eliminate those less than or equal to 2.5 times the 1-year, 5L/day Negligible MEG.

From this point forward, the assessment focuses upon the exposure pathways and chemicals with peak PEPCs that are greater than the acute screening criteria.

3.4.5.2 Characterize Exposure and Rank Acute Hazard Severity

To characterize exposure and rank hazard severity, a determination should be made whether the exposure is the result of a one-time or rare event, or if it is an intermittent event relative to the deployment duration. While the following method for ranking hazard severity is the same for each of these situations, the frequency of intermittent events should be articulated during risk characterization. Under normal circumstances, knowledge of the source of the chemicals will play a role in making this determination. However, if the source of the chemicals is unknown, then it should be treated as if it could be an intermittent event, as this would be a conservative (health-protective) assumption until more information is available. For the assessment of risk of acute health effects, ambient environmental conditions should be treated as if each day is an intermittent event.

- **Air**. For airborne exposures, both the peak PEPCs and the average PEPC across the selected ED should be determined and/or calculated from the risk assessment data set (see Section 3.4.4) for selection of the hazard severity by comparison to the MEGs as

shown in Exhibit 3-1. The decision logic presented in this figure ranks severity according to the highest MEG that the PEPC exceeds.

- **Drinking Water**. For drinking water exposures, both the peak and average PEPCs across the selected ED should be calculated from the risk assessment data set (see Section 3.4.4) for selection of the acute hazard severity by comparison to the MEGs as shown in Exhibit 3-2. The decision logic presented in this figure ranks severity according to the highest MEG that the average PEPC exceeds. The risk assessor will need to choose either the 5 L/day or the 15 L/day MEGs for comparison purposes. This choice should be based on knowledge of site conditions, climate, and expected consumption rates in the population at risk. The 5 L/day MEGs should be used for consumption rates not to exceed 10 L/day, while the 15-L/day MEGs should be used for consumption rates of 10-L/day or higher.

- **Non-drinking Water (e.g., used for hygiene or cooking)**. For non-drinking water exposures, both the peak and average PEPCs across the selected ED should be calculated from the risk assessment data set (see Section 3.4.4). A hazard severity of Negligible should be assigned to those chemicals with a PEPC less than 2.5 times the 14-day, 5-L/day Negligible MEG (see Section 3.5.2 for the basis of this criterion). If a 14-day Negligible MEG is unavailable or if a PEPC is greater than 2.5 times the 14-day, 5-L/day Negligible MEG, then contact USAPHC (Prov) for assistance.

3.4.5.3 Rank Acute Hazard Probability

Acute hazard probability ranks should be determined for each PEPC that was given a hazard severity rank. The recommended method for ranking hazard probability involves developing a ranking score that jointly considers four hazard probability factors related to the degree of exposure, the representativeness of the field data, the duration of exposure, and the rate of exposure (see Section 3.3.3). For each exposure event or ambient environmental condition being assessed (i.e., for every PEPC), each of the four factors are scored as a 1, 2, or 3 and then summed for a total score. The decision-logic for ranking hazard probability using these factors is provided in Exhibit 3-3.

Exhibit 3-1 Decision-Logic for Ranking Acute Hazard Severity for Airborne Exposures

For most chemicals

Exposure to MEG relationship	*Hazard Severity*
PEPC ≤ 14 day Negligible MEG	Negligible
PEPC > 14 day Negligible MEG but ≤ 8 hr Negligible MEG	Negligible
PEPC > 8 hr Negligible MEG but ≤ 1 hr Negligible MEG	Negligible
PEPC > 1 hr Negligible MEG but ≤ 1 hr Marginal MEG	Negligible
PEPC > 1 hr Marginal MEG but ≤ 1 hr Critical MEG	Marginal *
PEPC > 1 hr Critical MEG	Critical – Catastrophic *

For PM

Exposure to MEG relationship	*Hazard Severity*
PEPC ≤ 24 hr Negligible MEG	Negligible
PEPC > 24 hr Negligible MEG but < 24 hr Marginal MEG	Negligible
PEPC ≥ 24 hr Marginal MEG but < 24 hr Critical MEG	Marginal
PEPC ≥ 24 hr Critical MEG	Critical * †

For CWAs and key TICs

Unlike the other chemicals, there are multiple sets of MEGs available for these chemicals. That is, for each of the EDs of 10 minutes, 1 hour, 8 hours, and 24 hours, there are Negligible, Marginal, Critical, and sometimes Catastrophic MEGs. Severity should be ranked using the MEG ED most closely aligned with the ED experienced by the population.

Exposure to MEG relationship	*Hazard Severity*
PEPC < Negligible MEG	Negligible
PEPC ≥ Negligible MEG but < Marginal MEG	Negligible
PEPC ≥ Marginal MEG but < Critical MEG	Marginal *
PEPC ≥ Critical MEG (for key toxic industrial chemicals)	Critical – Catastrophic *
PEPC ≥ Critical MEG but < Catastrophic MEG (for CWAs)	Critical *
PEPC ≥ Catastrophic MEG (for CWAs)	Catastrophic *

* In these situations, it is recommended that USAPHC (Prov) be contacted in order to validate the severity ranking, provide technical support, and to identify the need for follow-on MEG development.

† Exposures greater than the Critical 24-hour MEG for coarse PM_{10} are anticipated to result in significant irritation to eyes and respiratory system, but such exposures are not ever considered 'Catastrophic' from a *health standpoint*. However, it is acknowledged that certain blinding windstorms conditions can be so severe so has to halt most all outdoor operations (not technically a *health* hazard per se).

Exhibit 3-2 Decision-Logic for Ranking Acute Hazard Severity for Drinking Water Exposures

(1) Based on the ED being assessed, either the 7-day or 14-day MEGs must be chosen for these comparisons. The 7-day MEGs are designed for EDs less than 7 days. The 14-day MEGs are designed for acute/short-term exposures that are longer than 7 days in length.

(2) The risk assessor must choose either the 5-L/day or 15-L/day MEGs for these comparisons. The choice must be consistent across all evaluations in the same risk assessment. This choice should be based on knowledge of site conditions, climate, and expected consumption rates in the population at risk. The 5-L/day MEGs should be used for consumption rates not to exceed 10-L/day, while the 15-L/day MEGs should be used for consumption rates of 10-L/day or higher.

Exposure to MEG relationship	*Hazard Severity*
PEPC ≤ 7-day or 14-day Negligible MEG	Negligible
PEPC > 7-day or 14-day Negligible MEG	Negligible – Catastrophic *

* At this time Marginal and higher severity MEGs for water are not available. Until USAPHC (Prov) establishes such MEGs for a chemical, the hazard severity determination for exposures greater than the Negligible MEG will need to be made by trained subject matter experts. In most cases, based on USAPHC (Prov) experience, the acute hazard severity ranks for PEPC estimates that are greater than the 7-day or 14-day Negligible MEGs will be Negligible. However, when an acute PEPC estimate is substantially higher than the Negligible MEG, then the severity may be Marginal or greater. The severity rank should depend on the following factors:

- The WOE and confidence in the precision of the Negligible MEG as an estimate of the threshold for the health outcomes associated with the chronic hazard severity definition (see Section 3.3.2).
- The dose-response relationships for the health endpoints under consideration in relation to the magnitude of the estimated long-term PEPC.

Subject matter experts with appropriate understanding of the underlying chemical- and endpoint-specific toxicity data should be consulted to determine the most appropriate severity level when the next higher severity level MEG is unavailable.

In these situations, it is recommended that USAPHC (Prov) be contacted in order to validate or determine the severity ranking, provide technical support, and to identify the need for follow-on MEG development.

Exhibit 3-3 Decision-Logic for Ranking OEH Hazard Probability for Acute and Chronic Assessments

Instructions—Rank hazard probability by developing a ranking score that jointly considers the four hazard probability factors related to the degree of exposure, the representativeness of the field data, the duration of exposure, and the rate of exposure. For each exposure event or ambient environmental condition being assessed, each of the four factors are scored as a 1, 2, or 3 and then summed for a total score. The total score is then used to rank hazard probability according to the following pre-defined scale. Note: Methodologic rationale is provided on the last page of the Exhibit.

Hazard probability rank →	Unlikely	Seldom	Occasional	Likely	Frequent
Total factor score →	4 – 6	7	8	9	10 – 12

Factor 1—Degree of exposure. Score this factor from the options below by locating the most accurate relationship between the PEPC and the selected MEGs. For any given case, Method A or Method B must be chosen for use, as they are mutually exclusive.

Method A: When the PEPC is between MEGs of different severity levels for the duration, then select a factor score from among the following options. For example, when a PEPC is between the Negligible and Marginal 8-hour MEGs.

Option	*Factor Score*
PEPC is below the 25th percentile of the severity range	1
PEPC is at or between the 25th and 75th percentiles of the severity range	2
PEPC is above the 75th percentile of the severity range	3

The demarcation of the 25th and 75th percentiles of the severity range are chemical-specific and can be calculated by using the following equations.

25th percentile = $MEG_{lo} + \left(\frac{MEG_{hi} - MEG_{lo}}{4}\right)$ 75th percentile = $MEG_{hi} - \left(\frac{MEG_{hi} - MEG_{lo}}{4}\right)$

Method B: When the PEPC is not between MEGs of different severity levels for the duration, then select a factor score from the following options.

Option	*Factor Score*
PEPC ≤ Negligible MEG	1
PEPC > Negligible, Marginal, or Critical MEG (and the next higher severity MEG does not exist)	2

Factor 2—Representativeness of field data. Score this factor from the options below by using exposure assessment principles and professional judgment to determine if the field-collected data adequately represents the population exposure or if the field data likely under- or over-estimates exposure. Considerations include the sampling design, analytical method detection uncertainties, sample size, and data coverage across the exposure duration. A factor score of 2 is typically expected, especially if little-to-no information bias in the field data.

Option	*Factor Score*
Field data overestimates the population exposure	1
Field data adequately estimates population exposure	2
Field data underestimates the population exposure	3

[continued]

Exhibit 3-3 Decision-Logic for Ranking OEH Hazard Probability for Acute and Chronic Assessments (continued)

Factor 3—Duration of exposure. Score this factor from the options below by computing the ratio between the population's ED and the ED associated with the MEG. For example, if the field exposure is 9 months and the assessment is using a 1 year MEG, then the ratio is 0.75.

Option	*Factor Score*
Field exposure duration : MEG exposure duration ratio is less than 1	1
Field exposure duration : MEG exposure duration ratio is from 1 to 3	2
Field exposure duration : MEG exposure duration ratio is greater than 3	3

Factor 4—Rate of exposure. Score this factor from the options below by making a professional judgment of the actual field conditions associated with population exposure at the site. A factor score of 2 is typically expected, especially if little-to-no information about exposure rate is available.

For airborne exposures

Level of activity related to inhalation rate	*Factor Score*
Light exertion. Standing in foxhole. Guard duty. Desk work. Vehicle driving.	1
Typical exertion. Equipment maintenance. March with load-bearing equipment no rucksack. (Use this option for site-wide annual assessments of air quality.)	2
Heavy exertion. Forced load carriage march with 20-kg load. Repetitive lifting and carrying heavy loads (e.g., ammo handlers).	3

For drinking water exposures

Estimated average water consumption rate		*Factor Score*
Evaluations using a 5-L/day MEG	*Evaluations using a 15-L/day MEG*	
< 3 L/day	10 – 13 L/day	1
4 – 7 L/day	14 – 16 L/day	2
8 – 10 L/day	> 17 L/day	3

For non-drinking water exposures (e.g., hygiene and cooking)

Existing facilities and level of activity related to water contact rate	*Factor Score*
Little water contact or incidental consumption of water (e.g., temporary facilities, or field conditions without centralized facilities, preventing routine showering).	1
Typical and routine uses for hygiene and cooking (e.g., Garrison-type fixed facilities used for cooking, showering, and other hygiene uses).	2
Heavy water contact beyond normal activities (e.g., swimming, submersion for extended periods of time).	3

For exposures to soil

Level of activity related to soil contact rate	*Factor Score*
Minor contact with soil on an infrequent basis (office & shop maintenance work).	1
Moderate contact with soil on a regular basis (frequent patrols on unpaved areas, standard construction). (Use this option for site-wide assessments of soil quality.)	2
Heavy contact with soil on a daily basis (road construction, digging defensive positions).	3

[continued]

Exhibit 3-3 Decision-Logic for Ranking OEH Hazard Probability for Acute and Chronic Assessments (continued)

Rationale underlying the scoring methodology

The hazard probability scoring methodology was designed so that most assessments will result in a rank of Occasional. Occasional is interpreted to mean that "Personnel will occasionally experience exposures that are greater than that required to produce the health effect outcomes associated with the hazard severity level [chosen prior to ranking probability]" (see Table 3-5). The scoring methodology was designed so that a score of 2 for a factor represents the typical score for that factor. A score of 1 represents a down-grading of the probability and a score of 3 represents an up-grading of the probability. This is the case for each of the four factors. Thus, a score of 2 for each factor sums to a total probability score of 8, which translates into a probability ranking of Occasional, which is the middle rank. Higher ranks will indicate that the hazard severity outcomes become more likely and lower ranks indicate that the outcomes become less likely.

The situations that will tend to rank probability higher than Occasional are (1) when the estimated exposure term (i.e., the PEPC) is near the next higher MEG, (2) when site-specific information leads the analyst to believe that the calculated PEPC may actually underestimate exposure, (3) when the duration of exposure is longer than the duration used to derive the comparison MEG, and (4) when the exposure rate in the population is expected to be much higher than that assumed to derive the comparison MEG.

The situations that will tend to rank probability lower than Occasional are (1) when the estimated exposure term (i.e., the PEPC) is near the next lower MEG, (2) when site-specific information leads the analyst to believe that the calculated PEPC may actually overestimate exposure, (3) when the duration of exposure is shorter than the duration used to derive the comparison MEG, and (4) when the exposure rate in the population is expected to be much lower than that assumed to derive the comparison MEG.

3.4.5.4 Estimate Tactical Risks and Level of Confidence

As described above in Section 3.2.2, tactical risk is aligned to the ability of the field unit to complete the mission or maintain tactical readiness and is associated with potential so-called "acute" health effects that may occur during the mission. Tactical risk is first estimated by simply looking up the intersection of the acute hazard probabilities and acute hazard severities associated with the exposure event or environmental condition using the risk assessment matrix (see Table 3-1). A final risk estimate for the exposure event should be based on all the individual chemical risks.

As a final step, the risk assessor should validate whether the assigned risk levels are aligned with the doctrinal meaning of the tactical risk level definitions in Table 3-2. If a misalignment is perceived, then professional judgment (and possibly technical support from USAPHC (Prov)) will be needed to adjust the conclusions in consideration of all relevant information.

> **Consultation with Subject Matter Experts** — When MODERATE or higher risk levels are identified, it is recommended that USACHPPM subject matter experts, or other qualified medical/health professionals, be consulted in order to validate the risk assessment. If exposures actually occur, then such a validation should also review the need for increased medical surveillance and risk communication support.

Before the risk level is communicated to the decision maker, a level of confidence should be assigned to the final risk estimates according to the guidance provided in Section 3.3.4.

The final risk level selected for the acute health effects assessment will correspond to both the tactical and lifecycle risk level definitions. For example (and referencing Table 3-2 and Table 3-3), an OEH exposure resulting in a MODERATE tactical risk of an expected degradation of mission capabilities should also be linked to a MODERATE lifecycle risk of an expectation that a limited level of medical surveillance activity related to the exposure will occur.

3.4.6 Conduct a Chronic Risk Assessment

Based on the purpose of the risk assessment, a chronic assessment may not be needed. However, where there is sufficient data to estimate long-term exposure levels, then a chronic assessment can be conducted. This is important because there may be situations where insufficient environmental monitoring data exists in order to conduct a chronic assessment. There is an expectation that there is a minimum standard for data quality related to determining reasonably reliable estimates of long-term (or annual) exposure levels. Good risk management and medical surveillance decisions cannot be made using chronic assessments that are based on insufficient environmental monitoring data.

3.4.6.1 Screen for Hazardous Exposures that May Lead to Chronic Effects (chronic hazards)

Potential chronic (or latent) hazards are those exposures that are long term and may result in latent health effects that may arise after the deployment. In this step, hazardous chronic exposures are identified for each previously identified exposure pathway.

This screening is performed by calculating PEPCs for each chemical not eliminated by the prescreen and comparing them to chronic screening criteria. The chronic screening criteria are the 1-year Negligible MEGs. These MEGs reflect the most conservative 'plausible worst-case' exposure assumptions (e.g., a repeated continuous exposure over 1 year's time). If the PEPC is equal to or falls below this level, then one may assume that the identified chemical exposure does not pose a chronic health hazard. The proper PEPC for identifying potential chronic hazards is the average concentration from the identified data set, which will ideally include results from applicable historic site data (if historical data is consistent with current environmental conditions). Those chemicals with a PEPC less than or equal to the screening criteria are eliminated from further consideration. Remaining chemical substances are then considered to be chronic hazards associated with the exposure event or condition.

The chronic screening algorithm is defined as follows.

- **Frequency of Detection Screen**. Eliminate from further consideration all chemical substances that are detected less than 5 percent of the time (EPA 1989, p. 5-22) within the sample set to be used to calculate exposure estimates for each exposure pathway.

- **Air and Soil**. Calculate the deployment-length PEPC from the risk assessment data set (see Section 3.4.4). At sites operating for multiple years, more than one annual average can be used. Eliminate from further consideration all chemical substances with deployment-length PEPCs that are less than or equal to the 1-year Negligible MEG.

- **Drinking Water**. Calculate the source PEPC from the risk assessment data set (see Section 3.4.4). Eliminate from further consideration all chemical substances with deployment-length PEPCs that are less than or equal to the 1-year Negligible MEG for the 15L/day consumption rate.

- **Non-drinking Water (e.g., used for hygiene or cooking)**. Calculate the source PEPC from the risk assessment data set (see Section 3.4.4). Eliminate from further consideration all chemical substances with deployment-length PEPCs that are less than or equal to 2.5 times the 5L/day, 1-year Negligible MEG. (See Section 3.5.2 for the basis of this screening criterion).

From this point forward, the assessment focuses upon the exposure pathways and chemicals with PEPCs that are greater than the chronic screening criteria.

3.4.6.2 Characterize Exposure and Rank Chronic Hazard Severity

At this point, the assessment focuses upon the exposure pathways and chemicals with average deployment-length PEPCs that are greater than the 1 year Negligible MEG.

When conducting a chronic exposure assessment, it is desirable to evaluate all the data available from the site that was collected over time. An examination of all of the data provides a better indication of the "true" environmental picture at the site over an extended period of time and how accurately a current data set represents chronic exposures. This complete data assessment can also assist with the acute evaluation since it demonstrates if the current data set is "in line" with past data or indicates a new trend and potential problems that require further investigation and additional sample collection. At sites operating longer than 1 year, then chronic hazard severity assignments for multiple years may be useful to assess trends over time.

For air, water, and soil exposures, chronic hazard severity should be ranked by comparing the calculated annual average PEPC, or deployment-length PEPC, to the long-term, 1 year MEGs using the decision-logic presented in Exhibit 3-4. Section 3.4.4 provides guidance on calculating the average PEPC.

For drinking water exposures, the risk assessor should choose either the 5-L/day or the 15-L/day water MEGs for comparison purposes based on knowledge of site conditions, climate, and expected consumption rates in the population at risk. The 5-L/day MEGs should be used for consumption rates not to exceed 10-L/day, while the 15-L/day MEGs should be used for consumption rates of 10-L/day or higher.

For non-drinking water exposures, USAPHC (Prov) should be contacted for assistance. A standard methodology has not yet been developed to evaluate chemical exposures with deployment-length PEPCs that are greater than the screening criterion of 2.5 times the 5-L/day, 1-year Negligible MEG.

The final chronic hazard severity rank for the exposure event or environmental condition should not necessarily be an automatic decision based on the guidelines presented in Exhibit 3-4. Professional judgment should be applied before a final determination is reached if a higher than negligible rank is selected. Considerations include the basis and confidence in the MEG value, knowledge about the dose-response function, toxicological WOE, other alternative health criteria and their basis, the short-term MEGs, and any other relevant factors.

Exhibit 3-4 Decision-Logic for Ranking Chronic Hazard Severity for Long-Term Exposures to Air, Drinking Water, and Soil

Exposure to MEG relationship	*Hazard Severity*
PEPC ≥ 1 yr Negligible MEG but < 1 yr Marginal MEG	Negligible *
PEPC ≥ 1 year Marginal MEG	Marginal – Critical *

* At this time only one long-term Marginal MEG is available (for $PM_{2.5}$) and no long-term Critical MEGs are available. Until USAPHC (Prov) establishes a long-term Marginal and Critical MEG for a chemical, the hazard severity determination for an exposure greater than the Negligible MEG will need to be made by trained subject matter experts. In most cases, based on USAPHC (Prov) experience, the chronic hazard severity ranks for PEPC estimates that are greater than the 1 year Negligible MEG will be Negligible. However, when long-term PEPC estimates are substantially higher than the Negligible MEG, then the severity may be Marginal or, in rare cases, Critical. The severity rank should depend on the following factors:

- The weight of evidence and confidence in the precision of the MEG as an estimate of the threshold for the health outcomes associated with the chronic hazard severity definition (see Section 3.3.2).
- The dose-response relationships for the health endpoints under consideration in relation to the magnitude of the estimated long-term PEPC.

SMEs with appropriate understanding of the underlying chemical- and endpoint- specific toxicity data should be consulted to determine most appropriate severity level when the next higher severity level MEG is unavailable.

In these situations, it is recommended that USAPHC (Prov) be contacted in order to validate or determine the severity ranking, provide technical support, and to identify the need for follow-on MEG development.

3.4.6.3 Rank Chronic Hazard Probability

Chronic hazard probability ranks should be determined for each PEPC that was given a hazard severity rank. The recommended method for ranking hazard probability involves developing a ranking score that jointly considers four hazard probability factors related to the degree, duration, and rate of exposure (see Section 3.3.3). For each exposure event or ambient environmental condition being assessed (i.e., for every PEPC), each of the four factors are scored as a 1, 2, or 3 and then summed for a total score. The decision-logic for ranking hazard probability using these factors is provided in Exhibit 3-3 (page 60).

3.4.6.4 Estimate Lifecycle Risk and Level of Confidence

As described above in Section 3.2.2, USAPHC (Prov) recommends that lifecycle risk be aligned to the medical and related resources required to address personnel health outcomes post-deployment and into retirement, whereby, such potential health outcomes referred to as "chronic" (or latent) health effects using the terminology found in Joint policy (CJCS 2007).

Lifecycle risk is first estimated by simply looking up the intersection of the chronic hazard probabilities and chronic hazard severities associated with the exposure event or environmental condition using the risk assessment matrix (see Table 3-1). A final risk estimate for the exposure event should be based on all the individual chemical severity ranks.

As a final step, the risk assessor should validate whether the assigned risk levels are aligned with the USAPHC (Prov)-recommended meaning of the lifecycle risk definitions in Table 3-3. If a misalignment is perceived, then professional judgment (and possibly technical support from USAPHC (Prov)) will be needed to adjust the conclusions in consideration of all relevant information.

Consultation with Subject Matter Experts — When MODERATE or higher risk levels are identified, it is recommended that USAPHC (Prov) subject matter experts, or other qualified medical/health professionals, be consulted in order to validate the risk assessment. If exposures actually occur, then such a validation should also review the need for increased medical surveillance and risk communication support.

Before the risk level is communicated to the decision maker, a level of confidence should be assigned to the final risk estimates according to the guidance provided in Section 3.3.4.

The final risk level selected for the chronic health effects assessment will only correspond to the lifecycle risk level definitions because the potential health effects would not be expected to occur during the deployment; whereby if they did, then they would impact the tactical mission and would have been assessed in the context of an acute assessment.

3.4.7 Risk Characterization Summary

Risk characterization summaries provide a quick review of the conclusions of the risk assessment—they represent the executive summaries for preventive medicine officers and Commanders. The risk characterization summary should provide the following three key elements.

- The risk assessment summary table
- Identification of the potential health effects that could occur in the population
- A suggested set of bottom-line-up-front briefing statements

The following subsections provide basic guidance for each of these points. In addition, the case studies in Appendix H provide examples.

3.4.7.1 The risk assessment summary table

The summary table should present the risk levels, associated impacts to the tactical and lifecycle missions, and the level of confidence associated with the assessments. Recommended actions also can be presented. The following tables demonstrate how the results of an assessment might be displayed. There are obviously numerous potential ways to format such summary tables. These formats are provided as examples.

Table 3-9 Example Risk Characterization Summary Table

OEH Hazard		Tactical Risk Estimate	Lifecycle Risk Estimate	Current Recommended Actions
Media/ Source	**Chemical**	(acute effects)	(chronic effects)	
Ambient air impacted by local waste burning	**Elemental mercury**	**Low** Expected losses have little or no impact on accomplishing the mission. *Little to no in-theater medical resources anticipated for protection and treatment. However, a summary of any negative or low level sampling results should be documented and archived particularly if some personnel express concerns.* Confidence in the assessment is medium on a low-medium-high scale.	**Low *** No specific medical action required. *Documentation of environmental data in designated DoD archive.* Confidence in the assessment is medium on a low-medium-high scale.	Continue monitoring ambient air. Document data in designated DoD archive.

*This risk level was estimated in consultation with USAPHC (Prov) subject matter experts.

The above table presents the definitions of the tactical and lifecycle Low risk combined with the possible medical responses associated with the predicted health effects in the population (see Table 3-2 and Table 3-3). The footnote in the above table reflects to the audience that the risk assessor received consultative support from USAPHC (Prov) during the development of the risk estimates. There are scenarios in the TG 230 risk assessment process that recommend such consultations and/or there may be unique site-specific issues that can benefit from reach-back support. Communicating that reach-back SME support was used can increase the impact of the message.

3.4.7.2 Identification of Potential Health Effects

If OEH chemical hazards are identified in the risk assessment (i.e., those chemical exposures "failing" the acute and chronic screens), then the risk characterization summary needs to identify

the potential health effects that could occur in the population based on the assessment of field exposures. There will be cases where no health effects are expected in the population because exposures are too low, and this should be stated. General health effect information can be found in TG 230 Appendices B, C, D, and E. This section should present the potential health effects that are relevant in the final assessment. When risk levels are Moderate or higher, the identification of potential health effects should be based on consultations with appropriately trained subject matter experts at USAPHC (Prov) or another such service organization. This last point cannot be overly emphasized.

The following example illustrates what can be communicated based on the hypothetical assessment that supports the above example summary table.

- Hypothetical Acute Exposure to Elemental Mercury: Potential acute health effects are not expected. The estimated exposure is below the threshold for neurological damage based on occupational data.

- Hypothetical Chronic Exposure to Elemental Mercury: Potential chronic health effects are not expected.

3.4.7.3 Bottom-Line-Up-Front Briefing Statements

Bottom-line-up-front (BLUF) briefing statements are crucial for effective communication with Commanders in the deployment environment. Proven risk communication principles should be used to communicate findings to Command and unit soldiers. Section 4 provides risk communication guidance.

The following example BLUF statements illustrate what can be communicated based on the hypothetical assessment that supports the above example summary table and potential health effects statements.

- This risk assessment evaluated the health risk associated with exposure to ambient air impacted by emissions from the local waste burning activities occurring just off-post.

- The estimated risk level is LOW. Expected losses will have little or no impact on accomplishing the mission. Little-to-no in-theater medical resources are anticipated for protection and treatment.

- Acrolein, mercury, and dioxin related compounds were detected in the air. However, only the levels of mercury pose a health hazard.

- The predicted population exposures at the base camp are unlikely to lead to actual health effects in the population at risk. The acute mercury exposure estimate is below the threshold for neurological damage based on occupational data.

- The confidence in the assessment is medium, but additional analysis is unlikely to increase confidence due to technical limitations.

3.5 UNIQUE SUBSTANCES AND RISK ASSESSMENT CONSIDERATIONS

The risk assessment methodology described above represents a standardized approach and will work for most situations. However, there will be cases requiring special considerations and deviations from the standard methodology. The following subsections provide guidance for some of these cases.

3.5.1 Actions to Take When No Appropriate MEG is Available

Every effort was made to develop MEGs for chemicals that are part of the standard sampling protocols used by U.S. Forces. Although the list of chemicals included in TG 230 is quite broad, there are occasions where identified chemicals will not have a specified guideline. As of the publication of this guide, USAPHC (Prov) is fairly confident that there is a process to evaluate all the chemicals that are evaluated for with current methods. However, there will be cases where chemicals are detected, and there are no appropriate exposure guidelines. This will usually result when there is limited toxicity information available for the chemical. Occasionally, there may be a short-term guideline but no long-term guideline for a chemical. In these cases, it is likely that the chemical poses primarily an acute (short-term) hazard at higher concentrations; however, at lower concentrations there are no documented effects, even after continued long-term exposures. On the other hand, some chemicals may not pose a health risk unless the exposure is constant and repeated over a long-term exposure. In this case, there may not be any short-term MEGs.

In any situation where there is information lacking on a chemical, the risk assessor has two general options: (1) contact USAPHC (Prov) to do research and characterize severity and risk, or (2) establish an overall risk estimate based on the other chemicals detected that have MEGs, and then document the uncertainty (i.e., reduced confidence) in the risk estimate by not including a chemical assessment of the chemical(s) without MEGs. Alternatively, if USAPHC (Prov) assistance is not available for a time-critical need, the risk assessor may choose to assess other available sources of health and toxicity data to develop a temporary surrogate for a MEG value. If this is performed, USAPHC (Prov) requests that the surrogate nature be noted and the basis be documented with a copy of the assessment sent to USAPHC (Prov) for development of future MEGs.

3.5.2 Assessment of Water for Purposes Other than Consumption

The Water MEGs were derived to assess ingestion exposure to drinking water. Ingestion is the route of exposure that generally contributes most to overall intake. However, there has been an

increasing concern that dermal, inhalation, and incidental ingestion exposures resulting from non-drinking use of water sources (such as, showering and cooking) may also be important to evaluate. Water MEGs for non-drinking exposure scenarios have not been derived for several reasons: (1) there is limited data on dermal effects from exposure to chemicals in water, (2) government agencies have not published exposure standards for non-drinking purposes, and (3) use of the water MEGs should be protective for assessing most non-drinking exposures.

Nonetheless, screening criteria and risk assessment guidance for the assessment of water potentially used for hygiene, cooking, and other non-drinking uses have been provided in this chapter. The USAPHC (Prov) currently recommends using the 2.5 times the 5-L/day water MEGs for screening non-drinking water exposures (see Sections 3.4.3, 3.4.5.1, and 3.4.6.1). The Water MEGs are based on toxicological data for health effects associated with ingestion of water and exposure assumptions of 5-to 15 L per day consumption. These MEGS are often similar to civilian criteria and in some cases may be even lower (more protective) due to assumption that deployed military personnel may consume significantly more than the typical US adult. The EPA and other public health entities generally assume adults consume approximately 2 L per day when establishing water standards. These criteria are based on ingestion as a worst-case-exposure assumption, and therefore, the same criteria are considered adequate for other water usage, which would account for substantially less than 2 L/day. The use of a MEG adjusted to reflect EPA-civilian exposure assumptions (that is, multiply by 2.5 to adjust from 5 L/day to 2 L/day) provides protective criteria for the pre-screening and hazard identification of water supplies that are not primary drinking supplies.

Note. According to military doctrine, potable water, including that used for non-consumptive purposes, must still meet military field drinking water standards as described in TB MED 577. For those short-term MEGs that are based on TB MED standards, the standard itself, without adjustment, should be used to determine whether it meets potability requirements. The process described above may be used to assess severity of direct health risk from the specified parameter but does not reflect indirect effects such as those associated with aesthetic (taste/visual) qualities.

If there are chemicals in water used for non-drinking purposes with concentrations greater than the above recommended screening criteria, then USAPHC (Prov) should be contacted for assistance.

3.5.3 Assessment of Airborne Particulate Matter

Particulate matter air pollution is a complex mixture of extremely small particles and liquid droplets in the air. When breathed in, some of these particles can reach the deepest regions of the lungs. Exposure to particle pollution is linked to a variety of significant health problems. Particulate matter pollution can be a major health and operational risk concern in some deployment environments. An accurate assessment of the health and operational risks of high concentrations of airborne PM in the deployment environment has been challenging for several reasons (see RD 230).

Although PM may emanate from many sources, fossil-fuel combustion is the predominant source of particulate in areas with high population density, such as in the United States and the European Union. However, in some important deployed settings, blowing dust can be a major contributor to the total PM concentration. The size and composition of measured PM in deployment settings is directly relevant to the accurate assessment of PM health risks for deployed personnel. For this reason, the accurate health assessment of PM measurements must be accompanied by evaluations of the likely sources and composition of the measured particles.

3.5.3.1 Current Particulate Matter MEGs

Health criteria are not currently available for PM_{10} and $PM_{2.5}$ using the standard hierarchy of sources used for other chemical substances. Therefore, a specific methodology was developed for PM based, in part, on guidelines provided by the EPA National Ambient Air Quality Standards (NAAQS) and air quality index (AQI) sub-indices, and recent USAPHC (Prov) experience assessing PM risks in deployment settings.

Table 3-10 and Table 3-11 present the MEGs selected for PM. The USAPHC (Prov) RD 230 provides a summary of the issues and the derivation of the current PM MEGs.

3.5.3.2 Limitations of the Current Particulate Matter MEGs

The level of protection provided by the short-term PM MEGs is uncertain due to a lack of directly relevant data and the limitations of the available data. Unfortunately, the long-term PM MEGs are considered highly uncertain, and their use should be associated with a low confidence ranking. Both sets of MEGs are likely to be revised pending continued USAPHC (Prov) experience, new data and/or scientific analyses, and future recommendations of national scientific panels.

3.5.3.3 Evaluating Long-Term Exposures to Particulate Matter Without $PM_{2.5}$ Data

The USAPHC (Prov) no longer recommends any long-term MEGs for PM_{10} since the EPA revoked the annual NAAQS for PM_{10} citing a lack of evidence linking health problems to long-term exposure to coarse particle pollution. Therefore, the current PM_{10} MEGs are for short-term exposures only; and so when PM_{10} exposures are assessed, the data must be evaluated to provide an acute health risk estimate for individual days and not averaged over a year. This is consistent with the current EPA position, which considers the health risks of long-term exposures to PM to be primarily associated with the $PM_{2.5}$ fraction. Since historically many sampling protocols (to include both EPA procedures as well as those developed for military deployments) have been designed to obtain PM_{10} data, there are many sites for which there may not yet be data for $PM_{2.5}$. In these situations, no long-term health risk to PM can be reasonably estimated without additional data. Where only PM_{10} data are available, health risk estimates should be limited to estimates of daily acute health effects. Site sampling for $PM_{2.5}$ is recommended in order to assess chronic exposure risks.

Table 3-10 Short-Term (24-hour) Particulate Matter Air MEGs*

Hazard Severity	$PM_{2.5}$	PM_{10}	Description of Military Health and Operational Effects
Critical	500 µg/m^3	600 µg/m^3	Above these, most if not all personnel will experience very notable eye, nose, and throat irritation and respiratory effects. Visual acuity is impaired, as is overall aerobic capacity. Some personnel will not be able to perform assigned duties. Some lost-duty days are expected. Those with a history of asthma or cardiopulmonary disease will experience more severe symptoms.** Conditions may also result in adverse, non-health related materiel/logistical impacts.
Marginal	250 µg/m^3	420 µg/m^3	Above these, a majority of personnel will experience notable eye, nose, and throat irritation and some respiratory effects. Some lost-duty days are expected. Significant aerobic activity will increase risk. Those with a history of asthma or cardiopulmonary disease are expected to experience increased symptoms.**
Negligible	65 µg/m^3	250 µg/m^3	Above these, a few personnel may experience notable mild eye, nose, or throat irritation; most personnel will experience only mild effects. Pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may be exacerbated.**

* The MEGs and descriptors are based on professional judgment reflecting a consensus opinion of USAPHC (Prov) subject matter experts. ** Diagnosis of pulmonary or cardiopulmonary diseases would prevent deployment, though some conditions may go undetected. A small percentage of deployed personnel fall into this sensitive group.

Table 3-11 Long-Term (1-year) Particulate Matter Air MEGs*

Hazard Severity	$PM_{2.5}$	PM_{10}	Description of Military Health and Operational Effects
Marginal	65 µg/m^3	Not defined	With repeated exposures above this, it is plausible that development of chronic health conditions such as reduced lung function or exacerbated chronic bronchitis, chronic obstructive pulmonary disease (COPD), asthma, atherosclerosis, or other cardiopulmonary diseases could occur in generally healthy troops. Those with a history of asthma or cardiopulmonary disease are considered to be at particular risk. This guideline is an uncertain screening value—it is not a known health effects concentration.
Negligible	15 µg/m^3	Not defined	With repeated exposures above this, it is considered possible that a small percentage of personnel may have increased risk for developing chronic conditions, such as reduced lung function or exacerbated chronic bronchitis, COPD, asthma, atherosclerosis, or other cardiopulmonary diseases. Personnel with history of asthma or cardiopulmonary disease are considered to be at particular risk. Exposures below this are not expected to result in development of chronic health conditions in generally healthy troops.

* The MEGs and descriptors are based on professional judgment reflecting a consensus opinion of USAPHC (Prov) subject matter experts. USAPHC (Prov) no longer recommends long-term MEGs for PM_{10}. The Negligible MEG is the EPA NAAQS standard reflecting a threshold level for the general population based on studies evaluating primarily children or individuals with cardiovascular and other diseases. Alternative standards for healthy adults do not yet exist. This MEG is considered a point of departure for further consideration and is not an action level.

3.5.4 Air MEGs and Aerosol Particle Size-Selector Issues

There are two basic types of air MEGS. Those developed for gasses/vapors and those developed for aerosols. The primary difference being that the gasses/vapors refer to the gaseous or vaporous state of the chemical, while aerosols refer to small particles (either solid or liquid droplets) in suspension in the air. Whenever air sampling for aerosols is conducted it is important to know the aerodynamic size range of aerosols the sampler is designed to collect. TG 230 strives to be a comprehensive source of information for as many chemicals as possible the data within is drawn from many different and varied sources, and therefore different aerosol MEGs may be based on different sampling methods with different particulate size selection behavior. At this time, it is important to note that there is the possibility that the field sample may collect a different particulate size range than those used in the studies underlying the development of the MEG. And therefore, this may result in an over or underestimation of risk, depending on the actual size distribution of the aerosol in the field and the particle size-selective sampling device used.

When sampling for PM_{10} or $PM_{2.5}$ particulate matter for comparison to the respective MEGs, it is essential that the particle-size selective samplers conforming to PM_{10} and $PM_{2.5}$ criteria be used. Similarly, for other aerosols the sampling method used out in the field would ideally utilize a pre-selector that had the same particulate size selection behavior as the method used in setting the MEG, however that is not always practical or even sometimes possible. For instance, some aerosol MEGs are based on or derived from an ACGIH TLV (see RD 230). The ACGIH TLV booklet year used to derive the aerosol MEG should be consulted and the appropriate size-selective sampler should be used. Depending on the particular substance, the size-selective sampler should conform to size-selective criteria sampling criteria identified in the TLV booklet and will be identified as respirable (R), thoracic (T), inhalable (I), or will have no designation next to it. If there is no R, T, or I designation for the particular TLV, then it means that it is assessed as "total" particulate (TP) (using a 37-mm closed-face cassette).

3.5.5 Choosing Which MEGs to Use for Metals and Metal-Containing Compounds

Environmental laboratories, when performing analyses for metals, often use analytical methods that provide the greatest potential for extraction of all forms of the metal from the specific matrix. These methods often do not reflect the bioavailability of these elements from the investigated matrix, and often provide a worse-case concentration. Usually laboratory reports describe the total recoverable forms of the element and report the results under the elemental form of the metal, to include the use of the Chemical Abstract Service Registry Number (CASRN) for the elemental form of the metal. However, for some metals, there are numerous chemical forms with MEG values. For example, the following table provides a list of all the forms of nickel that have at least one air MEG.

Table 3-12 Example of Alternative Air MEGs for a Metal: Nickel Compounds

Forms of nickel with at least one air MEG	CASRN
Nickel (elemental)	7440-02-0
Nickel (II) bromide	13462-88-9
Nickel (II) chloride hexahydrate	7791-20-0
Nickel (II) formate	3349-06-2
Nickel (II) hydroxide	12054-48-7
Nickel (II) hydroxide carbonate hydrate	39430-27-8
Nickel (II) nitrate hexahydrate	13478-00-7
Nickel (II) nitrite	17861-62-0
Nickel (II) hydroxide	12125-56-3
Nickel ammonium sulfate	15699-18-0
Nickel carbonyl	13463-39-3
Nickel chloride	7718-54-9
Nickel cyanide	557-19-7
Nickel insoluble inorganic compounds	NA
Nickel oxalate dihydrate	6018-94-6
Nickel oxide	1313-99-1
Nickel refinery dust	NA
Nickel subsulfide	12035-72-2
Nickel sulfamate	13770-89-3
Nickel sulfate	7786-81-4
Nickel sulfate hexahydrate	10101-97-0
Nickel, (carbonato(2-))tet	12607-70-4
Nickel, soluble salts	NA
Nickelous nitrate	13138-45-9

CASRN = Chemical Abstract Service Registry Number
NA = Not available

The assignment of the appropriate set of MEGs to the environmental data should be based on the most appropriate chemical match between the environmental data and the toxicity data used to generate the MEGs. In order to facilitate these decisions, default choices for each metal are provided in Table 3-13. Deviation from the default is expected when sufficient site-specific information is available to justify the use of a particular set of MEGs.

Table 3-13 Recommended Metal Forms for Selection of Default MEGs When No Site-Specific Data Justifies Use of a Specific Set of MEGs

Recommended Default MEG Choices* (presented by substance name from the MEG look-up tables)	**CASRN**	**Applicable Media**
Aluminum, elemental	7429-90-5	Air, Water, Soil
Arsenic, elemental	7440-38-2	Air, Water, Soil
Cadmium, elemental	7440-43-9	Air, Water, Soil
Cobalt	7440-48-4	Air, Water, Soil
Chromium, elemental	7440-47-3	Air, Water
Chromium (III)	16065-83-1	Soil
Copper, elemental	7440-50-8	Air, Water, Soil
Iron	7439-89-6	Air, Water, Soil
Lead and compounds (inorganic)	7439-92-1	Air, Water, Soil
Manganese	7439-96-5	Air, Water, Soil
Mercury, elemental	7439-97-6	Air, Water, Soil
Molybdenum	7439-98-7	Water, Soil
Molybdenum, soluble respirable	NA	Air
Nickel, soluble salts	NA	Air, Water, Soil
Selenium	7782-49-2	Air, Water, Soil
Silver	7440-22-4	Water, Soil
Silver soluble compounds	NA	Air
Strontium, stable	7440-24-6	Air, Water, Soil
Thallium (I) chloride	7791-12-0	Soil
Thallium	7440-28-0	Air
Thallium soluble compounds	7440-28-0	Water
Tin, inorganic	7440-31-5	Air, Water, Soil
Tungsten	7440-33-7	Air
Uranium, highly soluble salts	NA	Air, Water, Soil
Vanadium	7440-62-2	Air, Water, Soil
Zinc, metallic	7440-66-6	Air, Water, Soil

CASRN = Chemical Abstract Service Registry Number NA = Not available

* Note that these substance names do not necessarily line-up with the exact form of the metal used in the underlying dose-response data supporting the MEGs due to differences in how the sources of the health criteria name and publish their recommendations. The USAPHC (Prov) database improvement efforts will eventually address this source-data limitation so that TG 230 substance names and CASRN values will more consistently align with true measured forms of the metals.

3.5.6 Dioxin-like Compounds

Dioxin-like compounds exist in the environment as mixtures and may include polychlorinated dibenzo-p-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs), and some coplanar polychlorinated biphenyls (PCBs). They share certain chemical structures and biological characteristics. Table 3-14 lists these compounds. The PCDDs and PCDFs are formed as a result of combustion processes such as commercial or municipal waste incineration and from burning fuels (like wood, coal or oil). They are also produced naturally such as by forest fires and volcanic activity. Historically, commercial or municipal waste incineration, manufacture and use of certain herbicides, and chlorine bleaching of pulp and paper resulted in the major releases of dioxins to air and water. The dioxin-like PCBs are manufactured products that are no longer produced in the United States.

Table 3-14 Dioxin-like Compounds and Toxicity Equivalency Factors (TEFs)

Halogenated Aromatic Hydrocarbon Congener	CASRN	IUPAC* No.	TEF
PCDD congeners			
2,3,7,8-Tetrachlorodibenzo-*p*-dioxin	1746-01-6	—	1
1,2,3,7,8-Pentachlorodibenzo-*p*-dioxin	40321-76-4	—	1
1,2,3,4,7,8-Hexachlorodibenzo-*p*-dioxin	39227-28-6	—	0.1
1,2,3,6,7,8-Hexachlorodibenzo-*p*-dioxin	57653-85-7	—	0.1
1,2,3,7,8,9-Hexachlorodibenzo-*p*-dioxin	19408-74-3	—	0.1
1,2,3,4,6,7,8-Heptachlorodibenzo-*p*-dioxin	35822-46-9	—	0.01
1,2,3,4,6,7,8,9-Octachlorodibenzo-*p*-dioxin	3268-87-9	—	0.0003
PCDF congeners			
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	—	0.1
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	—	0.03
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	—	0.3
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	—	0.1
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	—	0.1
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	—	0.1
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	—	0.1
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	—	0.01
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	—	0.01
1,2,3,4,6,7,8,9-Octachlorodibenzofuran	39001-02-0	—	0.0003
PCB congeners			
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	77	0.0001
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	81	0.0003
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	105	0.00003
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	114	0.00003
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	118	0.00003
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	123	0.00003
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	126	0.1
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	156	0.00003
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	157	0.00003
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	167	0.00003
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	169	0.03
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	189	0.00003

Note: *IUPAC = International Union of Pure and Applied Chemistry

3.5.6.1 Prescreen

The maximum concentrations of the detected dioxin-like compounds should be summed without regard to TEFs, and then evaluated relative to the standard rules (see Section 3.4.3) using the MEGs for 2,3,7,8-Tetrachlorinated dibenzo-p-dioxin (2,3,7,8-TCDD).

3.5.6.2 Acute Risk Assessments

Acute risk assessments of exposure to dioxin-like compounds should proceed as follows. The environmental concentrations for each congener should be summed without regard to the TEFs. This total concentration should then be compared to the short-term MEGs available for 2,3,7,8-TCDD.

3.5.6.3 Chronic Risk Assessments

Chronic risk assessments of exposure to dioxin-like compounds should proceed as follows. The environmental concentration (in air, water, or soil) for each congener is multiplied by the congener-specific TEF. Table 3-14 provides the most current, consensus-based TEFs for each congener (Van den Berg 2006). These TEQ concentrations are then summed across all detected dioxin-like compounds in the medium into a single value that represents the 2,3,7,8-TCDD TEQ concentration for that medium. This single 2,3,7,8-TCDD TEQ concentration is then compared to the 2,3,7,8-TCDD MEG.

3.5.7 Military Smokes and Obscurants

It is important to note that the MEGs for military smokes and obscurants should only be used for exposure to these specific smokes and not for the specific chemicals contained within the smoke (the converse is also true). There are air MEGs for the following military smokes and obscurants:

Hexachloroethane smoke	Red phosphorous smoke	Fog oil smoke
Diesel fuel smoke	Titanium dioxide smoke	Graphite smoke
White phosphorous smoke	Brass smoke	

There are separate MEGs that should be used for inhalation exposure to diesel fuel vapor or hexachloroethane chemical exposure. For example, the inhalation toxicity of hexachloroethane smoke is attributed to the production of zinc chloride ($ZnCl_2$), the major component of the smoke, and not the chemical hexachloroethane (HC). Diesel fuel smoke is really particulate in nature as it is composed of very small droplets of liquid diesel fuel. Therefore, even though there is diesel vapor in diesel fuel smoke, the diesel fuel smoke MEG covers the combination of both the droplets and vapor and should only be used as such.

3.5.8 Diesel Fuels, Diesel Engine Emissions, and Diesel Smoke

There are Air MEGs for the following diesel-related compounds, which represent different chemical mixtures and exposures. The follow paragraphs provide clarity as to the similarities and differences between the compounds and how their MEGs should be applied.

- Diesel fuels (CASRN 68334-30-5). In general, diesel fuel usually refers to No. 2 fuel oil (standard heating oil) and what is purchased at the pump in the United States.

- Diesel fuel marine (CASRN 77650-28-3). Marine diesel is different from typical diesel fuel; whereas, it is usually a mixture of normal diesel (No.2 fuel oil) and some heavier fuel oil (No. 6, for example). This particular CAS number is usually compared to No. 4 diesel fuel. The Air MEGs for Diesel fuel marine are based on the inhalation of the vapors from the fuel.

- Diesel fuel smoke (no CASRN). Diesel fuel smoke refers to the military obscurant (i.e., used to hide vehicles, troops, or their movements). This is usually formed by injecting diesel fuel into the exhaust manifold of a vehicle causing it to be vaporized and expelled with the exhaust (but not combusted). When it reaches the atmosphere it condenses into very small droplets that generate a white smoke. Diesel smoke is still un-combusted liquid diesel fuel that is suspended in the air in very small droplets. Diesel smoke contains a significant portion of diesel fuel vapors, but additionally it contains the small droplets of liquid in suspension. The Air MEGs are based on the toxicity when these small droplets are inhaled, in combination with the other constituents in the smoke.

- Diesel engine exhaust (no CASRN). Exposures to diesel engine exhaust are those associated with combusted diesel fuel that would come out of a standard engine exhaust. From past experience this is primarily a conglomerate of particulate matter, sulfur oxide (SOx), oxides of nitrogen (NOx), carbon monoxide (CO), carbon dioxide (CO_2), and probably a very small portion of un-combusted, or partially combusted fuel. Only a 1-year Air MEG is available for this compound mixture, based on a chronic noncarcinogenic health endpoint from EPAs IRIS database. The IRIS contains both carcinogenic and noncarcinogenic information for this compound. While IRIS does not provide a cancer-based health criterion, it states that diesel exhaust is likely to be carcinogenic to humans by inhalation from environmental exposures.

3.5.9 Dealing with Typically Non-Hazardous Chemicals

Some chemical data received from routine laboratory analyses will include certain constituents that can be readily identified as “non-hazards.” These are primarily identified in soil analysis and include essential nutrients, minerals, and related parameters. They are found commonly in nature and are considered, at least at some level, beneficial or even necessary to the proper functioning of the human body. The USAPHC (Prov) identified constituents as not being deployment hazards and in the past had not developed MEGs on the basis that they do not

require evaluation. However, since the EPA and other agencies have developed screening values presumably in an attempt to address laboratory results, the USAPHC (Prov) felt compelled to follow suit. Soil constituents that are not considered to be hazards but may be reported with laboratory results are listed below.

Barium	Iron	Potassium
Calcium	Magnesium	Sodium

These substances do not need to be factored into a health risk assessment, but if laboratory results include these constituents and there is a need to address them, screening MEGs are now available consistent with EPA and other agency publications. These constituents are generally only toxic when ingested in large amounts at high concentrations, which is not realistically feasible from soil ingestion at typical environmental concentrations.

The USAPHC (Prov) notes that despite the health basis for the MEGs it has selected or derived, these constituents are generally of less concern than others detected. If concentrations of these constituents previously not identified as non-hazards are greater than the associated MEG, the significance is generally based on worst-case assumptions. The hazard severity should be considered Negligible.

3.5.10 Drinking Water Parameters

Drinking water analysis often includes parameters that may not cause adverse health effects but which may aesthetically (e.g., color, taste, odor) make the water less palatable. This could lead to reduced consumption that could in turn result in indirect health effects from dehydration. The aesthetics of water is subjective and can develop into Soldiers' perceptions of a health risk based on aesthetic factors only and not on sampling data. The context of how these perceptions are addressed will determine if concerns decrease or escalate. Therefore, integration of risk communication principles will be important when the aesthetics of water are in question. In addition, these parameters may be a useful source of information when evaluating water treatment system capabilities or as general indicators of potential unsanitary (microbial) conditions. The MEGs are not developed for physical, biological, or radiological parameters. Specific standards for these parameters are provided in TB MED 577 to ensure that aesthetic standards and general potable sanitary conditions are met.

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4 RISK COMMUNICATION GUIDANCE

4.1 INTRODUCTION

According to the NRC, risk communication is defined as an "interactive process of information and opinion exchange with individuals, groups, or institutions about real or perceived risks" (NRC 1989). In the classic sense, risk communication situations are those that involve some level of concern/ conflict/ disagreement, and some degree of mistrust/ skepticism.

This widely accepted definition suggests that the most effective approach to communicating about risk involves both information exchange and/or communication processes. Delivery of information in a one-way fashion (e.g., via fact sheets, web pages, etc.) is traditionally a public affairs function within the Army/ DOD, and is vital to effective risk communication efforts. Informing and increasing awareness can be helpful to an individual's assessment of risk.

However, one-way communication alone assumes that audience awareness, education, and understanding of a risk (and at times, support for risk mitigation measures) will increase as a result. However, social science research and the Army's own experience/ history suggest this is not always the case. When concerns about possible deployment-related exposure are low, providing one-way information may be appropriate to address concerns adequately. Even then, one-way communication efforts should take place on a regular basis so that information transparency and availability is reinforced, versus the layperson seeking information on their own (e.g., conducting a general internet search).

Defining high concern or what constitutes a risk communication situation will be issue- or site-dependent, but should be based on a risk-benefit analysis of possible outcomes (i.e., social, political, court of public opinion, and mission outcomes) if evidence-based risk communication tools are not adopted:

- Increased demand for additional environmental studies/ public health registries;
- Time/ resources required to repeatedly discuss the same/ similar issues, allegations and concerns;
- Potential for unwanted or increased media/ Congressional scrutiny; and
- Unit detraction from mission accomplishment as/ if concerns become more widespread.

PVNTMED professionals can better assist in Command decision-making by effectively integrating proven risk communication tools and processes. This will help increase the chance that communication actually takes place, while minimizing the risks of these unwanted outcomes. When done well, timely and effective risk communication can reduce stress,

alleviate anxiety, and serve as a force multiplier by helping to ensure that deployed forces focus all of their physical and mental abilities on mission accomplishment.

It is important to note that while effective health risk communication will not guarantee a decrease in anxiety and/or stress levels, inadequate risk communication efforts will almost certainly increase them. Therefore, the goal of risk communication is to provide accurate and timely information in a manner that neutralizes or minimizes unnecessary concern about OEH risks in a deployed environment. Your goal is not to convince people of a particular position (e.g., the OEH risk is low), but to increase knowledge and understanding, build trust and credibility, and encourage appropriate decisions and behaviors (Center for Risk Communication 2006).

This section discusses basic risk communication concepts that would apply to situations where TG230 methodologies are used, referenced, or required, and provides specific tools to assist in clearly communicating OEH risk assessment information when concerns and emotions are high.

Remember that risk communication expertise is available through USAPHC (Prov) (see point of contact information at the end of Section 4).

4.2 DEPLOYMENT HEALTH RISK COMMUNICATION CHALLENGES

Communicating highly technical information by itself will be challenging due, in part to the level of technical detail and knowledge required to perform OEH risk assessments (e.g. results of an assessment, the associated risk matrix, rationale behind/ basis for assessment results). Other risk communication challenges will include the related uncertainties (e.g., field data quality, inhalation rate, exposure time); subjective assignment of confidence levels; “conservative” assumptions made (e.g., which in the end, depend on an individual’s perceptions of the suspected risk); and professional judgments applied. While helpful and necessary to risk assessment experts working to protect Soldier health, the OEH risk assessment process may be difficult to understand, and may be of little interest to those who are focused on identifying and mitigating specific health risks. Therefore, synthesizing and effectively communicating this process will present challenges for even the most skilled PVNTMED subject matter expert.

Consider three scenarios:

1. An OEH risk assessment of ambient environmental conditions results in low tactical and lifecycle risks and recommendations for no further sampling or risk mitigation action. However, base camp Soldiers still suspect an environmental cause for a negative health symptom/ outcome; may question the process used to assess the risk (e.g., why did you use the databases you did?); and possibly suspect the motives of those who conducted the assessment (e.g., an intentional “cover up” or “skewed” assessment) (MacGregor et. al. 1999). [3] Ambient conditions throughout the world can generate any number of health concerns, particularly when deployed settings are new, unfamiliar, involve extremes of any kind (e.g., high heat, little/ no precipitation), or the local environment results in environmental exposures just at or below the associated military exposure guideline

(MEG). Depending on the location, temperature; air and water quality; local industrial operations or customs; and natural weather conditions, the geographic location of some deployed environments can create harsh living conditions, and result in deployment-related concerns. Although risk mitigation options for poor ambient conditions may be limited (e.g., naturally high dust levels), PVNTMED assets will still be required to communicate OEH risk assessments in a manner that increases awareness, confidence and understanding, yet appropriately minimizes health and/or safety concerns.

2. An unexpected exposure event occurs to a deployed unit (all or some portion), and concerns are understandably high. Although it is nearly impossible to collect environmental data during an actual event (unless sampling monitors are operating at the time or PVNTMED assets experience the same acute exposure), human nature will demand clear, near-instantaneous answers to exposure concerns. Modeling can certainly assist in defining potential past and/or future exposures and potential health outcomes, but on technical grounds, completely accurate predictions of health risk outcomes cannot be assigned to past, acute exposures. Communicating uncertainties, assumptions and professional judgments in the face of high concern requires excellent risk communication tools and processes in order to be successful.

3. Finally, unit Commanders will look to PVNTMED assets to provide an accurate assessment of OEH risk that can readily be factored into overall risk management decisions. Commanders will want the "bottom line upfront" (BLUF), along with recommendations that can readily be turned into actions. Although communication needs may be different from the average Soldier, you will still be expected to communicate clearly, succinctly, logically, and with actionable items to make decision-making easier.

Although communicating technical information alone will be difficult, risk communication efforts can be clouded even further by psychological factors when concern is high and/or trust is low. Risks perceived to be involuntary, catastrophic, or unfamiliar, for instance, will be psychologically processed as riskier than those that are not (Slovic 1987). These risk perception factors are just one of three identified sources of risk communication challenges:

- High or widespread emotion (e.g., fear, anxiety, frustration, anger, etc.). Research by the CDC indicates that until emotions are acknowledged and addressed adequately, communication cannot take place (CDC 2009);

- High degree of misperceptions/ misunderstandings. On average, the level of scientific understanding/ skill amongst Americans is low (~6th grade level) and media/social influence cannot be overstated;

- Agendas that come into play (e.g., positioning for a specific outcome [e.g., lifetime healthcare, desire for a different job, etc.]).

Being aware of the mental heuristics in play and the potential sources of concern (e.g., emotion, perception, agenda) are crucial in defining appropriate risk communication messages and approaches. In risk communication situations, efforts should first focus on verifying or building the trust necessary to discuss risk issues productively, and include communication strategies to address the values and potential emotional outrage associated with a particular health risk (Sandman 2009).

Effective risk communication is no easy task. No one is born knowing what to say, how to respond, or when to begin communicating. Becoming a skilled risk communicator requires, among other things, a:

- Willingness to get trained. Risk communication and media training can help broaden your skills, and increase your confidence in situations where mistrust/ skepticism/ scrutiny are high and understanding may be low;

- Willingness to consider the risks and benefits of not addressing concerns at the time they're identified; not considering the communication/ involvement needs and expectations of those most directly affected by the risk; and not communicating well from the beginning;

- Commitment to communicating more effectively based on what science tells us. Although a relatively new field of research, risk communication findings and recommendations are based on decades of academic research; and

- High degree of emotional and social intelligence (EI/SI), and willingness to identify/ accept your own role in how concerns are addressed. Psychological research clearly indicates that people with high levels of EI/SI are more skilled at recognizing and managing emotions; have better listening skills; and more democratic in dealing with others -- qualities necessary to be effective in risk communication situations (Goleman 1995).

4.3 GENERAL RISK COMMUNICATION GUIDELINES

Overall factors directly related to effective risk communication have been identified through years of evidence-based research. These factors can provide the context in which productive risk communication can take place, such as:

- **Trust/credibility** – Research clearly indicates that this is the foundation of effective risk communication efforts. In the absence of adequate knowledge and understanding about a risk, the layperson relies on trust in the institution and on the individual ("social trust") to determine what's risky (Siegrist et. al. 2001). Because this factor is so critical to effective risk communication, it is worth refocusing risk communication efforts over the long-term. Even though PVNTMED assets are assigned to 2- to 3-year tours, each individual's risk communication abilities will impact those that follow you. Therefore,

trust-building actions, such as demonstrating empathy, offering open dialogue, transparent decision-making processes, accountability and timeliness should be factored into risk communication efforts to maintain or strengthen the social trust necessary to effectively discuss risk (Greenberg et al. 1991).

- **Importance of perceptions** – Perception of risk is reality for most people, regardless of the risk itself (e.g., health, safety, occupational), health risk results, and quantity or quality of data. From a public health perspective, the layperson's perception about perceived exposures or possible latent health effects related to an acute or chronic exposure can be equally or more important than the quantitative technical data, in part due to the effort, resources and time required to address concerns effectively. Research indicates that "technicals" (e.g., the PVNTMED expert) and "democratics" (e.g., the layperson) perceive risk differently, although both apply valid principles to do so: Technicals rely heavily on quantitative data and one-way education to communicate risk, while democratics focus on perceived equity of the risk, and violation of rights, particularly the right to be engaged in decisions about issues that directly affect them (Rowan 1994).

- **Non-standard meaning and inferences of language** – Scientific experts who perform OEH risk assessments rely heavily on standard "risk assessment" terminology to represent specific ideas or concepts: Environmental health risk, toxicity factors, exposure points, hazard, severity, probability, etc. However, social science research suggests that words and concepts, no matter how complex or simple, have different meanings to different people. Democratics' processing of language and psychological determination of risk is also a complex process, involving mental heuristics, language interpretation, social trust (discussed above), and assessment of intent (Rowan 1994). Knowing that the meaning of words to some degree is processed by "inferring the intent of the speaker or communicator" reinforces the need for interactive risk communication processes to identify and understand expectations, attitudes and perceptions. This suggests that in risk communication situations, messages/ information should be developed carefully, balancing the information required to communicate OEH results clearly with the layperson's communication needs/ expectations. Pre-tested messages/ information prior to use can be helpful in gauging clarity, intent, and meaning.

- **Two-way dialogue** – As mentioned above, addressing concerns about environmental exposures through a transparent process is known to be the most effective. Although the military operating tempo (OPTEMPO) often requires answers and decisions quickly, when time allows, two-way dialogue prior to or about a health risk decision is the most effective. To the extent possible, offering opportunities for discussions about health risk issues and related decisions can reinforce two-way dialogue; strengthen social trust between the layperson and leaders in charge of Force Health Protection; offer the layperson some level of control over the real/ perceived health risk; and increase understanding of the limitations and requirements involved in the decision-making process. For example, epidemiological difficulties associated with disease cluster investigations can often be overcome by developing a better understanding of the

public's awareness of an issue, their level and extent of emotion, and understanding of the investigation process itself to help build/ strengthen the trust necessary to effectively address community concern about the perceived presence or absence of a disease cluster (Williamson et al. 2005). Two-way risk communication processes can provide mutual benefits to the layperson and to the PVNTMED team by:

- **PVNTMED benefits** –
  - Better understanding the Soldier's level of knowledge and concerns about where/ when exposures may have occurred, and what health outcomes, if any, might warrant further assessment/ investigation;
  - Helping design the level of technical detail needed for Soldiers to better understand the assessment process (i.e., what the OEH risk assessment will and will not accomplish and why) and final results;
  - Helping identify what risk assessment methodologies and/or hypotheses may be acceptable to Soldiers;
  - Assisting in development of the most effective risk communication methods throughout the course of the assessment;
  - Helping garner Soldier understanding and "buy-in" of the evaluation process before final decisions are made regarding risk management or additional study.

- **Layperson benefits** –
  - Better understanding the OEH risk assessment process;
  - Better understanding the rationale behind why further health assessments and/or environmental monitoring may not be warranted;
  - Better understanding of the risk assessment methodological weaknesses and uncertainties faced by the PVNTMED experts; why they were unavoidable; and how they could impact the confidence level in the results;
  - Better understanding what questions the risk assessment will/ will not answer; what actions will/ will not be taken and why; and
  - Becoming more familiar with the technical concepts (e.g., assumptions, statistical significance, ascertainment), making the PVNTMED expert's job of communicating the risk results and progress easier, and potentially increasing the likelihood that Soldier concerns will be addressed more quickly.

4.4 COMMUNICATING RISK TO KEY AUDIENCES

Audiences potentially interested in and/or impacted by an OEH risk assessment are outlined below. Although the technical concepts and skills involved in an OEH risk assessment will likely not change (e.g., level of expertise, toxicity data), the most effective risk communication tools may vary based on audience communication needs, degree of social trust, expectations, and

real/ perceived impact of the health risk (e.g., infantry vs. communications). As a contributing factor in risk management decision-making, OEH information must be communicated to Command leaders first, followed by Soldier communications and risk communication to other audiences.

4.4.1 Communicating with Command leadership

- Anticipate Command needs. Learn as much as possible about Command structure, to include leadership backgrounds, preferred briefing styles, level of technical knowledge, expectations of you/ PM support, etc.

- Anticipate/ identify:
  - The most difficult questions possible and develop key points to address them
  - Areas of high uncertainty and/or topics you wish to avoid and develop responses
  - Concerns related to confidence levels (e.g., if confidence level is low, why does the issue warrant a Commander's attention?) and develop responses

- Learn more about your predecessor's success (or failure) so you can be aware of potential baggage, "hot button" issues, areas of growing concern, etc.

- Coordinate ahead of time with all Command functions that may have a role in addressing/ mitigating the OEH health risk being discussed/ briefed (e.g., transportation, logistics, medical).

- Develop your briefing, keeping this suggested briefing outline in mind:
  - WHY : Gains attention, orients listeners to topic, purpose of briefing
  - WHAT: Contains 75 % of briefing content. Focus on 3 key messages with supporting data
  - HOW: Restate main points, include recommendations, issues to be followed up and by whom, conclude with final statement

- When possible, practice your presentation with colleagues whose feedback you value to increase your confidence level, polish your risk communication skills.

4.4.2 Communicating with Soldiers

- Accept that technical knowledge may be limited and take advantage of "teachable" moments. Although OEH risk assessments are difficult to explain and understand, use appropriate terminology when necessary followed immediately by a brief, understandable explanation.

- Know when facts/ data should be secondary to a more empathetic response. Trivializing or discounting concerns/ emotions will only serve to escalate them (e.g., "there's no

reason to worry about that..”). Verbally acknowledge/ validate risk perceptions and emotions related to a health risk, regardless of risk assessment findings.

- Limit technical data/ statistics until perceptions/ emotions related to the health risk have been identified/ addressed, to the extent possible.

- Provide information in manageable “layers.” Offer concrete examples or actions. Doing so can help prioritize important information, and provide the layperson with some level of control regarding the level of information detail.

- Reference 3rd party credible sources, when possible. For instance, stating that EPA, OSHA, the National Research Council, etc., follow similar risk assessment guidelines can help demonstrate transparency, increase familiarity.

- Be sensitive that your own perceptions of Soldiers can make risk communication efforts more difficult. Assuming that a Soldier won’t understand the information, wouldn’t be interested in it, or is just trying to be difficult will only make risk communication efforts harder for you.

- Anticipate the most difficult questions and develop key points to reference in all potential responses:
    - “Will breathing high levels of dust for a year cause lung problems?”
    - “How did you determine the health risk to be low when I can smell chemical odors every night?”
    - “Why do you keep putting in burn pits when you know they’re bad for us?”
    - “What was I exposed to and how much?”
    - “How can the OEH air assessment be low when dust covers everything in camp?”

- Develop key messages/ points that support the OEH assessment process and/or results that also balance the Soldiers’ communication needs, knowledge level, etc.. Messages should be short (7-15 words), understandable, memorable; use familiar words/ terminology, active voice, personal pronouns (e.g., “I” vs. “the Army”). In risk communication situations, the ideal response is “key message + more detailed short answer.”

- Practice responding to difficult questions to increase your skill and confidence level (USACHPPM/Fulton Communications 2006):
    1) Allow ventilation of emotions/ opinions. Only you can decide how long this should last
    2) Express empathy. This must be sincere; faked empathy will backfire
    3) State key point(s). (see above)
    4) Provide supporting facts for each point. Based the level of detail you provide on the layperson/ audience preference
    5) Restate key point(s), to reinforce what you want the audience to remember

6) Discuss future steps/ actions

- Improve your non-verbal skills and strive to match words and actions.

- Be willing to say "I don't know," combined with specific actions and timeframes about how you will find the answer.

4.4.3 Communicating with other stakeholders (e.g., military family members, local nationals)

- Accept that technical knowledge about OEH risk assessments may be limited and take advantage of "teachable" moments.

- Know when facts/ data should be secondary to a more empathetic response. Verbally acknowledge/ validate risk perceptions and emotions related to a health risk, regardless of OEH findings.

- Limit technical data/ statistics until perceptions/ emotions related to the health risk have been identified/ addressed, to the extent possible.

- Provide information in manageable "layers." Offer concrete examples or actions. Doing so can help prioritize important information, and provide the layperson with some level of control regarding the level of information detail.

- Reference 3rd party credible sources, when possible. For instance, stating that EPA, OSHA, the National Research Council, host nation government, etc., follow similar risk assessment guidelines can help demonstrate transparency, increase familiarity.

- Anticipate the most difficult questions/ allegations and develop key points to reference in all potential responses:
    - "What are you going to do to get rid of the mold growing on my ceiling since it just started after Camp X was put in down the road?"
    - "I have lung cancer and I know it's from your burn pits!"
    - "What was my husband exposed to at Camp X that could have caused his current health problems?"
    - "What kind of long-term health effects can I expect because I've been living near Camp "X" for so long?"
    - "Why didn't you all tell us about this exposure before?"

- Develop key messages/ points that support the OEH assessment process and/or results, but that also balances interests/ concerns of the layperson.

- Practice responding to difficult questions to increase your skill and confidence level (see *Communicating with Soldiers* section above).

- Improve your non-verbal skills and strive to match words and actions.

- Be willing to say “I don’t know” combined with specific actions and timeframes about how you will find the answer.

4.4.4 Summary

Communication of health risk information requires very specialized skills gained by practiced and refined over time. Being aware of how risks are determined/ perceived and how to identify/ develop appropriate messages and two-way dialogue opportunities are critical to successful risk communication efforts. Discussions with media have not been covered in this section, since it too involves a specialized skill set. If you are approached by the media, you must coordinate with your unit Public Affairs Officer (PAO) for guidance/ direction on how to proceed. Although risk communication can and will be challenging to PVNTMED experts involved in OEH risk assessments, adopting the proven tools and strategies discussed here will lead to successful interactions and more effective communications about health risk. Practice and preparation cannot be overstated enough, and risk communication support is available to you.

Feel free to call on USAPHC (Prov)’s risk communication experts when needed to provide document development/ review, and consultation guidance on how to approach specific situations.

USAPHC (Prov) Health Risk Communication Program (HRCP):
Ph: 410-436-3515/ 1-800-222-9698
usachppmhrcp@amedd.army.mil

APPENDIX A

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water and bottled water. During the development of the 1-year water MEGs, these Federal standards were examined in collaboration with the lead subject matter experts for the TB MED 577 revision so that the the long-term (1-year) Negligible water MEGs would not conflict with the 2010 TB MED 577 LTP standards.

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APPENDIX B

LIST OF ACRONYMS, HEALTH EFFECTS DESCRIPTIONS, AND TARGET ORGANS/SYSTEMS

CONTENTS

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Table B-1. Acronym List

Acronym	Full Name
µci/L	microcurie per liter
µg/dL	microgram per decaliter
µg/kg	microgram per kilogram
µg/L	microgram per Liter
µg/m³	microgram per cubic meter
µg/mg	microgram per milligram
µm	micrometer
ABS	dermal absorption fraction for soil
ABSGI	gastrointestinal absorption rate
ACGIH	American Conference of Governmental Industrial Hygienists
ADP	agent degradation product
AEGL	Acute Exposure Guideline Level
AEL	Airborne Exposure Limit
AF	soil-to-skin adherence factor
AFs/d	soil/dust absorption
Ah	Aryl hydrocarbon
AIHA	American Industrial Hygiene Association
Al	aluminum
ALM	adult lead model
AMEDD	Army Medical Department
AMEDD	US Army Medical Department
AMEG	Air Military Exposure Guideline
AO	area of operation
AOR	area of responsibility
AQI	air quality index
As	arsenic
AT	averaging time
ATca	averaging time for carcinogens
ATnc	averaging time for non-carcinogens
ATSDR	Agency for Toxic Substances and Disease Registry
Ba	barium
BDU	battle dress uniform

Table B-1. Acronym List

Acronym	Full Name
BEI	biological exposure index
BW	body weight
C	ceiling limit
Ca	calcium
ca	cancer
CASRN	Chemical Abstract Service Registry Number
Cat	catastrophic
CBRN	Chemical, Biological, Radiological, and Nuclear
Cd	cadmium
CDC	Centers for Disease Control and Prevention
CEGL	Continuous Exposure Guidance Level
CENTCOM	Central Command
CF	conversion factor
CFR	Code of Federal Regulations
chr	chronic
cm	centimeter
cm/L	centimeter per liter
cm^2	square centimeter
cm^2/sec	square centimeter per second
cm^3	cubic centimeter
cm^3/day	cubic centimeter per day
cm^3/g	cubic centimeter per gram
cm^3/hr	cubic centimeter per hour
cm^3/kg	cubic centimeter per kilogram
CN	cyanide
CN/L	cyanide per liter
CO	carbon monoxide
CO2	carbon dioxide
COA	course of action
CONUS	continental United States
COPD	chronic obstructive pulmonary disease
COT	Committee on Toxicology

Table B-1. Acronym List

Acronym	Full Name
Crit	critical
CRM	composite risk management
CSF	cancer slope factor
CSFabs	dermal absorption cancer slope factor
CSFi	inhalation cancer slope factor
CSFo	oral cancer slope factor
CWA	chemical warfare agent
DA	apparent diffusivity
DA	Department of the Army
DA Pam	Department of the Army Pamphlet
DATSD-CBD	Deputy Assistant to the Secretary of Defense Chemical and Biological (Warfare
DIMP	diisopropyl methylphosphate
DL	detection limit
DMDC	Defense Manpower Data Center
DNBI	disease and non-battle injuries
DOD	Department of Defense
DODI	Department of Defense Instruction
DODVSA	Department of Defense Veterinary Service Activity
DOE	U.S. Department of Energy
DOEHRS	Defense Occupational Environmental Health Readiness System
EC	effective concentration
ECt01_severe	exposure concentration causing severe effects in 1 percent of the given populati
ECt50_mild	exposure concentration causing mild effects in 50 percent of the given population
ECt50_severe	exposure concentration causing severe effects in 50 percent of the given populat
ED	exposure duration
ED01	effective dose causing effects in 1 percent of the given population
ED50	effective dose causing effects in 50 percent of the given population
EEGL	Emergency Exposure Guidance Level
EF	exposure frequency
EGL	exposure guidance level
EPA	U.S. Environmental Protection Agency
EPMSP	Enhanced Particulate Matter Surveillance Program

Table B-1. Acronym List

Acronym	Full Name
ERPG	Emergency Response Planning Guideline
EV	event frequency
FDA	U.S. Food and Drug Administration
Fe	iron
FHP	Force Health Protection
FI	fraction ingested
FM	Field Manual
g/m²	grams per square meter
g/mol	grams per mole
GA	tabun
GB	sarin
GD	soman
GF	cyclosarin
GI	gastrointestinal
GPL	general population limit
HA	drinking water health advisory
HAadj	adjusted drinking water health advisory
HAH	halogenated aromatic hydrocarbon
HBESL	Health-Based Environmental Screening Levels
HC	hexachloroethane
HCN	hydrogen cyanide
HD	sulfur mustard
HEAST	Health Effects Assessment Summary Tables
HQ	hazard quotient
HQDA	Headquarters Department of the Army
hr	hour
HSDB	Hazardous Substance Databank
IARC	International Agency for Research on Cancer
IDA	Institute for Defense Analysis
IDLH	Immediately Dangerous to Life and Health
IED	improvised explosive device
IMP	isopropyl methylphosphonate

Table B-1. Acronym List

Acronym	Full Name
IMPA	isopropyl methyl phosphonic acid
inter	intermediate
IOM	Institute of Medicine
IPB	Intellegence Preparatin of the Battlefield
IR	inhalation rate
IRA	adult inhalation rate
IRa	inhalation rate
IRIS	Integrated Risk Information System
IRM	military inhalation rate
IRR	residential inhalation rate
IRs	soil ingestion rate
IRw	drinking water ingestion rate
IUPAC	International Union of Pure and Applied Chemistry
JP	joint publication
K	potassium
Kd	soil-water partition coefficient
kg	kilogram
kg/m³	kilogram per cubic meter
L	liter
L/day	liter per day
LC	lethal concentration
LC01	statistically determined lethal concentration for 1 percent of the exposed populati
LC50	statistically determined lethal concentration for 50 percent of the exposed popula
LCLO	lowest lethal concentration
LCt	lethal concentration
LCt16	lethal concentration in 16 percent of a given population
LOAEL	lowest-observed adverse effect level
LOD	limit of detection
LOQ	limit of quantification
LTP	Long Term Potability Standards
m/hr	meters per hour
m/s	meters per second

Table B-1. Acronym List

Acronym	Full Name
m^3/day	cubic meter per day
m^3/hr	cubic meter per hour
m^3/kg	cubic meter per kilogram
Marg	marginal
MAX	maximum soil concentration
MCL	maximum contaminant level
MCLG	Maximum Contaminant Level Goal
MDL	method detection limit
MEG	Military Exposure Guideline
METT-TC	Mission, Enemy, Terrain and Weather, Troops, Time, Civilian Considerations
MFWS	Military Field Water Standards
Mg	magnesium
mg/cm^2	milligram per square centimeter
mg/day	milligram per day
mg/kg	milligram per kilogram
mg/kg-day	milligram per kilogram per day
mg/L	milligram per liter
mg/m^3	milligram per cubic meter
MIL-STD	Military Standard
MOPP	mission oriented protective posture
MPA	methyl phosphonic acid
MRL	Minimal Risk Level
MSSL	medium specific screening levels
MW	molecular weight
NA	not applicable
NAAQS	National Ambient Air Quality Standards
NAPL	non-aqueous phase liquid
nc	non-cancer
NCEA	National Center for Environmental Assessment
NCHS	National Center for Health Statistics
NCI	National Cancer Institute
Neg	negligible

Table B-1. Acronym List

Acronym	Full Name
NG	National Guard
NIOSH	National Institute of Occupational Safety and Health
NLM	National Library of Medicine
NMCPHC	Navy and Marine Corps Public Health Center
NO	nitric oxide
NO2	nitrogen dioxide
NOAEL	no-observable adverse effect level
NOx	oxides of nitrogen
NRC	National Research Council
NRC/COT	National Research Council Committee on Toxicology
NSTC	National Science and Technology Council
NSTC/PRD 5	National Science and Technology Council/Presidential Review Directive 5
NTU	nephelometric turbidity units
O3	ozone
OAQPS	EPA Office of Air Quality Planning and Standards
OCONUS	outside the continental United States
OEF	Operation Enduring Freedom
OEH	occupational and environmental health
OIF	Operation Iraqi Freedom
ORD	EPA Office of Research and Development
ORISE	Oak Ridge Institue for Science and Education
ORM	Operational Risk Management
ORNL	Oak Ridge National Laboratory
OSHA	Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbon
Pb	lead
PbB1	background blood lead concentration in adult male
PbB2	target blood lead level
PCB	polychlorinated biphenols
PCDD	polychlorinated dibenzo-p-dioxin
PCDF	polychlorinated dibenzofuran
PEF	soil particulate emmission factor

Table B-1. Acronym List

Acronym	Full Name
PEGL	permissible exposure guidance level
PEL	Permissible Exposure Limit
PEPC	population exposure point concentration
PHC	Public Health Command
PM	particulate matter
PM10	particles with an aerodynamic diameter 10 microns or smaller
PM2.5	particles with an aerodynamic diameter 2.5 microns or smaller
PMEG	preliminary 1-year AMEG
PNOR	particles not otherwise regulated
PNOS	Particles (insoluable or poorly soluable) not otherwise specified
PPEGL	permissible public exposure guidance level
ppm	parts per million
PPRTV	Provisional Peer Reviewed Toxicity Values
PRD	Presidential Review Directive
PRG	Preliminary Remediation Goal
PTE	population threshold estimate
RAGS	Risk Assessment Guidance for Superfund
Rb	rubidium
RBC	Risk-Based Concentration
RD	reference document
RDX	cyclotrimethylenetrinitramine
REGL	repeated exposure guidence level
REL	Recommended Exposure Limit
RfC	reference concentration
RfCchr	chronic reference concentration
RfCsub	subchronic reference concentration
RfD	reference dose
RfDabs	dermal absorption reference dose
RfDo	oral reference dose
RL	reporting limit
RPEGL	repeated public exposure guidance level
RSC	relative source contribution

Table B-1. Acronym List

Acronym	Full Name
S	water solubility
SA	skin surface area
SAT	soil saturation concentration
Sb	antimony
SCAPA	Subcommittee on Consequence Assessment and Protective Actions
sec/hr	seconds per hour
Si	silicon
SMEG	Soil Military Exposure Guideline
SO2	sulfur dioxide
SOH	DOD Safety and Occupational Health Program
SOx	sulfur oxides
SPEGL	Short-Term Public Emergency Guidance Level
Sr	strontium
SRC	Syracuse Research Corporation
SSL	soil screening level
STANAG	Standardization Agreement
STEL	short-term exposure limit
STP	Short Term Potability Standards
sub	subchronic
SVOC	semi-volatile organic compound
TB MED	Technical Bulletin, Medical
TCDD	2,3,7,8-Tetrachlorodibenzo-p-dioxin
TCR	target cancer risk
TDS	total dissolved solids
TEEL	Temporary Emergency Exposure Limits
TEF	toxicity equivalence factor
TEQ	toxicity equivalence
TG	technical guide
THQ	target hazard quotient
Ti	titanium
TIC	toxic industrial chemical
TIM	toxic industrial material

Table B-1. Acronym List

Acronym	Full Name
TLV®	threshold limit value
TLVadj	adjusted threshold limit value
TLVc	threshold limit value ceiling limit
TMM	Textbook of Military Medicine
TPH	total petroleum hydrocarbon
TRW	Technical Review Workgroup
TSFWS	Tri-Service Field Water Standard
TSP	total suspended particulate
TWA	time-weighted average
UF	uncertainty factor
UR	unit risk factor
URF	unit risk factor
URFi	inhalation unit risk factor
URFo	oral unit risk factor
URi	inhalation unit risk factor
URo	oral unit risk factor
USACASCOM	US Army Combined Arms Support Command
USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
USAMEDD	US Army Medical Department
USAPHC	U.S. Army Public Health Command
USARIEM	U.S. Army Research Institute of Environmental Medicine
USCENTCOM	US Central Command
V	vanadium
VF	soil-to-air volatilization factor
VOC	volatile organic compound
VX	nerve agent VX
WHO	World Health Organization
WMEG	Water Military Exposure Guideline
WOE	weight-of-evidence
WPL	worker population limit
yr	year
Zn	zinc

Table B-1. Acronym List

Acronym	Full Name
ZnCl2	zinc chloride
Zr	zirconium

Table B-2. Health Effects Acronyms and Descriptions

Acronym	Full Name	Description
abdom	abdominal	The part of the body occupying the space between the chest and the pelvis.
abnor	abnormal/abnormalities	Not conforming to type or standard.
	acidosis	Decrease of alkali in the blood, which may result in a decrease in the pH. Symptoms include very deep respirations, dehydration, drowsiness, stupor, or coma.
album	albuminuria	The finding of albumin on urine analysis, which may indicate kidney disease.
	alopecia	Loss of hair (in humans), wool or feathers (in animals).
	analgesia	Insensibility to pain without loss of consciousness.
	anemia	A condition in which the blood is deficient in red blood cells, in hemoglobin, or in total volume.
anes	anesthesia	Loss of sensation, usually produced in order to permit a painless surgical operation.
	angina	A disease marked by spasmodic attacks of intense suffocative pain; often of the chest and as a result of coronary artery spasm.
anor	anorexia	Lack or loss of the appetite for food.
anos	anosmia	Loss of the sense of smell.
	anoxia	Lack of oxygen.
	anuria	Complete urinary suppression or failure of kidney function.
anxi	anxiety	Fear, apprehension.
	aphonia	Loss of voice and of all but whispered speech.
	aplastic	Pertaining to a anatomical undevelopment or organs or cells; aplastic anemia is a condition in which the bone marrow may not be producing adequate numbers of blood elements.
	apnea	Transient cessation of respiration.
arrhy	arrhythmias	Lack of rhythm, applied especially to irregularities of heart beat.
	asbestosis	A pneumoconiosis due to asbestos particles.
asphy	asphyxia	Suffocation.
aspir	aspiration	Sucking up a fluid or solid into the respiratory tract.
	asthenia	Lack or loss of strength.
	asthma	A condition often of allergic origin that is marked by continuous or paroxysmal labored breathing accompanied by wheezing, by a sense of constriction in the chest, and often by attacks of coughing or gasping.
	ataxia	Inability to coordinate muscles in movement.

Table B-2. Health Effects Acronyms and Descriptions

Acronym	Full Name	Description
	atrophy	Decrease in size or wasting away of a body part or tissue.
	azotemia	An excess of urea and other nitrogenous waste in the blood resulting from kidney damage or failure.
	berylliosis	Poisoning resulting from exposure to fumes and dusts of beryllium compounds or alloys and occurring chiefly as an acute pneumonitis or as a granulomatosis involving esp. the lungs.
	blepharospasm	A twitching or spasmodic contraction of eyelid.
BP	blood pressure	The force or pressure exerted by the heart in pumping blood from its chambers.
	bradycardia	Abnormally slow heartbeat below a rate of 60 beats per minute.
breath	breath/breathing	Air which is inhaled and exhaled.
bron	bronchitis	Inflammation of the bronchial tubes.
	byssinosis	An occupational respiratory disease associated with inhalation of cotton, flax, or hemp dust and characterized initially by chest tightness, shortness of breath, and cough, and eventually by irreversible lung disease -- called also brown lung.
	cachexia	A state of ill health, malnutrition and wasting.
	calcification	The deposit of calcium in tissues of the body.
carc	carcinogen	Potential occupational carcinogen.
card	cardiac	Relating to the heart.
	casts	Usually renal casts, found in the urine (can denote kidney disease).
	chloracne	Acne-like disruptions over the body resulting from exposure to certain chlorinated hydrocarbons such as dioxins.
	cholestasis	Blockage of the flow of bile resulting in increases of bilirubin in the blood.
chol	cholinesterase	An enzyme that breaks down the neurotransmitter acetylcholine to stop its action.
ChE Inh	cholinesterase inhibitor	
	chorea	A nervous disease characterized by involuntary and irregular movements of the muscles of the limbs and face.
cirr	cirrhosis	An inflammatory disease of the liver associated with the replacement of liver cells by fibrous tissue.
	clonic	Referring to jerky muscle contractions or spasms.
	colic	Severe abdominal pain.
conc	concentration	The total quantity of a substance present in a given volume of a gas or liquid.
conf	confusion	A mental state marked by mingling of ideas and feelings resulting in disorientation and inability to resolve a problem.

Table B-2. Health Effects Acronyms and Descriptions

Acronym	Full Name	Description
conj	conjunctivitis	Inflammation of the mucous membrane that lines the inner surface of the eyelids and is continued over the forepart of the eyeball.
constip	constipation	Difficult bowel evacuation, occurring at prolonged intervals.
convuls	convulsions	A violent, uncontrolled muscle spasm, or a series of them, sometimes repeated at rapid intervals.
corn	corneal	The tissue that covers the pupil and iris of the eye.
	coryza	The common cold; acute rhinitis.
cyan	cyanosis	Bluish discoloration of the skin, caused by inadequate oxygenation of the blood.
	cystitis	Inflammation of the urinary bladder; accompanied by pain and frequency of urination.
decr	decreased	
depres	depressed/depression	Dejection; melancholia.
derm	dermatitis	Inflammation of the skin.
	desquamation	Shedding of outer layer of skin.
diarr	diarrhea	Increased frequency and liquid consistency of the stools.
dist	disturbance	
	diuresis	An increased excretion of urine.
dizz	dizziness	The condition of being dizzy; a sensation of unsteadiness accompanied by a feeling of movement within the head.
drow	drowsiness	
	dysphagia	Difficulty in swallowing.
	dysphonia	Difficulty in speaking; hoarseness.
dysp	dyspnea	Breathing difficulty.
	dysuria	Impaired ability to pass urine.
	ectopic	Occuring in an abnormal position.
	eczema	An inflammatory condition of the skin characterized by redness, itching, and oozing vesicular lesions which become scaly, crusted, or hardened.
	edema	An abnormal excess accumulation of serous fluid in connective tissue or in a serous cavity.
EKG	electrocardiogram	The recording of the electrical impulses of the heart.
EEG	electroencephalogram	Tracing of brain waves produced by an encephalograph (an apparatus for detecting and recording brain waves).

Table B-2. Health Effects Acronyms and Descriptions

Acronym	Full Name	Description
emphy	emphysema	A condition in which the air spaces in the lungs are enlarged.
	encephalopathy	A disease of the brain.
eosin	eosinophilia	An abnormally large number of eosinophils (red staining white blood cells) in the circulating blood.
	epigastric	Refers to the upper central portion of the abdomen between the lower ribs and the umbilicus (belly button).
epilep	epileptiform	Resembling that of epilepsy.
epis	epistaxis	Nose bleed.
equi	equilibrium	Balance.
eryt	erythema	Skin redness.
euph	euphoria	An exaggerated state of well-being.
	exertional	Referring to a conditon that develops upon the act, or following the expenditure, of effort.
	expectoration	The act or an instance of expectorating (to eject matter from the throat or lungs by coughing or hawking and spitting).
	extrasystoles	A heartbeat occurring before its normal time; extrasystoles create an irregular rhythm, commonly referred to as a "skipped beat".
fail	failure	A state of inability to perform a vital function.
fasc	fasciculation	A small local contraction of muscles; visible through the skin.
ftg	fatigue	Tiredness; weariness; exhaustion.
fib	fibrosis	Replacement of the normal components of a structure by fibrous tissue.
	flush	To blush, to become red; to cleanse a wound by dowsing it with water or salt solution.
FEV	forced expiratory volume	
func	function	Any of a group of related actions contributing to a larger action.
	gastritis	Inflammation esp. of the mucous membrane of the stomach.
	gastroenteritis	Inflammation of the stomach and intestines, usually accompanied by vomiting and diarrhea.
	gingival	Referring to the gums; the tissue surrounding the teeth.
	goiter	An enlargement of the thyroid gland that is commonly visible as a swelling of the anterior part of the neck.
	granuloma	A mass or nodule of chronically inflamed tissue with granulations that can be associated with an infective process, trauma, presence of a foreign body (e.g., talc, oil, beryllium), or exposure to certain salts.

Table B-2. Health Effects Acronyms and Descriptions

Acronym	Full Name	Description
	granulomatous pneumonitis	Inflammation of the lung which may result from inhalation of organic dusts by persons sensitized to antigens in the dusts ("farmer's lung").
halu	hallucinations	Imagined or false sense perception.
head	headache	Pain in the head.
	hematoma	A mass of usually clotted blood that forms in a tissue, organ, or body space as a result of a broken blood vessel; "blood blister".
hemato	hematopoietic	The formation of blood or blood cells in the body.
hema	hematuria	Blood in the urine.
	hemoglobinuria	The presence of hemoglobin the urine.
	hemolysis	Destruction of red blood cells and escape of the hemoglobin within the bloodstream.
	hemolytic anemia	Abnormal destruction of red blood cells resulting in a decrease in the number of cells in the blood and presence of free hemoglobin, which can lead to acute renal failure.
	hemoptysis	Spitting of blood arising from hemorrhage of the larynx, trachea, bronchial tubes, or lungs.
hemorr	hemorrhage	Escape of blood from the blood vessels,
	hepatitis	Inflammation of the liver.
	hyperkeratosis	Overgrowth of the of the horny layer of the skin (stratum corneum); can also be an overgrowth of the tissue covering the pupil of the eye (cornea).
hyperpig	hyperpigmentation	Excess pigmentation in a bodily part or tissue (as the skin).
	hyperplasia	Abnormal but non-cancerous increase in the number of cells in a tissue or organ.
	hyperpnea	Abnormally rapid or deep breathing.
	hyper-reflexia	Over-activity of physiological reflexes.
	hypertension	Elevated blood pressure.
	hyperthermia	Elevated body temperature.
	hypochromic	Deficiency of color or pigmentation; deficiency of hemoglobin in the red blood cells.
	hypokalemia	A deficiency of potassium in the blood.
	hypotension	Reduced blood pressure.
	hypothermia	Decreased body temperature.
hypox	hypoxemia	Reduced oxygen in the blood.

Table B-2. Health Effects Acronyms and Descriptions

Acronym	Full Name	Description
	immunosuppression	Suppression of the immunologica response, leading to decreased resistance to disease.
inco	incoordination	Lack of coordination; inability to control muscle activity.
incr	increased	
inebri	inebriation	Drunkenness.
inflamm	inflammation	The reaction of tissues to injury; manifested by pain, heat, swelling, and redness.
ing	ingestion	To eat.
inh	inhalation	The act of breathing in.
inj	injury	Hurt, damage, or loss sustained.
insom	insomnia	Sleeplessness.
irreg	irregular/irregularities	Lacking perfect symmetry of form.
irrity	irritability	The property of protoplasm and of living organisms that permits them to react to stimuli.
irrit	irritation	A condition of inflammation, soreness, or irritability of a bodily organ or part.
jaun	jaundice	A yellow staining or darkening of the skin, whites of the eyes, and excreta due to increased bile pigments in the blood and tissues.
kera	keratitis	Inflammation of the cornea.
kerato-conj	keratoconjunctivitis	Combined inflammation of the cornea and conjunctiva.
lac	lacrimation	Discharge of tears.
	larnygitis	Inflammation of the larynx.
lar	laryngeal	Of, relating to, affecting, or used on the larynx.
lass	lassitude	Weakness, exhaustion.
	leucoplakia	A condition commonly considered precancerous in which thickened white patches of epithelium occur on the mucous membranes esp. of the mouth, vulva, and renal pelvis.
leucyt	leukocytosis	Increased blood leukocytes.
leupen	leukopenia	Reduced blood leukocytes.
liq	liquid	Flowing freely in a manner similar to that of water; neither solid nor gaseous.
local	localized	Occurs at the site of bodily contact.
	lymphocytosis	An increase in the number of lymphocytes in the blood usually associated with chronic infections or inflammations.

Table B-2. Health Effects Acronyms and Descriptions

Acronym	Full Name	Description
mal	malaise	Vague feeling of discomfort.
malnut	malnutrition	State of being undernourished or poorly nourished.
	mania	Excitement of psychotic proportions manifested by mental and physical hyperactivity, disorganization of behavior, and elevation of mood.
methemo	methemoglobinemia	Condition in which the oxidation state of iron in hemoglobin is abnormal leading to decreased availability of oxygen to the body tissues.
	miosis	Contraction of the pupil (pin-pointed pupil).
	monocytosis	Excessive number of monocytes (a type of white blood cell) in the blood.
	mucosa	Mucous membrane; membrane lining bodily channels that communicate with air (i.e., mouth, respiratory tract, eye); glands of mucous membranes secrete mucous.
muc memb	mucous membrane	A surface membrane composed of cells which secrete various forms of mucus.
musc	muscle	Tissue composed of fibers which have the ability to elongate and shorten, thus causing bones and joints to move.
	myalgia	Pain in one or more muscles.
	mydriasis	Dilation of the pupil.
	myocardial	Of, relating to, or involving the myocardium (the middle muscular layer of the heart wall).
	myoclonic	Of, relating to, characterized by, or being myoclonus (seizures).
narco	narcosis	Stupor or deep unconsciousness; can be caused by exposure to a number of chemicals. Differs from anesthesia which refers to the loss of sensation (e.g., pain) or touch and can be local or general.
nau	nausea	The feeling that one may vomit.
nec	necrosis	Death of tissue.
neph	nephritis	Inflammation of the kidneys.
numb	numb/numbness	Diminished sensation.
	ochronosis	A metabolic condition associated with brown discoloration of the facial skin, whites of the eyes, and tissues of the muscle and cartilage.
opac	opacity	The quality of not being transparent.
	pallor	Paleness of the skin.
	palmar/plantar hyperkeratoses	An overgrowth of the horny layer of skin (stratum corneum) found on either the palm of the hand (palmar) or the sole of the foot (plantar).

Table B-2. Health Effects Acronyms and Descriptions

Acronym	Full Name	Description
palp	palpitations	Perceptible irregular or rapid beating or pulsation of the heart.
	palsy	Nerve paralysis or degeneration; a common manifestation is trembling of the hands.
	papule	A small solid usually conical elevation of the skin caused by inflammation, accumulated secretion, or overgrowth of tissue elements.
para	paralysis	Inability to use muscles because of disease or injury of the nerves which supply them.
	paresis	Slight or partial paralysis.
pares	paresthesia	Burning prickling, tingling, or tickling sensation.
	paroxysmal	Recurring in sudden, periodic attacks or intensification of symptoms of a disease.
perf	perforation	Pierced, ruptured; having a hole through it.
periorb	periorbital	Situated around the eye.
peri neur	peripheral neuropathy	Abnormal state of the nerves supplying the hands, arms and legs, and other areas outside of the central nervous system.
phar	pharyngeal	Relating to or located in the region of the pharynx.
photo	photophobia	Abnormal visual intolerance to light.
	pneumoconiosis	A disease of the lungs caused by the habitual inhalation of irritants (as coal dust).
pneu	pneumonitis	Inflammation of the lung.
polyneur	polyneuropathy	Disease involving a number of peripheral nerves (e.g., nerves in the hands, feet or legs).
	polyuria	Excessive secretion of urine.
	porphyria	A metabolic (often hereditary) condition oten characterized by skin photosensitivity and lesions, abdominal colic, mental disturbance, etc.
	porphyria cutanea tarda	A metabolic disorder in which reddish pigments or porphyrins are produced in the liver. The excess pigments accumulate in the skin where they are activated by visible light which causes photosensitive skin reactions characterized by skin erosions and blistering. These painful sores resolve slowly and may result in scarring, hair loss, and skin atrophy. Excess porphyrins are excreted in the urine which becomes colored dark red or brown as a result.
	precordial	Pertaining to the region over the heart and lower part of the thorax.
	prostration	Marked loss of strength; exhaustion.
prot	proteinuria	Albuminuria; the appearance of any protein in the urine.
	pruritus	Localized or generalized itching due to irritation of sensory nerve endings from organic or psychogenic causes.

Table B-2. Health Effects Acronyms and Descriptions

Acronym	Full Name	Description
	ptosis	Medical term for a drooping eyelid.
pulm	pulmonary	Pertaining to the lungs.
	pulmonary edema	Buildup of fluid in the lung.
	pulsus alternans	Alternation of strong and weak beats of the arterial pulse due to alternate strong and weak ventricular contractions.
	rales	An abnormal sound heard accompanying the normal respiratory sounds during stethoscopic examination of the chest.
RBC	red blood cell	Any of the hemoglobin-containing cells that carry oxygen to the tissues and are responsible for the red color of blood.
repro	reproductive	The act or process of reproducing.
resp	respiratory/respiration	Breathing.
restless	restlessness	Deprived of rest or sleep.
retster	retrosternal	Occurring behind the sternum.
	rhinitis	Inflammation of the mucous membrane of the nose.
rhin	rhinorrhea	Discharge of thin nasal mucus.
salv	salivation	Excess secretion of saliva from the various salivary glands.
	scotomas	Blind or dark spots in the visual field.
sens	sensitization	The action or process of making sensitive or hypersensitve.
short	shortness	
	silicosis	A chronic fibrous lung condition found among miners who have inhaled silicon dust over a period of years.
	sinusitis	Inflammation of a sinus of the skull.
con	skin and/or eye contact	
sneez	sneezing	To make a sudden violent spasmodic audible expiration of breath through the nose and mouth esp. as a reflex act following irritation of the nasal mucous membrane.
sol	solid	A substance that does not flow perceptibly under moderate stress; neither gaseous nor liquid.
soln	solution	The mixture of a solid, liquid or gas with another liquid.
	spasticity	Hypertonicity of muscles causing stiff and awkward movements.
	spermatogenesis	Development of sperm cells.
	sputum	Expectorated matter made up of saliva and often discharges from the respiratory passages.

Table B-2. Health Effects Acronyms and Descriptions

Acronym	Full Name	Description
	stannosis	Benign pneumoconiosis due to the inhalation of tin oxide; it is symptomless unless accompanied by silicosis.
	stenosis	Constriction or narrowing of a passage or orifice.
	stomatis	Inflammation of the mucous membranes of the mouth.
	strabismus	Inability of one eye to attain binocular vision with the other because of imbalance of the muscles of the eyeball ("cross-eye," "squint").
	stupor	A condition of greatly dulled or completely suspended sense or sensibility.
subs	substernal	Occurring beneath the sternum.
sweat	sweating	To excrete moisture in visible quantities through the opening of the sweat glands.
swell	swelling	To become distended or puffed up.
	syncope	A transient form of unconsciousness during which the person slumps to the ground resulting from cerebral anoxia (insufficient oxygen in the brain).
sys	system	A set of organs performing one main function.
tacar	tachycardia	Excessive rapidity in the action of the heart.
	tachypnea	Increased rate of respiration.
tend	tenderness	Pain on touching a part.
terato	teratogenic	Of, relating to, or causing malformations of an embryo or fetus.
throb	throbbing	To pulsate or pound esp. with abnormal force or rapidity.
tight	tightness	
	tinnitus	Noise (typically ringing) in the ears.
	tonic	Characterized by tonus (contraction of muscle); marked by or being prolonged muscular contraction.
twitch	twitching	A short spastic contraction of muscle fibers.
	ulcer	A break in skin or mucous membrane with loss of surface tissue.
uncon	unconsciousness	Asleep, or in a coma, or under anesthesia.
UT	urogenital tract	Denotes the organs involved in reproduction and urination.
	vacuolization	The development or formation of vacuoles (small cavity or space in the tissues of an organism containing air or fluid).
vap	vapor	A substance in the gaseous state as distinguished from the liquid or solid state.
	vascular thrombus	A blood clot within a blood vessel.

Table B-2. Health Effects Acronyms and Descriptions

Acronym	Full Name	Description
	ventricular fibrillation	Rapid contractions or twitching of the muscle fibers that replace normal contraction of the ventricular chambers of the heart.
	vertigo	Dizziness; sense of spinning.
vesic	vesiculation	Formation of a small blister-like small elevation on the skin containing serous fluid.
vis	visual	Of, relating to, or used in vision.
vomit	vomiting	To throw up the contents of the stomach.
weak	weak/weakness	
low-wgt	weight loss	
wheez	wheezing	Noisy or difficult breathing.

Table B-3. Target Organs and Systems

Target System: ALA **System Description:** Alimentary accessory organs

Target Organ	Organ Description
Gall bladder	
Liver	
Pancreas	
Salivary Glands	
Teeth	
Tongue	

Target System: ALM **System Description:** Alimentary system

Target Organ	Organ Description
Alimentary system - unspecified	
Anal canal	
Esophagus	
GI tract - unspecified	Unspecified target in the gastrointestinal tract
Large intestine	
Mouth/palate	
Pharynx	
Rectum	
Small intestine	
Stomach	

Target System: END **System Description:** Endocrine system

Target Organ	Organ Description
Adrenal glands	
Chromaffin systems/cells	
Hormones - unspecified	
Hypothalamus	
Neurosecretory systems/cells	
Other ducted glands	
Pancreas	
Parathyroid glands	
Pineal glands	
Pituitary glands	
Thyroid	
Thyroid glands	

Target System: HML **System Description:** Haemolymphoid system

Target Organ	Organ Description
Arterial system	
Blood	
Blood vessels	
Bone marrow	
Capillaries	
Circulatory system - unspecified	

Table B-3. Target Organs and Systems

CVS - unspecified	Unspecified target in the cardiovascular system
Heart	
HML - unspecified	Unspecified target in the haemolymphoid system
HMP system - unspecified	Unspecified target in the haematopoietic system
IMM system - unspecified	Unspecified target in the immune system
LYMP system - unspecified	Unspecified target in the lymphatic system
Lymph	
Lymph nodes/tissues	
Lymphatic vessels	
Lymphoid cells	
Platelets	
RBC	Red blood cells
Spleen	
Thoracic duct	
Thymus	
Venous system	
WBC	White blood cells

Target System: INT **System Description:** Integumental system

Target Organ	Organ Description
Breasts	
Eyes	
Hair	
Nails	
Skin	

Target System: MUS **System Description:** Muscular system

Target Organ	Organ Description
Muscles (non-heart)	

Target System: None **System Description:** No target system, general or no effects

Target Organ	Organ Description
None	None reported
Whole body	Non-specific general effects

Target System: NVS **System Description:** Nervous system

Target Organ	Organ Description
Brain	
CNS - unspecified	Unspecified target in the central nervous system
Nerves	
Nervous system - unspecified	
PNS - unspecified	Unspecified target in the peripherial nervous system
Special senses app.-sight, hearing	
Spinal cord	

Table B-3. Target Organs and Systems

Target System: RPR **System Description:** Reproductive system

Target Organ	Organ Description
Conceptuses/Fetuses	
Developmental - generic	
Female reproduction - unspecified	
Male reproduction - unspecified	
Male supporting structures	
Oocytes	
Ovaries	
Prostrate	
Reproductive - unspecified by gen	
Sperm	
Testes	
Urethra	
Uterus	
Vagina	

Target System: RSP **System Description:** Respiratory system

Target Organ	Organ Description
Bronchi	
Larynx	
Lungs	
Nasal-pharynx	
Nose	
Paranasal sinuses	
Respiration - unspecified	
Trachea	

Target System: SKE **System Description:** Skeletal system

Target Organ	Organ Description
Bone	
Cartilage	
Connective tissue	
Ligaments	

Target System: URI **System Description:** Urinary system

Target Organ	Organ Description
Bladder	
Kidneys	
Ureters/urethra	

APPENDIX C

MILITARY EXPOSURE GUIDELINES FOR AIR

CONTENTS

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Table C-1. Short- and Long-Term Air MEGs for Particulate Matter

C-1a. Short-Term (24-hour) Particulate Matter Air MEGs*

Hazard Severity	$PM_{2.5}$	PM_{10}	Description of Military Health and Operational Effects
Critical	500 µg/m^3	600 µg/m^3	Above these, most if not all personnel will experience very notable eye, nose, and throat irritation and respiratory effects. Visual acuity is impaired, as is overall aerobic capacity. Some personnel will not be able to perform assigned duties. Some lost-duty days are expected. Those with a history of asthma or cardiopulmonary disease will experience more severe symptoms.** Conditions may also result in adverse, non-health related materiel/logistical impacts.
Marginal	250 µg/m^3	420 µg/m^3	Above these, a majority of personnel will experience notable eye, nose, and throat irritation and some respiratory effects. Some lost-duty days are expected. Significant aerobic activity will increase risk. Those with a history of asthma or cardiopulmonary disease are expected to experience increased symptoms.**
Negligible	65 µg/m^3	250 µg/m^3	Above these, a few personnel may experience notable mild eye, nose, or throat irritation; most personnel will experience only mild effects. Pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may be exacerbated.**

* The MEGs and descriptors are based on professional judgment reflecting a consensus opinion of USAPHC (Prov) subject matter experts.
** Diagnosis of pulmonary or cardiopulmonary diseases would prevent deployment, though some conditions may go undetected. A small percentage of deployed personnel fall into this sensitive group.

C-1b. Long-Term (1-year) Particulate Matter Air MEGs*

Hazard Severity	$PM_{2.5}$	PM_{10}	Description of Military Health and Operational Effects
Marginal	65 µg/m^3	Not defined	With repeated exposures above this, it is plausible that development of chronic health conditions such as reduced lung function or exacerbated chronic bronchitis, COPD, asthma, atherosclerosis, or other cardiopulmonary diseases could occur in generally healthy troops. Those with a history of asthma or cardiopulmonary disease are considered to be at particular risk. This guideline is an uncertain screening value—it is not a known health effects concentration.
Negligible	15 µg/m^3	Not defined	With repeated exposures above this, it is considered possible that a small percentage of personnel may have increased risk for developing chronic conditions such as reduced lung function or exacerbated chronic bronchitis, COPD, asthma, atherosclerosis, or other cardiopulmonary diseases. Personnel with history of asthma or cardiopulmonary disease are considered to be at particular risk. Exposures below this are not expected to result in development of chronic health conditions in generally healthy troops.

* The MEGs and descriptors are based on professional judgment reflecting a consensus opinion of USAPHC (Prov) subject matter experts. USAPHC (Prov) no longer recommends long-term MEGs for PM_{10}. The Negligible MEG is the EPA NAAQS standard reflecting a threshold level for the general population based on studies evaluating primarily children or individuals with cardiovascular and other diseases. Alternative standards for health adults do not yet exist. This MEG is considered a point of departure for further consideration and is not an action level.

Table C-2. Short-Term Air Military Exposure Guidelines for Chemical Warfare Agents

Chemical GA **CASRN:** 77-81-6

Health Effect Level	10-minute mg/m³	1-hour mg/m³	8-hour mg/m³	24-hour mg/m³	Potential Health Effects	Target Organs
Negligible	6.9E-03	2.8E-03	1.0E-03	3.0E-04	see entries for GB	Blood Eyes Whole body
Marginal	1.4E-01	5.8E-02	2.0E-02	6.7E-03		
Critical	2.2E-01	9.1E-02	3.2E-02	1.1E-02		
Catastrophic	1.1E+01	4.6E+00	1.6E+00			

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Table C-2. Short-Term Air Military Exposure Guidelines for Chemical Warfare Agents

Chemical GB **CASRN:** 107-44-8

Health Effect Level	10-minute mg/m³	1-hour mg/m³	8-hour mg/m³	24-hour mg/m³	Potential Health Effects		Target Organs
Negligible	6.9E-03	2.8E-03	1.0E-03	3.0E-04	cramp		Blood
Marginal	1.4E-01	5.8E-02	2.0E-02	6.7E-03	decr	RBC-ChE	Eyes
Critical	2.2E-01	9.1E-02	3.2E-02	1.1E-02	dysp		Whole body
Catastrophic	5.6E+00	2.3E+00	8.1E-01		head		
					irrit	Throat	
					irrit	Eyes	
					mal		
					miosis	Eyes	
					miosis		
					nau		
					photo	Eyes	
					rhin		
					tight	Chest	
					vomit		

Table C-2. Short-Term Air Military Exposure Guidelines for Chemical Warfare Agents

Chemical GD **CASRN:** 96-64-0

Health Effect Level	10-minute mg/m³	1-hour mg/m³	8-hour mg/m³	24-hour mg/m³	Potential Health Effects	Target Organs
Negligible	3.5E-03	1.4E-03	5.0E-04	2.0E-04	see entries for GB	Blood Eyes Whole body
Marginal	6.1E-02	2.5E-02	9.0E-03	3.0E-03		
Critical	8.9E-02	3.7E-02	1.3E-02	4.3E-03		
Catastrophic	5.6E+00	2.3E+00	8.1E-01			

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Table C-2. Short-Term Air Military Exposure Guidelines for Chemical Warfare Agents

Chemical GF **CASRN:** 329-99-7

Health Effect Level	10-minute mg/m³	1-hour mg/m³	8-hour mg/m³	24-hour mg/m³	Potential Health Effects	Target Organs
Negligible	3.5E-03	1.4E-03	5.0E-04	2.0E-04	see entries for GB	Blood Eyes Whole body
Marginal	5.7E-02	2.3E-02	8.0E-03	2.7E-03		
Critical	8.9E-02	3.7E-02	1.3E-02	4.3E-03		
Catastrophic	5.6E+00	2.3E+00	8.1E-01			

Table C-2. Short-Term Air Military Exposure Guidelines for Chemical Warfare Agents

Chemical HD **CASRN:** 505-60-2

Health Effect Level	10-minute mg/m³	1-hour mg/m³	8-hour mg/m³	24-hour mg/m³	Potential Health Effects		Target Organs
Negligible	4.0E-01	6.7E-02	8.0E-03	3.0E-03	blepharospasm		Eyes
Marginal	1.2E+00	1.9E-01	2.4E-02	8.1E-03	blisters	Skin	Whole body
Critical	2.5E+00	4.2E-01	5.2E-02	1.2E-02	burn	Skin	
Catastrophic	1.0E+01	1.7E+00	2.1E-01		cell damage/death	Skin	
					conj	Eyes	
					conjunctivitis	Eyes	
					erythema	Skin	
					eye reddening	Eyes	
					head		
					irrit	Eyes	
					itching rash	Skin	
					lac	Eyes	
					lar	Larynx	
					photo	Eyes	
					pulm	Lungs	
					rhinitis		
					swell	Eyes	
					swell		
					swelling	Skin	
					urticaria	Skin	

Table C-2. Short-Term Air Military Exposure Guidelines for Chemical Warfare Agents

Chemical VX **CASRN:** 50782-69-9

Health Effect Level	10-minute mg/m³	1-hour mg/m³	8-hour mg/m³	24-hour mg/m³	Potential Health Effects		Target Organs
Negligible	5.7E-04	1.7E-04	7.1E-05	2.4E-05	abdom		Blood
Marginal	1.3E-02	5.1E-03	1.8E-03	6.0E-04	decr	RBC-ChE	Eyes
Critical	2.2E-02	9.0E-03	3.0E-03	1.0E-03	dizz		Whole body
Catastrophic	2.2E+00	9.1E-01	3.2E-01		GI		
					head		
					irrity		
					lass		
					nau		
					resp		
					tight	chest	
					vomit		

Table C-2. Short-Term Air Military Exposure Guidelines for Chemical Warfare Agents

CASRN = Chemical Abstract Service Registry Number
CWA = chemical warfare agents
MEG = Military Exposure Guideline
mg/m³ = milligrams per cubic meter

Potential Health Effects: please see Appendix B for acronyms and definitions. Health effects information was provided by the following sources:

1) CDC 2004. Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health (NIOSH) Pocket Guide to Chemical Hazards, 97-140, Feb 2004.
2) USACHPPM 2004. Acute Toxicity Estimation and Operational Risk Management of Chemical Warfare Agent Exposures, U.S. Army Center for Health Promotion and Preventive Medicine. Report No. 47-EM-5863-04: May, 2004.
3) NRC/COT 2003. National Research Council, Committee on Toxicology. Acute Exposure Guideline Levels for Selected Airborne Chemicals, Volume 3. Committee on Toxicology, Subcommittee on Acute Exposure Guideline Levels. National Academy Press, Washington, DC.

Target organs were identified using USACHPPM 2004 and NRC/COT 2003.

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
(2H3)Acetonitrile	2206-26-0	1.3E+03	6.0E+02	2.0E+01		
(C12-C18) Alkyldimethylbenzyl	68391-01-5	1.3E+02	2.5E+01	3.5E+00		
1,1,1,2,2,3,4,5,5,5-Decafluoropentane	138495-42-8	1.3E+04	4.0E+03	2.0E+03		
1,1,1,3,3,3-Hexafluoro-2-propanol	920-66-1	6.0E+03	1.0E+03	1.5E+02		
1,1,1,3,3-Pentafluoropropane	460-73-1	3.0E+05	3.0E+05	5.0E+03		
1,1,2,2-Tetrafluoroethane	359-35-3	1.0E+05	5.0E+04	3.5E+04		
1,1,3,3-Tetramethoxypropane	102-52-3	5.0E+02	1.5E+02	2.5E+01		
1,1'-Methylenebis(isocyanato-benzene)	26447-40-5	1.2E+02	1.2E+02	7.2E+01		
1,2,3,5-Tetramethylbenzene	527-53-7	5.0E+02	3.5E+00	5.0E-01		
1,2,3,6-Tetrahydropyridine	694-05-3	2.5E+02	5.0E+01	3.0E+01		
1,2,4,5-Tetramethylbenzene	95-93-2	5.0E+02	5.0E+02	1.0E+02		
1,2-Bis(2-Chloroethoxy)ethane	112-26-5	1.0E+02	2.0E+01	3.0E+00		
1,2-Cyclohexanediamine	694-83-7	3.5E+02	6.0E+01	1.0E+01		
1,2-Dimethylimidizole	1739-84-0	4.0E+02	7.5E+01	1.3E+01		
1,3,6-Naphthalenetrisulfonic acid	19437-42-4	2.5E+02	5.0E+01	3.0E+01		
1,3-Diisopropylbenzene	99-62-7	5.0E+02	5.0E+02	5.0E+02		
1,3-Propanediol	504-63-2	5.0E+02	4.0E+02	6.0E+01		
1,5-Pentanediol	111-29-5	5.0E+02	1.5E+02	2.5E+01		
1,6-Dibromohexane	629-03-8	1.0E+02	2.0E+01	3.5E+00		
1,6-Hexanediol diacrylate	13048-33-4	5.0E+02	2.5E+01	3.5E+00		
1,8-Diazabicyclo(5.4.0.)undec-7-ene	6674-22-2	1.5E+02	3.5E+01	5.0E+00		
1-Bromo-3-methoxybenzene	2398-37-0	2.5E+02	5.0E+01	3.0E+01		
1-Bromo-3-methylbutane	107-82-4	2.5E+03	5.0E+02	7.5E+01		
1-Bromodecane	112-29-8	1.5E+03	3.0E+02	4.0E+01		
1-Bromododecane	143-15-7	5.0E+02	1.5E+02	2.5E+01		
1-Bromooctane	111-83-1	2.0E+03	4.0E+02	6.0E+01		
1-Fluoro-2-nitrobenzene	1493-27-2	5.0E+02	1.5E+02	2.5E+01		
1h-Tetrazole	288-94-8	1.5E+02	3.5E+01	5.0E+00		
1-Hydroxybenzotriazole	2592-95-2	5.0E+02	5.0E+02	1.3E+02		
1-Iodoheptafluoropropane	754-34-7	5.0E+01	2.5E+00	2.5E+00		
1-Iodopentane	628-17-1	2.5E+01	1.6E+00	1.6E+00		
1-Methyl-1-propanethiol	513-53-1	7.5E+02	1.5E+02	2.0E+01		
1-Naphthol	90-15-3	5.0E+02	5.0E+02	7.5E+01		
1-Nonene	124-11-8	2.5E+02	5.0E+01	7.5E+00		
1-Octanamine	111-86-4	4.0E+01	7.5E+00	1.3E+00		
1-Propanol, zirconium(4+) salt	23519-77-9	1.8E+02	9.0E+01	3.6E+01		
1R-(-)-10-Camphorsulfonic Acid	35963-20-3	4.0E+02	7.5E+01	1.3E+01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
2-(2-Ethyhexyloxy)ethanol	1559-35-9	5.0E+02	5.0E+02	3.5E+02		
2-(Methylamino)ethanol	109-83-1	1.0E+03	2.0E+02	3.0E+01		
2-(N-Morpholino)ethanesulfonic acid	4432-31-9	1.3E+02	2.5E+01	4.0E+00		
2,2,2-Trichloroethanol	115-20-8	2.5E+02	2.5E+02	3.5E+01		
2,2,6,6-Tetramethyl-3,5-heptanedione	1118-71-4	2.5E+02	5.0E+01	3.0E+01		
2,2-Dichloro-1,1,1-trifluoroethane	306-83-2	6.3E+04	6.3E+03	7.5E+02		
2,2-Diethoxyethylamine	645-36-3	5.0E+02	1.5E+02	2.5E+01		
2,2-Dimethoxyethylamine	22483-09-6	2.5E+02	5.0E+01	3.0E+01		
2,2-Dimethoxypropane	77-76-9	1.5E+02	3.5E+01	5.0E+00		
2,2-Dimethyl-1,3-propanediol	126-30-7	2.0E+04	4.0E+03	6.0E+02		
2,2-Dimethylbutyric acid	595-37-9	5.0E+02	1.5E+02	2.5E+01		
2,2-Dimethylpentane	590-35-2				1.6E+03	4.0E+02
2,2'-Sulfonylbis-ethanol	2580-77-0	1.5E+02	3.5E+01	5.0E+00		
2,3-Dimethylpentane	565-59-3				1.6E+03	4.0E+02
2,4,4-Trimethyl-1-pentene	107-39-1	7.5E+03	1.5E+03	1.0E+03		
2,4-Dimethylpentane	108-08-7				1.6E+03	4.0E+02
2,5,8,11-Tetraoxadodecane	112-49-2	7.5E+02	1.5E+02	2.0E+01		
2,6-Diaminopyridine	141-86-6	4.0E+01	7.5E+00	1.3E+00		
2,6-Diisopropylaniline	24544-04-5	5.0E+02	5.0E+02	1.0E+02		
2,6-Lutidine	108-48-5	3.5E+04	6.0E+03	1.0E+03		
2-Bromoethanol	540-51-2	6.0E+01	1.5E+00	2.0E-01		
2-Bromomesitylene	576-83-0	2.5E+02	5.0E+01	3.0E+01		
2-Bromomethyl-1,3-dioxolane	4360-63-8	5.0E+02	1.5E+02	2.5E+01		
2-Chloro-1,1,1,2-Tetrafluoroethane	2837-89-0	5.6E+04	2.8E+04	5.6E+03		
2-Chloroethyl vinyl sulfide	81142-02-1	1.5E+01	3.0E+00	4.0E-01		
2-Dimethylaminoethyl chloride	4584-46-7	1.0E+02	1.5E+01	2.0E+00		
2-Dodecen-1-yl succinic anhydride	19780-11-1	2.5E+02	5.0E+01	3.0E+01		
2-Ethyl-1,3-hexanediol	94-96-2	4.0E+03	1.5E+03	2.5E+02		
2-Ethyl-2-oxazoline	10431-98-8	4.0E+01	7.5E+00	1.3E+00		
2-Hydroxyethyl acrylate	818-61-1	2.5E+02	3.5E+01	5.0E+00		
2-Methoxypropyl-1-acetate	70657-70-4	2.7E+04	5.4E+03	2.7E+02		
2-Methyl-1-pentanol	105-30-6	6.0E+02	2.0E+01	3.0E+00		
2-Methyl-2-butene	513-35-9	6.0E+02	1.3E+02	1.5E+01		
2-Methyl-8-quinolinol	826-81-3	2.5E+02	5.0E+01	3.0E+01		
2-Methylheptane	592-27-8	1.0E+03	2.0E+02	3.0E+01		
2-Methylhexane	591-76-4				1.6E+03	4.0E+02
2-Naphthol	135-19-3	5.0E+02	5.0E-02	7.5E-03		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
2-Naphthol-8-sulfonic acid, sodium salt	832-85-9	2.0E+02	4.0E+01	6.0E+00		
2-Nitro-m-xylene	81-20-9	5.0E+02	2.0E+02	3.0E+01		
2-Octanol	123-96-6	3.5E+02	2.5E+02	3.5E+01		
2-Phenoxyethanol	122-99-6	5.0E+02	1.0E+02	1.0E+02		
2-Phenyl-2-oxzaoline	7127-19-7	1.5E+02	3.0E+01	1.5E+01		
2-Thiosalicylic acid	147-93-3	2.0E+01	4.0E+00	6.0E-01		
3-(Chloropropyl)trimethoxysilane	2530-87-2	3.0E+03	1.5E+03	2.5E+02		
3-(Cyclohexylamino)-1-propanesulfonic	1135-40-6	1.3E+02	2.5E+01	4.0E+00		
3-(Trimethoxysilyl)-1-propanamine	13822-56-5	2.5E+02	5.0E+01	3.0E+01		
3,3',5,5'-Tetramethylbenzidine	54827-17-7	6.0E+01	1.0E+01	1.5E+00		
33 SN	20820-80-8	6.0E-02	1.3E-02	1.5E-03		
3-Aminopropylmethyldiethoxysilane	3179-76-8	5.0E+02	4.0E+02	5.0E+01		
3-Carene	13466-78-9				1.1E+02	2.7E+01
3-Chloropropanol	627-30-5	5.0E+02	2.0E+02	3.0E+01		
3-Mercaptopropionic acid	107-96-0	4.0E+01	6.0E+00	7.5E-01		
3-Methylhexane	589-34-4				1.6E+03	4.0E+02
3-Methylpentane	96-14-0	7.5E+03	1.5E+03	1.5E+03		
3-Nitrobenzenesulfonic acid, sodium	127-68-4	5.0E+02	5.0E+02	1.3E+02		
3-Trimethoxysilyl-1-Propanethiol	4420-74-0	3.0E+02	6.0E+01	7.5E+00		
3-Trimethoxysilylpropyl methacrylate	2530-85-0	5.0E+02	1.3E+02	1.5E+01		
3-	29915-38-6	2.5E+02	5.0E+01	3.0E+01		
4-Chlorobutyryl chloride	4635-59-0	2.5E+02	5.0E+01	7.5E+00		
4-Hydroxy-3-methoxybenzaldehyde	121-33-5	5.0E+02	1.3E+02	3.0E+01		
4-Hydroxybenezenesulfonic acid	98-67-9	5.0E+02	5.0E+02	7.5E+01		
4-Hydroxybenzoic acid	99-96-7	5.0E+02	4.0E+02	6.0E+01		
4-Methoxybenzyl alcohol	105-13-5	5.0E+02	2.0E+02	2.5E+01		
4-Methyldecane	2847-72-5	2.5E+02	5.0E+01	3.0E+01		
4-Methylmorpholine	109-02-4	7.5E+02	1.5E+02	2.5E+01		
4-Methylnonane	17301-94-9	1.3E+03	2.5E+02	4.0E+01		
4-Nitro-3-trifluoromethylphenol	88-30-2	6.0E+01	1.3E+01	1.5E+00		
4-Pyridinecarboxaldehyde	872-85-5	5.0E+02	2.5E+02	4.0E+01		
4-Tert-butylpyridine	3978-81-2	2.5E+02	5.0E+01	3.0E+01		
5-chloro-2-benzenesulfonic acid	0-306*	2.0E+02	5.0E+01	6.0E+00		
5-Chloro-methyl-isothiazolin-3-one	26172-55-4	1.0E+00	1.0E+00	6.0E-01		
5-Methyl-2-(1-methylethyl)phenol	89-83-8	4.0E+02	1.5E+00	2.5E-01		
6-Benzyl aminopurine	1214-39-7	5.0E+02	1.0E+02	1.5E+01		
6-Ethyl-2-methyl octane	62016-19-7	2.0E+02	4.0E+01	6.0E+00		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
6-Methyl-2-Heptanone	928-68-7	2.5E+02	5.0E+01	3.0E+01		
6-S-Hexadecyl-2-methoxythioascorbic	8065-53-0	6.0E+01	1.5E+01	3.0E+00		
9-Octadecenoic acid	112-80-1	5.0E+02	4.0E-01	5.0E-02		
Acacia	9000-01-5	5.0E+02	5.0E+02	5.0E+02		
Acenaphthene	83-32-9	2.5E+02	7.5E+00	1.3E+00		
Acenaphthylene	208-96-8	5.0E+02	1.5E+00	2.0E-01		
Acetaldehyde	75-07-0	1.5E+03	4.9E+02	8.1E+01	8.1E+01	3.6E+00
Health Effects	carc , CNS depres , conj , cough , delayed pulm edema , derm , eye burns , in animals: kidney effects , in animals: repro effects , in animals: terato effects , irrit eyes , irrit nose , irrit throat , skin burns					
Target Organs	Nose					
Acetamide	60-35-5	5.0E+02	5.0E+02	7.5E+01		
Acetanilide	103-84-4	5.0E+01	7.5E+00	1.0E+00		
Acetic acid	64-19-7	6.1E+02	8.6E+01	1.2E+01	1.2E+01	8.4E+00
Health Effects	black skin , chronic bron , conj , dental erosion , eye burns , hyperkeratosis , irrit eyes , irrit nose , irrit skin , irrit throat , lac , phar edema , skin burns , skin sens					
Acetic acid 2-methylbutyl ester	624-41-9				2.7E+02	9.1E+01
Acetic acid ethenyl ester	27360-07-2	2.5E+02	5.0E+01	3.0E+01		
Acetic acid, allyl ester	591-87-7	2.0E+02	4.0E+01	6.0E+00		
Acetic acid, lithium salt	546-89-4	5.0E+02	2.5E+02	3.5E+01		
Acetic acid, manganese(2+) salt,	6156-78-1	5.0E+02	2.2E+01	1.3E+01		
Acetic acid, manganese(II) salt (2:1)	638-38-0	5.0E+02	1.6E+01	9.4E+00		
Acetic anhydride	108-24-7	4.2E+02	6.3E+01	2.1E+00		
Health Effects	bron , conj , corn edema , corn opac , cough , dysp , lac , nasal irrit , phar irrit , photo , sens derm , skin burns , vesic					
Acetol	116-09-6	5.0E+02	2.0E+02	2.5E+01		
Acetone	67-64-1	1.4E+04	7.6E+03	4.7E+02	4.7E+02	4.7E+02
Health Effects	CNS depres , derm , dizz , head , irrit eyes , irrit nose , irrit throat					
Target Organs	Nervous system - unspecified					
Acetone cyanohydrin	75-86-5	5.2E+01	2.5E+01	7.0E+00	3.5E+00	
Health Effects	asphy , conf , convuls , dizz , head , irrit eyes , irrit resp sys , irrit skin , kidney inj , lass , liver inj , pulm edema					
Target Organs	CNS - unspecified					
Acetone thiosemicarbazide	1752-30-3	1.0E+02	1.0E+02	6.0E+01		
Acetone-d6	666-52-4	1.5E+04	7.5E+03	5.0E+02		
Acetonitrile	75-05-8	1.1E+03	5.4E+02	2.2E+01	2.2E+01	8.2E+00
Health Effects	asphy , chest pain , convuls , in animals: kidney damage , in animals: liver damage , irrit nose , irrit throat , lass , nau , stupor , vomit					
Target Organs	Lungs, Whole body					
Acetophenone	98-86-2	3.5E+02	5.0E+01	4.9E+01	4.9E+01	1.7E+01
Acetyl bromide	506-96-7	1.0E+02	2.0E+01	3.0E+00		
Acetyl chloride	75-36-5	4.0E+02	1.5E-01	2.0E-02		
Acetyl triethyl citrate	77-89-4	5.0E+02	1.3E+02	2.0E+01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Acetylaminofluorene, 2-	53-96-3	3.5E+02	1.3E+02	1.5E+01		
Health Effects	carc , reduced function of bladder , reduced function of kidneys , reduced function of liver , reduced function of pancreas					
Acetylaminofluorenone, 2-	3096-50-2	7.5E+01	1.5E+01	2.5E+00		
Acetylene	74-86-2	6.0E+03	2.5E+03	3.5E+02		
Health Effects	asphy , dizz , head , liquid: frostbite					
Acetylene tetrabromide	79-27-6	1.0E+02	1.0E+02	7.5E+01	1.4E+00	3.5E-01
Health Effects	abdom pain , anor , CNS depres , head , irrit eyes , irrit nose , jaun , leucyt , nau					
Acetylsalicylic acid	50-78-2				5.0E+00	1.2E+00
Health Effects	incr blood clotting time , irrit eyes , irrit skin , irrit upper resp sys , kidney inj , liver inj , nau , vomit					
Target Organs	Blood					
Acridine orange	494-38-2	4.0E+01	7.5E+00	1.3E+00		
Acrolein	107-02-8	3.2E+00	2.3E-01	7.0E-02	7.0E-02	4.6E-02
Health Effects	chronic resp disease , decr pulm func , delayed pulm edema , irrit eyes , irrit muc memb , irrit skin					
Target Organs	Lungs, Nose, Respiration - unspecified					
Acrylamide	79-06-1	6.0E+01	6.0E+01	7.5E+00	3.0E-02	7.3E-03
Health Effects	absent deep tendon reflex , ataxia , carc , drow , hand sweat , irrit eyes , irrit skin , lass , musc weak , numb limbs , pares , repro effects					
Target Organs	Breasts, CNS - unspecified, Mouth/palate, Skin, Thyroid, Uterus					
Acrylic acid	79-10-7	5.3E+02	1.4E+02	4.4E+00	4.4E+00	2.0E+00
Health Effects	eye burns , in animals: kidney inj , in animals: liver inj , in animals: lung inj , irrit eyes , irrit resp sys , irrit skin , skin burns , skin sens					
Target Organs	Nasal-pharynx, Nose, Reproductive - unspecified by gender					
Acrylic acid 2-ethylhexyl ester	103-11-7	7.5E+01	7.5E+01	1.3E+01		
Acrylonitrile	107-13-1	1.6E+02	7.6E+01	2.2E+01	4.3E+00	1.5E-01
Health Effects	asphy , carc , dizz , head , irrit eyes , irrit skin , lass , nau , scaling derm , skin vesic , sneez , vomit					
Target Organs	Lungs, Nervous system - unspecified, Nose, Respiration - unspecified					
Acrylyl chloride	814-68-6	3.5E+01	7.5E-01	4.0E-01		
Adamsite	578-94-9	6.4E+00	2.6E+00	1.6E-02	8.3E-04	
Adipic acid	124-04-9	1.3E+02	5.0E+00	5.0E+00	5.0E+00	1.7E+00
Adipic acid-TDI	68609-57-4	2.5E+02	5.0E+01	3.0E+01		
Adiponitrile	111-69-3	7.5E+02	1.5E+01	1.5E+01	8.8E+00	2.2E+00
Health Effects	abdom pain , blurred vision , conf , convuls , dizz , dysp , head , irrit eyes , irrit resp sys , irrit skin , lass , nau , vomit					
Target Organs	Blood, Lungs					
Adogen 464	63393-96-4	5.0E+02	5.0E+02	7.5E+01		
Aerosol A 102	39354-45-5	5.0E+02	5.0E+02	4.0E+02		
Agar-agar	9002-18-0	5.0E+02	5.0E+02	5.0E+02		
Agarose, type VII	9012-36-6	2.5E+02	5.0E+01	3.0E+01		
Alachlor	15972-60-8				1.0E+00	2.4E-01
Alamine 336	68814-95-9	5.0E+02	5.0E+02	6.0E+01		
Alcohol oxidase	9073-63-6	2.5E+02	5.0E+01	3.0E+01		
Alcohols, C6-C12	68603-15-6	2.5E+02	5.0E+01	3.0E+01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Aldicarb	116-06-3	2.6E-01	8.7E-02	3.0E-04		
Aldrin	309-00-2	2.5E+01	1.0E+01	2.5E-01	5.0E-02	1.2E-02
Health Effects	azotemia , carc , clonic convuls , coma , dizz , head , hema , mal , myoclonic jerks of limbs , nau , tonic convuls , vomit					
Target Organs	Liver					
Aldrithiol	2127-03-9	2.5E+02	5.0E+01	3.0E+01		
Aliphatic Hydrocarbon	X-068*	2.0E+02	4.0E+01	6.0E+00		
Aliphatic Naphtha	64742-89-8 (2)	5.0E+02	4.0E+02	6.0E+01		
Alizarin Red B	72-48-0	1.3E+02	2.5E+01	4.0E+00		
Alizarine Red S	130-22-3	6.0E+01	1.3E+01	1.5E+00		
Alkyl dimethylbenzyl ammonium	8001-54-5	1.0E+02	1.0E+02	2.0E+01		
Alkylamines	0-305*	2.5E+02	5.0E+01	3.0E+01		
Alkylbenzene (C10-C16)	68648-87-3	5.0E+02	5.0E+02	2.5E+02		
Allene	463-49-0	6.0E+03	1.3E+03	2.0E+02		
Allyl alcohol	107-18-6	4.8E+01	1.0E+01	5.0E+00	5.0E+00	4.1E-01
Health Effects	irrit eyes , irrit skin , irrit upper resp sys , pulm edema , tissue damage					
Allyl bromide	106-95-6	2.0E+03	4.0E+02	6.0E+01		
Allyl chloride	107-05-1	4.4E+02	1.7E+02	8.8E+00	8.8E+00	7.7E-01
Health Effects	in animals: kidney inj , in animals: liver inj , irrit eyes , irrit muc memb , irrit nose , irrit skin , pulm edema					
Target Organs	Liver, Nervous system - unspecified					
Allyl chloroformate	2937-50-0	1.0E+01	3.5E+00	5.0E-01		
Allyl formate	1838-59-1	4.0E+02	7.5E+01	1.3E+01		
Allyl glycidyl ether	106-92-3				4.7E+00	1.6E+00
Health Effects	derm , irrit eyes , irrit nose , irrit resp sys , irrit skin , narco , possible hemato effects , pulm edema , repro effects					
Target Organs	Skin					
Allyl isothiocyanate	57-06-7	5.0E+01	1.0E+01	4.0E+00		
Allyl propyl disulfide	2179-59-1				3.0E+00	1.0E+00
Health Effects	irrit eyes , irrit nose , irrit resp sys , lac					
Allylamine	107-11-9	4.2E+01	7.7E+00	9.8E-01	9.8E-01	
Health Effects	discomfort Lungs, head , irrit Nose, irrit Eyes, nau					
Target Organs	Eyes, Heart, Lungs, Nose, Whole body					
Allylmagnesium bromide	1730-25-2	2.5E+02	5.0E+01	3.0E+01		
Allyltrichlorosilane	107-37-9	2.4E+02	5.2E+01	4.3E+00	4.3E+00	
Alpha,alpha,4-trimethyl-3-cyclohexene-	10482-56-1	5.0E+02	5.0E+02	3.5E+02		
Alphahydroxybenzeneacetic acid, (+-)-	611-72-3	5.0E+02	3.5E+02	5.0E+01		
Aluminon	569-58-4	5.0E+02	7.5E-03	1.3E-03		
Aluminum acetate, basic	7360-44-3	2.0E+02	4.5E+01	2.7E+01		
Aluminum carbide	1299-86-1	3.5E+01	6.7E+00	6.7E+00		
Aluminum chloride	7446-70-0	5.0E+02	6.0E+01	9.9E+00		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Aluminum chloride hexahydrate	7784-13-6	5.0E+02	1.5E+02	2.5E+01		
Aluminum fluoride	7784-18-1	4.0E+01	7.5E+00	6.2E+00		
Aluminum hexafluorosilicate	17099-70-6	3.5E+02	1.8E+01	1.1E+01		
Aluminum hydroxide	21645-51-2	1.3E+02	1.3E+02	1.2E+01		
Aluminum nitrate	13473-90-0	5.0E+02	3.5E+02	5.0E+01		
Aluminum nitrate nonahydrate	7784-27-2	5.0E+02	1.5E+02	7.0E+01		
Aluminum oxide	1344-28-1	2.5E+01	1.5E+01	1.5E+00		
Health Effects	irrit eyes , irrit resp sys , irrit skin					
Target Organs	Lungs					
Aluminum oxide hydrate	1333-84-2	2.5E+01	1.5E+01	1.5E+00		
Aluminum phosphate	7784-30-7	5.0E+02	5.0E+02	1.0E+02		
Aluminum phosphate solution	13530-50-2	3.0E+02	6.0E+01	6.0E+01		
Aluminum phosphide	20859-73-8	8.5E+00	4.7E+00			
Aluminum potassium sulfate	10043-67-1	1.0E+02	4.8E+01	4.8E+01		
Aluminum potassium sulfate,	7784-24-9	5.0E+02	1.3E+02	8.8E+01		
Aluminum sulfate	10043-01-3	5.0E+02	3.2E+01	3.2E+01		
Aluminum yellow 4A	10343-58-5	2.5E+02	2.5E+01	1.5E+01		
Aluminum(III) isopropylate	555-31-7	5.0E+02	3.8E+01	3.8E+01		
Aluminum, elemental	7429-90-5	5.0E+02	5.0E+02	5.0E+00	1.0E+00	3.4E-01
Health Effects	irrit eyes , irrit resp sys , irrit skin					
Target Organs	Nervous system - unspecified					
Amberjet 4200-Cl	60177-39-1	2.5E+02	5.0E+01	3.0E+01		
Amberlite	100915-96-6	5.0E+02	4.0E+02	6.0E+01		
Amberlite IR-120(PLUS) ion-exchange	78922-04-0	2.0E+02	4.0E+01	6.0E+00		
Amberlite IR-120plus	9002-23-7	2.0E+02	4.0E+01	6.0E+00		
Amberlite IRA-400(Cl)	9002-24-8	2.5E+02	5.0E+01	3.0E+01		
Amberlite XAD-16, -7, -4 resin	104219-63-8	5.0E+02	4.0E+02	6.0E+01		
Amberlite XAD-2	9060-05-3	2.5E+02	5.0E+01	3.0E+01		
Amberlite XAD-7	37380-43-1	2.5E+02	5.0E+01	3.0E+01		
Amberlite ZAD-16	9003-69-4	5.0E+02	1.5E+02	2.5E+01		
Amberlyst 15	9037-24-5	2.5E+02	5.0E+01	3.0E+01		
Amino-1,3-naphthalenedisulfonic acid,	86-65-7	4.0E+02	7.5E+01	1.0E+01		
Amino-1-propanol, 3-	156-87-6	5.0E+02	3.0E-01	4.0E-02		
Amino-2,6-dinitrotoluene, 4-	6393-42-6	2.5E+02	5.0E+01	7.5E+00		
Amino-2-methyl-2-propanol, 1-	2854-16-2	5.0E+02	2.0E+02	3.0E+01		
Amino-4,6-dinitrotoluene, 2-	35572-78-2	5.0E+02	1.3E+02	1.5E+01		
Aminoanthraquinone, 2-	117-79-3	5.0E+02	1.5E+02	2.5E+01		
Aminobenzoic acid, 2-	118-92-3	5.0E+02	1.0E+02	1.3E+01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Aminobenzoic acid, 4-	150-13-0	5.0E+02	1.0E+02	1.5E+01		
Aminodiphenyl, p-	92-67-1	2.0E+02	1.0E+01	1.5E+00		
Health Effects	acute hemorrhagic cystitis , ataxia , carc , dizz , drow , dysp , head , lass , methemo , urinary burning					
Target Organs	Bladder					
Aminoethylethanolamine	111-41-1	5.0E+02	2.5E+02	3.5E+01		
Aminoethylpiperazine, 1-	140-31-8	5.0E+02	5.0E+01	7.5E+00		
Aminoheptane, 3-	28292-42-4	3.0E+01	6.0E+00	7.5E-01		
Aminophenol, 2-	95-55-6	5.0E+02	1.0E+01	1.5E+00		
Aminophenol, 3-	591-27-5	1.3E+02	2.0E+01	3.0E+00		
Aminopropriophenone, 4-	70-69-9	7.5E+01	5.6E+00	3.5E+00		
Aminopterin	54-62-6	2.5E+01	2.5E+01	1.5E+01		
Aminopyrazine	5049-61-6	2.0E+01	1.0E+01	6.0E+00		
Aminopyridine, 2-	504-29-0				1.9E+00	4.7E-01
Health Effects	convuls , dizz , excitement , head , high BP , irrit eyes , irrit nose , irrit throat , lass , nau , resp distress , stupor					
Target Organs	CNS - unspecified					
Aminopyridine, 4-	504-24-5	2.0E+01	2.0E+01	1.3E+01		
Amiton	78-53-5	3.3E+00	3.3E+00	2.0E+00		
Amiton oxalate	3734-97-2	3.0E+00	3.0E+00	1.5E+00		
Amitrole	61-82-5	5.0E+02	1.3E+02	6.0E-01	2.0E-01	4.9E-02
Health Effects	anor , ataxia , depres (thyroid func suppression) , dysp , incr body temperature , irrit eyes , irrit skin , lass , musc spasm , salv , skin dryness					
Target Organs	Reproductive - unspecified by gender, Thyroid					
Ammonia	7664-41-7	7.7E+02	1.1E+02	2.1E+01	2.1E+01	7.0E+00
Health Effects	chest pain , cough Respiration - unspecified, discomfort Eyes, dizz Whole body, dysp , head None, hyperpnea Respiration - unspecified, incr Nasal-pharynx, inebri Whole body, irrit Throat, irrit Eyes, irrit Nose, irrit Respiration - unspecified, irrit eyes					
Target Organs	Eyes, Lungs, Respiration - unspecified, Whole body					
Ammonium acetate	631-61-8	2.5E+02	5.0E+01	7.5E+00		
Ammonium aluminum fluoride	7784-19-2	4.3E+02	7.5E+01	1.3E+01		
Ammonium benzoate	1863-63-4	3.5E+02	7.5E+01	1.0E+01		
Ammonium bicarbonate	1066-33-7	2.0E+02	4.0E+01	6.0E+00		
Ammonium bifluoride	1341-49-7	3.8E+02	7.5E+01	1.0E+01		
Ammonium bisulfate	7803-63-6	2.5E+00	5.0E-01	7.5E-02		
Ammonium bisulfite	10192-30-0	2.5E+02	5.0E+01	3.0E+01		
Ammonium bromide	12124-97-9	5.0E+02	2.0E+02	3.5E+01		
Ammonium carbamate	1111-78-0	3.5E+01	6.0E+00	1.0E+00		
Ammonium carbonate	506-87-6	7.5E+01	1.5E+01	2.5E+00		
Ammonium chloride	12125-02-9	5.0E+02	5.0E+02	2.0E+01	1.0E+01	3.4E+00
Health Effects	cough , dysp , irrit eyes , irrit resp sys , irrit skin , pulm sens					
Ammonium chromate	7788-98-9	4.4E+01	7.5E+00	1.3E+00		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Ammonium citrate	7632-50-0	1.5E+02	3.0E+01	4.0E+00		
Ammonium citrate tribasic	3458-72-8	1.9E+02	3.5E+01	5.0E+00		
Ammonium dichromate	7789-09-5	3.6E+01	7.5E+00	1.0E+00		
Ammonium ferrous sulfate hexahydrate	7783-85-9	5.0E+02	1.6E+01	9.6E+00		
Ammonium fluoride	12125-01-8	4.9E+02	4.9E+00	4.9E+00		
Ammonium fluoroborate	13826-83-0	3.5E+02	6.0E+00	3.5E+00		
Ammonium formate	540-69-2	5.0E+02	2.0E+02	2.5E+01		
Ammonium hydrogen oxalate	37541-72-3	5.0E+02	1.5E+02	2.5E+01		
Ammonium hydroxide	1336-21-6	1.5E+02	6.0E+01	7.5E+00		
Ammonium iodide	12027-06-4	4.0E+02	7.5E+01	1.3E+01		
Ammonium iron (III) sulfate	10138-04-2	1.3E+02	2.5E+01	1.5E+01		
Ammonium lactate	515-98-0	5.0E+02	2.0E+02	3.5E+01		
Ammonium lignin sulfonate	8061-53-8	2.5E+02	5.0E+01	3.0E+01		
Ammonium molybdate	13106-76-8	3.0E+02	1.0E+02	6.1E+01		
Ammonium molybdate (VI) tetrahydrate	12054-85-2	1.5E+02	3.0E+01	1.8E+01		
Ammonium molybdenum oxide	27546-07-2	5.0E+02	8.8E+00	8.8E+00		
Ammonium molybdophosphate	12026-66-3	4.0E+02	8.2E+01	4.9E+01		
Ammonium molydbate	11098-84-3	5.0E+02	5.0E+02	3.5E+00		
Ammonium nitrate	6484-52-2	5.0E+02	3.0E-01	4.0E-02		
Ammonium oxalate	1113-38-8	2.0E+01	4.0E+00	5.0E-01		
Ammonium oxalate hydrate	6009-70-7	1.5E+02	3.0E+01	4.0E+00		
Ammonium oxalate monohydrate	5972-73-6	1.5E+02	3.0E+01	4.0E+00		
Ammonium pentaborate	12007-89-5	2.5E+02	5.0E+01	3.0E+01		
Ammonium perchlorate	7790-98-9	5.0E+02	1.0E+02	1.5E+01		
Ammonium perfluorooctanoate	3825-26-1				1.0E-02	2.4E-03
Ammonium permanganate	13446-10-1	5.0E+02	5.0E+00	3.0E+00		
Ammonium persulfate	7727-54-0	1.0E+02	2.0E+01	2.5E+00		
Ammonium picrate	131-74-8	2.5E+02	5.0E+01	3.0E+01		
Ammonium polyacrylate	9003-03-6	2.5E+02	5.0E+01	3.0E+01		
Ammonium salt	14307-43-8	2.5E+02	5.0E+01	3.0E+01		
Ammonium silicofluoride	16919-19-0	3.9E+02	2.0E+01	1.2E+01		
Ammonium sulfamate	7773-06-0	5.0E+02	3.5E+02	3.0E+01	1.0E+01	3.4E+00
Health Effects	cough , dysp , irrit eyes , irrit nose , irrit throat					
Ammonium sulfate	7783-20-2	5.0E+02	5.0E+02	1.3E+02		
Ammonium sulfite	10196-04-0	1.0E+01	1.0E+01	1.0E+01		
Ammonium sulfite monohydrate	7783-11-1	2.5E+02	5.0E+01	3.0E+01		
Ammonium tartrate	3164-29-2	2.0E+02	4.0E+01	5.0E+00		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Ammonium thiocyanate	1762-95-4	2.0E+02	2.0E+02	3.5E+01		
Ammonium thiosulfate	7783-18-8	5.0E+02	2.0E+02	2.5E+01		
Ammonium tungstate(VI)	11120-25-5	4.1E+00	4.1E+00	4.1E+00		
Ammonium vanadate	7803-55-6	7.5E-01	3.2E-01	4.0E-02		
Ammonium-d4 deuteroxide	13550-49-7	7.5E+02	1.3E+02	2.5E+01		
Amosite	12172-73-5	1.0E+02	2.0E+01	5.0E-02		
Amphetamine	300-62-9	2.0E+01	2.0E+01	1.3E+01		
Amyl acetate	628-63-7	5.0E+03	5.0E+02	5.0E+02	2.7E+02	9.1E+01
Health Effects	derm , irrit eyes , irrit nose , narco , possible CNS depres					
Amyl acetate, sec-	626-38-0				2.7E+02	9.1E+01
Health Effects	derm , irrit eyes , irrit nose , irrit skin , narco , possible CNS depres , possible kidney inj , possible liver inj					
Amyl alcohol	71-41-0	1.3E+02	7.5E+01	7.5E+01		
Amylamine	110-58-7	3.0E+01	6.0E+00	7.5E-01		
Amyltrichlorosilane	107-72-2	2.8E+02	6.1E+01	5.0E+00	5.0E+00	
Anhydrone	10034-81-8	5.0E+02	1.3E+02	1.5E+01		
Aniline	62-53-3	7.6E+01	4.6E+01	3.0E+01	3.8E+00	1.9E+00
Health Effects	anxi , ataxia , carc , cirr , cyan , cyan , dizz , dizz , dysp , dysp on effort , ftg , head , head , hypox , hypox Heart, irrit eyes , lass , methemo , syncope , tacar , tacar , weak					
Target Organs	Blood, Spleen					
Anisidine, o-	90-04-0	5.0E+01	2.5E+00	1.5E+00	5.0E-01	1.2E-01
Health Effects	carc , cyan , dizz , head , RBC Heinz bodies					
Anisidine, p-	104-94-9	5.0E+01	2.5E+00	1.5E+00	5.0E-01	1.2E-01
Health Effects	cyan , dizz , head , RBC Heinz bodies					
Anisole	100-66-3	4.0E+02	7.5E+01	1.3E+01		
Anthracene	120-12-7	1.5E+02	3.0E+01	4.0E+00		
Anthracenedisulfonic acid, 2,6-	2861-02-1	5.0E+02	2.5E+02	3.5E+01		
Anthraquinone	84-65-1	5.0E+02	1.0E+02	1.5E+01		
Antimony pentachloride	7647-18-9	1.2E+02	6.1E+00	3.7E+00		
Antimony pentafluoride	7783-70-2	8.9E+01	2.7E+00	8.9E-01		
Antimony pentasulfide	1315-04-4	8.3E+01	4.2E+00	2.5E+00		
Antimony potassium tartrate	28300-74-5	1.3E+02	6.5E+00	3.9E+00		
Antimony trichloride	10025-91-9	9.4E+01	9.4E-01	9.4E-01		
Antimony trifluoride	7783-56-4	7.3E+01	4.0E+00	7.3E-01		
Antimony trioxide	1309-64-4	6.0E+01	4.0E+00	1.8E+00		
Antimony, elemental	7440-36-0	5.0E+01	2.0E+01	1.5E+00	5.0E-01	1.7E-01
Health Effects	anor , cough , diarr , dizz , head , insom , irrit eyes , irrit mouth , irrit nose , irrit skin , irrit throat , nau , stomach cramps , unable to smell properly , vomit					
Target Organs	CVS - unspecified, Lungs					
Antimycin A	1397-94-0	1.3E+01	1.8E+00	1.0E+00		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
ANTU	86-88-4	1.0E+02	1.0E+01	9.0E-01	3.0E-01	1.0E-01
Health Effects	after ingestion of large doses: coarse pulm rales , after ingestion of large doses: cyan , after ingestion of large doses: dysp , after ingestion of large doses: vomit , liver damage					
Target Organs	Lungs					
Aqua regia	8007-56-5	4.0E+02	7.5E+01	4.0E+00		
Arginine, L-	74-79-3	2.5E+02	5.0E+01	3.0E+01		
Argon	7440-37-1	6.0E+05	3.5E+05	1.0E+05		
Aroclor 1016	12674-11-2	5.0E+00	1.0E+00	6.0E-01		
Aroclor 1016/1242 mixture	0-312*	5.0E+00	1.0E+00	6.0E-01		
Aroclor 1221	11104-28-2	5.0E+00	1.0E+00	6.0E-01		
Aroclor 1232	11141-16-5	5.0E+00	1.0E+00	6.0E-01		
Aroclor 1242	53469-21-9	5.0E+00	5.0E+00	3.0E+00	1.0E+00	3.4E-01
Health Effects	carc , chloracne , irrit eyes , liver damage , repro effects					
Target Organs	Liver, Skin					
Aroclor 1248	12672-29-6	5.0E+00	1.0E+00	6.0E-01		
Aroclor 1254	11097-69-1	5.0E+00	2.5E+00	1.5E+00	5.0E-01	1.7E-01
Health Effects	carc , chloracne , irrit eyes , liver damage , repro effects					
Target Organs	Liver					
Aroclor 1260	11096-82-5	5.0E+00	1.5E+00	6.0E-01		
Aroclor 1260/1262 mixture	0-313*	5.0E+00	1.5E+00	6.0E-01		
Aroclor 1262	37324-23-5	5.0E+00	5.0E+00	3.0E+00		
Aroclor 1268	11100-14-4	5.0E+00	1.0E+00	6.0E-01		
Aromatic hydrocarbon solvents	64742-95-6	3.5E+03	3.5E+03	3.5E+03		
Aromatic isocyanate mixture	X-210*	1.3E+02	2.0E+01	4.0E+00		
Arsenic acid	1327-52-2	9.5E+00	3.0E+00	4.0E-01		
Arsenic compounds	As cmpds	5.0E+00	2.0E+00	3.5E-01	1.0E-02	2.4E-03
Arsenic pentoxide	1303-28-2	7.7E+00	7.7E+00	1.0E+00		
Arsenic trioxide	1327-53-3	9.1E+00	3.0E+00	4.0E-01		
Arsenous trichloride	7784-34-1	7.5E+01	1.0E+01	1.5E+00		
Arsine	7784-42-1	1.6E+00	5.0E-01	1.5E-01	1.6E-02	3.9E-03
Health Effects	abdom pain , back pain , bronze skin , carc , dizz , dysp , head , hema , jaun , lass , liquid: frostbite , mal , nau , peri neur , vomit					
Target Organs	Blood, Kidneys, Spleen					
Ascaridole	512-85-6	7.5E+01	2.0E+01	2.5E+00		
Ascarite (II) ®	81133-20-2	2.5E+00	5.0E-01	3.0E-01		
Ascorbic acid	50-81-7	5.0E+02	5.0E+02	2.0E+02		
Asphalt	8052-42-4	2.5E+01	5.0E+00	7.5E-01	5.0E-01	1.7E-01
Health Effects	carc , irrit eyes , irrit resp sys					
Atrazine	1912-24-9				5.0E+00	1.7E+00
Health Effects	derm , dysp , hypothermia , inco , irrit eyes , irrit skin , lass , liver inj , salv , sens skin					

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Auramine	2465-27-2	6.0E+01	6.0E+01	7.5E+00		
Azaserine	115-02-6	7.5E+01	2.5E-01	4.0E-02		
Azinphos ethyl	2642-71-9	1.5E+02	3.9E+00	2.0E+00		
Azinphos methyl	86-50-0	1.0E+01	7.0E-01	6.0E-01	2.0E-01	1.4E-02
Health Effects	aching eyes , anor , blurred vision , card irreg , chest tight , convuls , cyan , diarr , head , lac , lar spasm , low BP , miosis , nau , para , rhin , salv , sweat , twitch , vomit , wheez					
Target Organs	Nervous system - unspecified					
Azobis(2-methylpropionitrile), 2,2'-	78-67-1	3.0E+02	1.5E+02	2.5E+01		
Azodicarbamide	123-77-3	2.0E+02	2.0E+02	1.3E+02		
Barbituric acid	67-52-7	2.0E+02	4.0E+01	6.0E+00		
Barium acetate	543-80-6	9.3E+01	4.7E+00	2.8E+00		
Barium carbonate	513-77-9	5.0E+01	6.0E+00	1.5E+00		
Barium chloride	10361-37-2	5.0E+01	1.5E+01	1.5E+00		
Health Effects	extrasystoles , gastroenteritis , hypokalemia , irrit eyes , irrit skin , irrit upper resp sys , musc spasm , skin burns , slow pulse					
Barium chloride dihydrate	10326-27-9	8.9E+01	4.5E+00	2.7E+00		
Barium chromate	10294-40-3	7.4E+01	1.3E+00	7.4E-01		
Barium cyanide	542-62-1	6.9E+01	3.5E+00	2.1E+00		
Barium diphenylamine sulfonate	6211-24-1	2.3E+02	1.2E+01	6.9E+00		
Barium fluoride	7787-32-8	6.4E+01	6.4E+01	1.9E+00		
Barium hydroxide	17194-00-2	6.2E+01	3.1E+00	1.9E+00		
Barium hydroxide octahydrate	12230-71-6	1.2E+02	2.0E+01	3.0E+00		
Barium metaborate	13701-59-2	5.0E+02	2.0E+02	3.0E+01		
Barium nitrate	10022-31-8	9.5E+01	2.0E+01	2.5E+00		
Health Effects	extrasystoles , gastroenteritis , hypokalemia , irrit eyes , irrit skin , irrit upper resp sys , musc spasm , skin burns , slow pulse					
Barium oxide	1304-28-5	5.6E+01	2.8E+00	1.7E+00		
Barium permanganate	7787-36-2	3.4E+01	3.4E+01	2.1E+01		
Barium peroxide	1304-29-6	6.2E+01	1.3E+01	1.5E+00		
Barium stearate	6865-35-6	5.0E+02	2.0E+02	3.0E+01		
Barium sulfate	7727-43-7	5.0E+02	3.5E+02	3.0E+01	1.0E+01	2.4E+00
Health Effects	benign pneumoconiosis (baritosis) , irrit eyes , irrit nose , irrit upper resp sys					
Barium, elemental	7440-39-3	5.0E+01	5.0E+01	1.5E+00	5.0E-01	1.7E-01
Bathophenanthroline	1662-01-7	5.0E+02	5.0E+02	2.5E+02		
Baygon	114-26-1	2.0E+01	2.0E+01	1.5E+00	5.0E-01	1.2E-01
Health Effects	abdom cramps , blurred vision , diarr , head , lass , miosis , musc twitch , nau , salv , sweat , vomit					
Benomyl	17804-35-2				1.0E+00	3.4E-01
Health Effects	irrit eyes , irrit skin , irrit upper resp sys , possible repro effects , possible terato effects , skin sens					
Target Organs	Reproductive - unspecified by gender, Skin					
Bentonite	1302-78-9	3.0E+01	3.0E+01	3.0E+01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Benzal chloride	98-87-3	7.5E+01	2.3E+00	1.3E+00		
Benzaldehyde	100-52-7	6.0E+02	1.5E+01	1.5E+01		
Benzamide	55-21-0	3.5E+02	6.0E+01	1.0E+01		
Benzenamine, sulfate (2:1)	542-16-5	2.5E+02	5.0E+01	3.0E+01		
Benzene	71-43-2	1.3E+04	2.6E+03	1.7E+02	2.9E+01	6.4E-01
Health Effects	anor , bone marrow depres , carc , derm , dizz , head , irrit eyes , irrit nose , irrit resp sys , irrit skin , lass , nau , staggered gait					
Target Organs	Blood, IMM system - unspecified, WBC					
Benzene D6	1076-43-3	1.3E+04	2.5E+03	1.5E+02		
Benzenearsonic acid	98-05-5	2.7E-01	2.7E-01	2.7E-01		
Benzenesulfonic acid chloride	98-09-9	2.0E+02	2.0E+02	1.3E+02		
Benzenetetracarboxylic dianhydride,	89-32-7	1.5E+01	1.5E+01	5.0E+00		
Benzenethiol	108-98-5	7.2E+00	2.4E+00	4.5E-01	4.5E-01	1.5E-01
Health Effects	CNS depres , cough , cyan , derm , dizz , dysp , head , irrit eyes , irrit resp sys , irrit skin , kidney damage , liver damage , nau , pneu , pulm edema , spleen damage , vomit , wheez					
Target Organs	CNS - unspecified, Eyes, Skin					
Benzidine	92-87-5	1.3E+02	3.5E+00	5.0E-01		
Health Effects	acute cystitis , acute liver disorders , carc , derm , hema , irreg urination , painful urination , secondary anemia from hemolysis					
Target Organs	Bladder					
Benzo(a)anthracene	56-55-3	1.5E+01	4.0E+00	6.0E-01		
Benzo(a)pyrene	50-32-8	8.0E+01	1.5E+01	6.0E-01		
Benzo(b)fluoranthene	205-99-2	2.0E+01	4.0E+00	6.0E-01		
Benzo(g,h,i)perylene	191-24-2	2.5E+02	5.0E+01	3.0E+01		
Benzo(k)fluoranthene	207-08-9	2.0E+01	4.0E+00	6.0E-01		
Benzo-4,7,13,16,21,24-hexaoxa-1,10-	31250-18-7	1.5E+02	3.5E+01	5.0E+00		
Benzoic acid	65-85-0	4.0E+02	7.5E+01	1.3E+01		
Benzoic acid, sodium salt	532-32-1	5.0E+02	5.0E+02	3.5E+02		
Benzoin oxime	441-38-3	6.0E+01	1.3E+01	1.5E+00		
Benzonitrile	100-47-0	2.4E+02	9.3E+01	1.3E+01		
Benzophenone	119-61-9	5.0E+02	3.5E+02	1.5E+00		
Benzothiazole	95-16-9	1.5E+02	1.0E+02	1.5E+01		
Benzotriazole	95-14-7	2.5E+02	5.0E-01	7.5E-02		
Benzotrichloride	98-07-7	1.0E+01	7.0E+00	1.0E+00		
Benzotrifluoride	98-08-8	5.0E+02	1.3E+02	1.5E+01		
Benzoyl chloride	98-88-4	1.1E+02	2.9E+01	1.7E+00		
Benzoyl peroxide	94-36-0	5.0E+02	5.0E+00	5.0E+00	5.0E+00	1.7E+00
Health Effects	irrit eyes , irrit muc memb , irrit skin , sens derm					
Benzyl acetate	140-11-4	1.5E+02	6.1E+01	6.1E+01	6.1E+01	2.1E+01
Benzyl alcohol	100-51-6	6.0E+02	6.0E+02	2.5E+02		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Benzyl benzoate	120-51-4	5.0E+02	2.5E+02	3.5E+01		
Benzyl bromide	100-39-0	6.0E+01	1.3E+01	1.5E+00		
Benzyl chloride	100-44-7	2.6E+02	5.3E+01	5.2E+00	5.2E+00	1.8E+00
Health Effects	head , irrit eyes , irrit nose , irrit skin , irrity , lass , pulm edema , skin eruption					
Target Organs	Lungs					
Benzyl chloroformate	501-53-1	2.0E+01	6.8E+00	1.0E+00		
Benzyl cyanide	140-29-4	3.0E+01	4.3E+00	6.0E-01		
Benzylamine	100-46-9	2.5E+02	5.0E+01	7.5E+00		
Benzyldimethylamine	103-83-3	2.0E+02	2.0E+01	3.0E+00		
Benzyldimethylstearylammonium	122-19-0	5.0E+02	1.0E+02	1.5E+01		
Benzylmagnesium chloride	6921-34-2	1.5E+02	3.5E+01	5.0E+00		
Benzyltrimethylammonium hydroxide	100-85-6	1.3E+01	2.5E+00	3.5E-01		
Beryllium chloride	7787-47-5	3.6E+01	4.4E-02	1.8E-02		
Beryllium fluoride	7787-49-7	2.1E+01	2.6E-02	1.0E-02		
Beryllium hydroxide	13327-32-7	1.9E+01	2.4E-01	3.5E-02		
Beryllium nitrate	13597-99-4	5.9E+01	7.4E+00	1.0E+00		
Beryllium oxide	1304-56-9	1.1E+01	1.4E+00	2.0E-01		
Beryllium, elemental	7440-41-7	1.0E-01	2.5E-02	3.5E-03	5.0E-05	1.4E-05
Health Effects	berylliosis (chronic exposure): anor , berylliosis (chronic exposure): chest pain , berylliosis (chronic exposure): clubbing of fingers , berylliosis (chronic exposure): cough , berylliosis (chronic exposure): cyan , berylliosis (chronic exposure): lass ,					
Target Organs	Lungs					
Betaine	107-43-7	5.0E+02	5.0E+02	1.3E+02		
beta-Pinene	127-91-3				1.1E+02	2.7E+01
Bibenzyl	103-29-7	5.0E+02	4.0E+02	5.0E+01		
Bidrin	141-66-2	8.8E-01	2.9E-01	1.5E-01	5.0E-02	1.2E-02
Health Effects	abdom cramps , anor , anxi , diarr , dizz , head , inco , lac , lass , mal , musc twitch , nau , restless , rhinitis , salv , sweat , tremor , vomit					
Bioxiran	1464-53-5	3.5E+01	3.5E+00	5.0E-01		
Biphenyl, 1,1-	92-52-4	1.0E+02	6.1E+01	7.5E+00	1.3E+00	3.1E-01
Health Effects	head , irrit eyes , irrit throat , lass , liver damage , nau , numb limbs					
Target Organs	Lungs					
Biphenylol, 4-	92-69-3	6.0E+01	6.0E+01	3.5E+01		
Bis(2,3-epoxypropoxy) butane, 1,4-	2425-79-8	5.0E+02	5.0E+02	1.0E+02		
Bis(2-chloro-1-methylethyl) ether	108-60-1	6.0E+02	4.0E+01	6.0E+00		
Bis(2-chloroethoxy)methane	111-91-1	4.0E+01	4.0E+01	1.5E+01		
Bis(2-chloroethyl) ether	111-44-4	6.0E+02	1.5E+02	6.0E+01	2.9E+01	1.0E+01
Health Effects	carc , cough , in animals: pulm edema , irrit nose , irrit resp sys , irrit throat , lac , liver damage , nau , vomit					
Target Organs	Liver, Lungs, Whole body					
Bis(2-chloroethylthio)methane	63869-13-6	5.0E+00	1.0E+00	1.5E-01		
Bis(2-chloroethylthio)-n-butane, 1,4-	142868-93-7	6.0E+00	1.3E+00	2.0E-01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Bis(2-chloroethylthio)-n-pentane, 1,5-	142868-94-8	7.5E+00	1.5E+00	2.0E-01		
Bis(2-chloroethylthio)-n-propane, 1,3-	63905-10-2	6.0E+00	1.3E+00	1.5E-01		
Bis(2-chloroethylthioethyl)ether	63918-89-8	3.0E+01	6.0E+00	7.5E-01		
Bis(2-chloroethylthiomethyl)ether	63918-90-1	6.0E+00	1.3E+00	1.5E-01		
Bis(2-dimethylaminoethyl)ether	3033-62-3	1.0E+02	1.0E+02	1.0E+00	3.3E-01	1.1E-01
Health Effects	in animals: irrit eyes , in animals: irrit skin , neurological disorders , possible urinary dist					
Target Organs	Eyes					
Bis(2-ethylhexyl) hydrogen phosphate	298-07-7	2.0E+00	4.0E-01	6.0E-02		
Bis(2-ethylhexyl) phenyl phosphate	16368-97-1	7.5E+00	1.5E+00	2.0E-01		
Bis(2-ethylhexyl) phthalate	117-81-7	5.0E+02	7.5E+01	1.0E+01	5.0E+00	1.7E+00
Health Effects	carc , in animals: liver damage , irrit eyes , irrit muc memb , terato effects					
Bis(2-methylstyryl)benzene, 4-	13280-61-0	2.5E+02	5.0E+01	3.0E+01		
Bis(3-tert-butyl-4-hydroxy-6-methyl-	96-69-5	5.0E+02	3.0E+02	3.0E+01		
Health Effects	irrit eyes , irrit resp sys , irrit skin					
Target Organs	Kidneys, Liver					
Bis(chloromethyl) ether	542-88-1	8.5E-01	2.1E-01	3.0E-02	4.7E-03	1.6E-03
Health Effects	blood-stained sputum , bronchial secretions , carc , corn damage , cough , decr pulm function , dysp , edema , irrit eyes , irrit muc memb , irrit resp sys , irrit skin , nec , pulm congestion , wheez					
Target Organs	Lungs, Respiration - unspecified					
Bis(chloromethyl)oxetane, 3,3-	78-71-7	7.5E+01	2.0E+00	1.3E+00		
Bis(trifluoromethyl)benzene, 1,3-	402-31-3	4.7E+02	2.4E+01	1.4E+01		
Bis[(benzo-15-crown-5)-4-	69271-98-3	2.5E+02	5.0E+01	3.0E+01		
Bisbutenylenetetrahydrofurfal	126-15-8	5.0E+02	2.0E+02	3.0E+01		
Bischloromethyl ketone	534-07-6	2.0E+00	2.0E+00	4.0E-01		
Bismuth acetate	22306-37-2	2.5E+02	5.0E+01	3.0E+01		
Bismuth germanate	12233-56-6	2.0E+02	4.0E+01	5.0E+00		
Bismuth hydroxide	10361-43-0	1.0E+02	3.0E+00	1.0E+00		
Bismuth iodide	7787-64-6	1.5E+02	3.5E+01	5.0E+00		
Bismuth nitrate	10361-44-1	5.0E+02	2.5E+01	4.0E+00		
Bismuth oxide	1304-76-3	5.0E+02	4.0E+02	6.0E+01		
Bismuth oxychloride	7787-59-9	5.0E+02	5.0E+02	2.5E+02		
Bismuth subnitrate	1304-85-4	5.0E+02	1.5E+02	2.0E+01		
Bismuth telluride	1304-82-1				1.0E+01	3.4E+00
Health Effects	garlic breath , irrit eyes , irrit skin , irrit upper resp sys					
Bismuth(III) nitrate, pentahydrate	10035-06-0	5.0E+02	4.0E+01	6.0E+00		
Bismuth, elemental	7440-69-9	2.0E+02	4.0E+01	5.0E+00		
Bisphenol A	80-05-7	5.0E+02	1.0E+02	1.5E+01		
Bisphenol A diglycidyl ether	1675-54-3	6.0E+00	6.0E+00	3.5E+00		
Bisphenol A epon 829 polymer	25036-25-3	5.0E+02	1.5E+02	2.5E+01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Bis-tris propane	64431-96-5	2.5E+02	5.0E+01	3.0E+01		
Bitoscanate	4044-65-9	2.0E+01	2.0E+01	1.3E+01		
BoBCalix	X-213*	2.5E+02	5.0E+01	3.0E+01		
Borane methyl sulfide complex	13292-87-0	3.5E+01	6.0E+00	1.0E+00		
Borane-tetrahydrofuran	14044-65-6	1.3E+02	2.5E+01	1.5E+01		
Borate	14213-97-9	5.0E+01	1.0E+01	6.0E+00		
Borates, pentahydrate	12179-04-3				2.0E+00	6.8E-01
Health Effects	cough , derm , dysp , epis , irrit eyes , irrit skin , irrit upper resp sys					
Borax	1303-96-4	5.0E+02	2.0E+02	5.3E+01	2.0E+00	6.8E-01
Health Effects	cough , derm , dysp , epis , irrit eyes , irrit skin , irrit upper resp sys					
Boric acid	10043-35-3	1.3E+02	1.0E+02	6.0E+00	2.0E+00	6.8E-01
Boric acid, tributyl ester	688-74-4	7.5E+02	1.5E+02	2.5E+01		
Boron	7440-42-8	2.5E+02	5.0E+01	7.5E+00		6.8E-03
Boron carbide	12069-32-8	5.0E+02	5.0E+02	1.3E+02		
Boron nitride	10043-11-5	5.0E+02	5.0E+02	5.0E+02		
Boron oxide	1303-86-2	5.0E+02	3.0E+02	3.0E+01	1.0E+01	3.4E+00
Health Effects	conj , cough , irrit eyes , irrit resp sys , irrit skin , skin eryt					
Boron tribromide	10294-33-4	4.1E+02	7.5E+01	3.4E+00	3.4E+00	
Health Effects	dysp , eye burns , irrit eyes , irrit resp sys , irrit skin , pulm edema , skin burns					
Boron trichloride	10294-34-5	1.3E+01	1.0E+01	1.5E+00		
Boron trifluoride	7637-07-2	1.1E+02	3.7E+01	2.5E+00	2.5E+00	
Health Effects	epis , eye burns , in animals: kidney damage , in animals: pneu , irrit eyes , irrit nose , irrit resp sys , irrit skin , skin burns					
Target Organs	Kidneys					
Boron trifluoride diethyl etherate	109-63-7	5.0E+02	1.5E+02	2.5E+01		
Boron trifluoride-dimethyl ether	353-42-4	1.1E+02	3.7E+01	2.5E+00		
Botulinum toxin-A	93384-43-1	3.0E-05	3.0E-08	4.0E-09		
Botulinum toxin-B	93384-44-2	1.5E-05	1.5E-05	1.3E-05		
Botulinum toxin-F	0-307*	1.0E-05	1.5E-06	2.0E-07		
Botulinum, clostridium	0-308*	6.0E-07	1.2E-07	1.5E-08		
Bovine albumin	9048-46-8	5.0E+02	5.0E+02	5.0E+02		
Brilliant blue	2650-18-2	6.0E-02	6.0E-02	6.0E-02		
Bromacil	314-40-9				1.0E+01	3.4E+00
Health Effects	in animals: thyroid inj , irrit eyes , irrit skin , irrit upper resp sys					
Bromadiolone	28772-56-7	1.0E+00	1.0E+00	6.0E-01		
Bromine	7726-95-6	5.6E+01	1.6E+00	2.2E-01	2.2E-01	2.2E-01
Health Effects	abdom pain , cough , diarr , dizz , epis , eye burns , feeling of oppression , head , lac , measle-like eruptions , pneu , pulm edema , skin burns					
Bromine chloride	13863-41-7	3.6E+01	1.2E+01	2.4E+00	2.4E+00	

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Bromine pentafluoride	7789-30-2	2.4E+02	7.2E+00	1.0E+00	7.2E-01	2.5E-01
Health Effects	corn nec , cough , dysp , irrit eyes , irrit resp sys , irrit skin , kidney inj , liver inj , pulm edema , skin burns					
Bromine trifluoride	7787-71-5	1.2E+02	1.1E+01	6.7E-01	6.7E-01	
Bromo-1-chloro-5,5-dimethylhydantoin,	126-06-7	2.5E+02	5.0E+01	7.5E+00		
Bromo-2-chloro-1,1,2-trifluoroethane, 1-	354-06-3	4.0E+04	7.5E+03	1.3E+03		
Bromo-3-chloro-5,5-dimethylhydanton,	16079-88-2	5.0E+02	1.3E+02	1.5E+01		
Bromoacetaldehyde diethyl acetul	2032-35-1	5.0E+02	1.5E+02	2.5E+01		
Bromoacetic acid	79-08-3	4.0E+00	7.5E-01	1.3E-01		
Bromoacetone	598-31-2	5.5E+00	1.8E+00	6.2E-02	6.2E-02	
Bromobenzene	108-86-1	2.0E+03	1.3E+02	1.5E+01		
Bromochlorobenzene, 3-	108-37-2	2.5E+02	5.0E+01	3.0E+01		
Bromochlorobenzene, 4-	106-39-8	2.5E+02	5.0E+01	3.0E+01		
Bromochlorodifluoromethane	353-59-3	3.5E+04	1.5E+03	2.5E+02		
Bromochloromethane	74-97-5	1.0E+04	1.0E+04	3.0E+03	1.1E+03	2.6E+02
Health Effects	CNS depres , conf , dizz , irrit eyes , irrit skin , irrit throat , pulm edema					
Target Organs	CNS - unspecified, Liver					
Bromocresol green	76-60-8	5.0E+02	2.5E+01	3.5E+00		
Bromocresol purple	115-40-2	5.0E+02	2.0E+01	3.0E+00		
Bromocyclohexanol, cis-2-	16536-57-5	3.0E+02	5.0E+00	7.5E-01		
Bromodichloromethane	75-27-4	1.5E+02	3.0E+01	4.0E+00		
Bromoethene	593-60-2	2.0E+02	1.5E+02	6.0E+00	2.2E+00	5.4E-01
Health Effects	carc , conf , dizz , inco , irrit eyes , irrit skin , liquid: frostbite , narco , nau , vomit					
Target Organs	CNS - unspecified, Liver, Lungs					
Bromoethylmagnesium	925-90-6	1.5E+02	3.5E+01	5.0E+00		
Bromofluorobenzene, p-	460-00-4	5.0E+02	5.0E+02	2.0E+02		
Bromoform	75-25-2	7.5E+03	3.5E+02	5.0E+01	5.2E+00	2.0E+00
Health Effects	CNS depres , irrit eyes , irrit resp sys , irrit skin , kidney damage , liver damage					
Target Organs	Large intestine, Lungs					
Bromohexane	111-25-1	3.0E+04	6.0E+03	7.5E+02		
Bromonaphthalene	90-11-9	3.5E+02	6.0E+01	1.0E+01		
Bromonitromethane	563-70-2	7.5E+01	1.5E+01	2.5E+00		
Bromophenol blue	115-39-9	2.5E+02	5.0E+01	3.0E+01		
Bromophenyl phenyl ether, 4-	101-55-3	2.0E+02	4.0E+01	6.0E+00		
Bromopropane, 1-	106-94-5	1.3E+04	1.3E+04	1.5E+02	5.0E+01	1.2E+01
Bromopropane, 2-	75-26-3	1.3E+05	6.0E+04	7.5E+03		
Bromopyrene, 3-	1714-29-0	2.5E+02	5.0E+01	3.0E+01		
Bromosuccinimide, N-	128-08-5	2.0E+02	4.0E+01	6.0E+00		
Bromothymol blue	76-59-5	2.5E+02	5.0E+01	3.0E+01		
Bromotrichloromethane	75-62-7	5.0E+01	1.0E+01	1.5E+00		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Bromotrifluoroethylene	598-73-2	6.0E+02	3.5E+02	2.0E+01		
Bromotrimethylsilane	2857-97-8	1.5E+02	3.5E+01	5.0E+00		
Brown menhaden fish oil	68440-42-6	2.5E+02	5.0E+01	3.0E+01		
Brucine	357-57-3	4.0E+01	1.3E+01	1.5E+00		
Buffer solution, aqueous	7732-18-5	5.0E+02	5.0E+02	5.0E+02		
Butadiene monoxide	930-22-3	7.5E+01	7.5E+01	3.0E+01		
Butadiene, 1,3-	106-99-0	4.9E+04	1.2E+04	1.5E+03	1.5E+03	1.5E-01
Health Effects	carc , dizz , drow , irrit eyes , irrit nose , irrit throat , liquid: frostbite , repro effects , terato effects					
Target Organs	Blood, Multiple sites, Ovaries					
Butane	106-97-8	1.3E+05	4.0E+04	1.3E+04	1.3E+04	5.8E+02
Health Effects	asphy , drow , liquid: frostbite , narco					
Butanediol dinitrate, 1,4-	3457-91-8	2.0E+01	3.0E+00	7.5E-01		
Butanediol, 1,3-	107-88-0	5.0E+02	5.0E+02	7.5E+01		
Butanediol, 1,4-	110-63-4	2.5E+02	2.5E+01	3.5E+00		
Butanenitrile	109-74-0	1.3E+02	1.0E+02	6.0E+01		
Health Effects	abdom pain , conf , convuls , dizz , dysp , head , irrit eyes , irrit resp sys , irrit skin , lass , nau , vomit					
Butanethiol	109-79-5	1.5E+03	1.5E+02	2.0E+01	1.8E+00	6.3E-01
Health Effects	conf , cyan , head , in animals: inco , in animals: lass , in animals: narco , irrit eyes , irrit skin , kidney damage , liver damage , mal , musc weak , nau , pulm irrit , sweat , vomit					
Target Organs	CNS - unspecified, Reproductive - unspecified by gender					
Butanol, 1-	71-36-3	4.0E+03	1.5E+02	6.1E+01	6.1E+01	2.1E+01
Health Effects	blurred vision , CNS depres , corn inflamm , derm , dizz , drow , head , hearing loss , irrit eyes , irrit nose , irrit throat , lac , photo , possible auditory nerve damage					
Butanol, aluminum salt, 2-	2269-22-9	4.0E+02	9.1E+01	5.5E+01		
Butanone oxamine	96-29-7	4.0E+02	4.0E+02	1.5E+02		
Butene	25167-67-3				5.7E+02	1.4E+02
Butene, 1-	106-98-9	1.5E+05	3.0E+04	1.5E+03	5.7E+02	1.4E+02
Butene, 2-	107-01-7	1.5E+05	3.0E+03	1.5E+03	5.7E+02	1.4E+02
Butene, cis-2-	590-18-1	7.5E+05	5.0E+05	1.5E+05	5.7E+02	1.4E+02
Butene, trans-2-	624-64-6	1.5E+05	3.0E+04	1.5E+03	5.7E+02	1.4E+02
Butoxyethanol acetate, 2-	112-07-2	1.0E+03	6.0E+02	4.0E+02	1.3E+02	4.5E+01
Health Effects	CNS depres , head , hema , hemolysis , irrit eyes , irrit nose , irrit skin , irrit throat , vomit					
Target Organs	CNS - unspecified					
Butoxypolypropylene glycol	9003-13-8	5.0E+02	5.0E+02	1.0E+02		
Butyl acetate, n-	123-86-4	1.4E+04	9.5E+02	2.4E+01	2.4E+01	2.4E+01
Health Effects	drow , head , irrit eyes , irrit skin , irrit upper resp sys , narco					
Butyl acetate, sec-	105-46-4	7.5E+03	1.5E+03	9.5E+02	9.5E+02	3.3E+02
Health Effects	drow , dry skin , dryness upper resp sys , head , irrit eyes , narco					
Butyl acetate, tert-	540-88-5	6.0E+03	4.0E+03	2.5E+03	9.5E+02	3.3E+02
Health Effects	derm , head , inflamm eyes , irrit upper resp tract , itch eyes , narco					
Butyl acetoacetate, tert-	1694-31-1	5.0E+02	4.0E+02	6.0E+01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Butyl acrylate resin, n-	9003-49-0	2.5E+02	5.0E+01	3.0E+01		
Butyl acrylate, n-	141-32-2	2.5E+03	6.8E+02	4.4E+01	4.4E+01	3.6E+00
Health Effects	dysp , irrit eyes , irrit skin , irrit upper resp sys , sens derm					
Butyl alcohol, sec-	78-92-2	6.0E+03	1.3E+03	4.0E+02	3.0E+02	1.0E+02
Health Effects	irrit eyes , irrit nose , irrit skin , irrit throat , narco					
Butyl benzyl phthalate	85-68-7	5.0E+02	5.0E+02	1.5E+01		
Butyl butyrate	109-21-7	1.0E+03	2.0E+02	3.0E+01		
Butyl chloroformate, n-	592-34-7	3.7E+01	1.2E+01	1.5E+00		
Butyl glycidyl ether, n-	2426-08-6	1.3E+03	3.0E+01	1.6E+01	1.6E+01	3.9E+00
Health Effects	CNS depres , irrit eyes , irrit nose , irrit skin , narco , possible hemato effects , skin sens					
Butyl isocyanate, n-	111-36-4	1.0E+00	9.3E-02	5.3E-02	5.3E-02	
Butyl lactate, N-	138-22-7				3.0E+01	1.0E+01
Health Effects	CNS depres , drow , head , irrit eyes , irrit nose , irrit skin , irrit throat , nau , vomit					
Butyl levulinate	2052-15-5	5.0E+02	4.0E+02	6.0E+01		
Butyl lithium	109-72-8	5.0E+02	5.0E+02	1.2E+02		
Butyl methacrylate	97-88-1	5.0E+02	5.0E+01	7.5E+00		
Butyl myristate	110-36-1	3.5E+03	6.0E+02	1.0E+02		
Butyl perbenzoate, tert-	614-45-9	4.0E+02	1.5E+02	2.5E+01		
Butyl propanoate	590-01-2	5.0E+02	5.0E+02	3.0E+02		
Butyl titanate	5593-70-4	1.3E+03	2.5E+02	4.0E+01		
Butyl-2-methylcyclopropane, T-1-	38851-70-6	2.5E+02	5.0E+01	3.0E+01		
Butylamine, (S)-2-	513-49-5	1.5E+02	3.0E+01	4.0E+00		
Butylamine, 4-(diethoxymethylsilyl)-	3037-72-7	4.5E+01	4.5E+01	6.0E+00		
Butylamine, n-	109-73-9	7.5E+02	1.5E+01	6.0E+00		
Health Effects	head , irrit eyes , irrit nose , irrit skin , irrit throat , skin burns , skin flush					
Butylamine, sec	13952-84-6	6.0E+01	3.0E+01	6.0E+00		
Butylamine, tert-	75-64-9	4.0E+02	2.0E+01	3.0E+00		
Butylated hydroxytoluene	128-37-0	4.0E+02	4.0E+01	6.0E+00	2.0E+00	6.8E-01
Health Effects	in animals: decr growth rate , in animals: incr liver weight , irrit eyes , irrit skin					
Butylbenzene, n-	104-51-8	7.5E+03	1.5E+03	2.0E+02		
Butylbenzene, sec-	135-98-8	7.5E+02	4.0E+00	5.0E-01		
Butylbenzene, tert-	98-06-6	1.3E+03	4.0E+00	6.0E-01		
Butylchloride, t-	507-20-0	7.5E+03	3.0E+01	4.0E+00		
Butylcyclohexane	1678-93-9	1.0E+03	2.0E+02	3.0E+01		
Butylcyclohexanone, p-tert-	98-53-3	5.0E+02	4.0E+02	6.0E+01		
Butylene carbonate	4437-85-8	5.0E+02	4.0E+02	6.0E+01		
Butylphenol, 2-sec-	89-72-5				3.1E+01	1.1E+01
Health Effects	irrit eyes , irrit resp sys , irrit skin , skin burns					
Butylphosphonic acid	3321-64-0	2.0E+00	4.0E-01	6.0E-02		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Butylpyrocatechol, 4-tert	98-29-3	5.0E+02	2.0E+00	3.0E-01		
Butyltoluene, p-tert-	98-51-1				6.1E+00	2.1E+00
Health Effects	abnor CVS stress , CNS depres , dry nose , dry throat , head , hemato depres , irrit eyes , irrit skin , kidney inj , liver inj , low BP , metallic taste , tacar					
Target Organs	CNS - unspecified, CVS - unspecified					
Butyltrichlorosilane	7521-80-4	2.6E+02	5.7E+01	4.7E+00	4.7E+00	
Butynediol, 1,4-	110-65-6	3.0E+01	2.0E+01	6.0E-01		
Butyraldehyde	123-72-8	4.0E+01	1.3E+00	1.5E-01		
Butyric acid	107-92-6	7.5E+02	7.5E+02	1.5E+02		
Butyric acid, sodium salt	156-54-7	5.0E+02	5.0E+02	1.5E+02		
Butyrolactone, gamma-	96-48-0	5.0E+02	4.0E+01	6.0E+00		
BZ	53800-72-9	6.9E-01	3.7E-02	2.0E-02		
Cacodylic acid	75-60-5	2.5E+02	4.0E+00	1.5E+00		
Cadmium acetate	543-90-8	1.9E+01	1.5E-01	6.2E-02		
Cadmium bromide	7789-42-6	2.2E+01	7.5E+00	7.3E-02		
Cadmium carbonate	513-78-0	1.4E+01	7.7E-02	4.6E-02		
Cadmium chloride	10108-64-2	1.5E+01	5.0E-01	4.9E-02		
Cadmium chloride hemipentahydrate	7790-78-5	1.8E+01	5.0E+00	6.1E-02		
Cadmium dinitrite	7790-83-2	1.6E+01	9.1E-02	5.5E-02		
Cadmium fluoride	7790-79-6	1.2E+01	6.7E-02	4.0E-02		
Cadmium hydroxide	21041-95-2	1.2E+01	6.5E-02	3.9E-02		
Cadmium nitrate	10325-94-7	1.9E+01	1.1E-01	6.3E-02		
Cadmium nitrate tetrahydrate	10022-68-1	2.5E+01	5.0E+00	6.0E-01		
Cadmium oxide	1306-19-0	1.0E+01	4.0E+00	3.4E-02		
Health Effects	anos , carc , chest tight , chills , cough , diarr , dysp , emphy , head , mild anemia , musc ache , nau , prot , pulm edema , subs pain , vomit					
Cadmium stearate	2223-93-0	5.5E+01	1.3E+01	1.8E-01		
Cadmium sulfate	10124-36-4	1.7E+01	9.3E-02	5.6E-02		
Cadmium sulfate, hydrate	7790-84-3	2.8E+01	3.0E-01	9.4E-02		
Cadmium sulfide	1306-23-6	1.2E+01	1.2E+01	3.9E-02		
Cadmium, elemental	7440-43-9	4.7E+00	7.6E-01	1.0E-01	4.1E-02	2.1E-05
Health Effects	anos , carc , chest tight , chills , cough , diarr , dysp , emphy , head , mild anemia , musc ache , nau , prot , pulm edema , subs pain , vomit					
Target Organs	Bronchi, Kidneys, Lungs, Trachea					
Calcium acetate	62-54-4	3.0E+01	4.0E-01	6.0E-02		
Calcium arsenate	7778-44-1	1.3E+01	1.0E+01	1.5E+00		
Health Effects	carc , derm , GI dist , in animals: liver damage , lass , palmar planter hyperkeratoses , peri neur , skin hyperpig					
Calcium carbide	75-20-7	2.5E+02	5.0E+01	3.0E+01		
Calcium carbonate	471-34-1	5.0E+02	5.0E+02	7.5E+01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Calcium carbonate	1317-65-3	3.0E+02	6.0E+01	1.5E+01		
Health Effects	cough , irrit eyes , irrit muc memb , irrit resp sys , irrit skin , irrit upper resp sys , lac , rhin , sneez					
Calcium chloride	10043-52-4	4.0E+02	2.0E+01	3.5E+00		
Calcium chloride dihydrate	10035-04-8	5.0E+02	5.0E+02	1.3E+02		
Calcium chloride hexahydrate	7774-34-7	5.0E+02	1.0E+02	1.5E+01		
Calcium chloride hydrate	22691-02-7	4.5E+02	4.0E+01	6.0E+00		
Calcium chromate	13765-19-0	4.5E+01	1.3E+00	9.0E-02	1.0E-03	2.4E-04
Calcium cyanamide	156-62-7	5.0E+02	1.3E+02	1.5E+00	5.0E-01	1.7E-01
Health Effects	antabuse-like effects , cough , dizz , head , irrit eyes , irrit resp sys , irrit skin , low BP , nau , rapid breath , skin burns , skin sens , vomit					
Target Organs	Skin					
Calcium cyanide	592-01-8	2.8E+01	1.3E+01	3.8E+00	1.9E+00	
Calcium fluoride	7789-75-5	5.0E+02	2.0E+02	1.5E+01		
Calcium formate	544-17-2	5.0E+02	2.0E+02	3.0E+01		
Calcium hydride	7789-78-8	1.5E+02	3.5E+01	5.0E+00		
Calcium hydroxide	1305-62-0	5.0E+02	5.0E+02	7.5E+01	5.0E+00	1.7E+00
Health Effects	bron , cough , eye burns , irrit eyes , irrit skin , irrit upper resp sys , pneu , skin burns , skin vesic					
Calcium hypochlorite	7778-54-3	3.5E+02	7.5E+01	1.0E+01		
Calcium metasilicate	10101-39-0	2.5E+02	5.0E+01	3.0E+01		
Calcium monohydrogen phosphate	7789-77-7	2.5E+02	5.0E+01	3.0E+01		
Calcium nitrate	10124-37-5	1.3E+02	2.5E+01	3.5E+00		
Calcium nitrate tetrahydrate	13477-34-4	5.0E+02	3.5E+02	5.0E+01		
Calcium nitrite	13780-06-8	5.0E+01	6.0E-01	7.5E-02		
Calcium oxalate	563-72-4	5.0E+01	5.0E+01	1.5E+01		
Calcium oxalate, hydrate	5794-28-5	6.0E+01	6.0E+01	1.5E+01		
Calcium oxide	1305-78-8	2.5E+01	5.0E+00	5.0E+00	2.0E+00	6.8E-01
Health Effects	derm , irrit eyes , irrit skin , irrit upper resp tract , perf nasal septum , pneu , ulcer					
Calcium phosphate	10103-46-5	3.5E+02	3.5E+01	2.0E+01		
Calcium phosphate tribasic	12167-74-7	2.5E+02	5.0E+01	3.0E+01		
Calcium phosphide	1305-99-3	1.3E+01	7.5E+00	1.0E+00		
Calcium sulfate	7778-18-9	2.5E+02	5.0E+01	3.0E+01	1.0E+01	2.4E+00
Health Effects	conj , epis , irrit eyes , irrit skin , irrit upper resp sys , rhinitis					
Calcium sulfate dihydrate	10101-41-4	7.5E+01	5.0E+01	3.0E+01	1.0E+01	2.4E+00
Calcium sulfate hemihydrate	10034-76-1				1.0E+01	2.4E+00
Calcium trifluoromethyl sulfonate	55120-75-7	5.0E+02	1.5E+02	2.0E+01		
Calcium, elemental	7440-70-2	2.5E+02	5.0E+01	3.0E+01		
Camphor	76-22-2	2.0E+02	3.0E+01	1.9E+01	1.2E+01	4.3E+00
Health Effects	diarr , dizz , epilep convuls , excitement , head , irrit eyes , irrit muc memb , irrit skin , nau , vomit					
Cantharidin	56-25-7	4.3E+00	4.3E+00	2.5E+00		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Caprolactam	105-60-2	2.0E+01	5.0E+00	5.0E+00	5.0E+00	1.7E+00
Health Effects	abdom cramps , asthma , conf , derm , diarr , dizz , epis , head , irrit eyes , irrit resp sys , irrit skin , irrity , kidney inj , liver inj , nau , skin sens , vomit					
Caprolactone	502-44-3	5.0E+02	3.5E+02	5.0E+01		
Caprylyl chloride	111-64-8	2.5E+02	5.0E+01	3.0E+01		
CAPSO	73463-39-5	2.5E+02	5.0E+01	3.0E+01		
Captafol	2425-06-1				1.0E-01	2.4E-02
Health Effects	bron , conj , derm , diarr , high BP , in animals: carc , in animals: terato effects , irrit eyes , irrit resp sys , irrit skin , kidney inj , liver inj , skin sens , vomit , wheez					
Target Organs	Skin					
Captan	133-06-2	5.0E+02	3.0E+01	1.5E+01	5.0E+00	1.7E+00
Health Effects	blurred vision , carc , derm , diarr , dysp , irrit eyes , irrit skin , irrit upper resp sys , skin sens , vomit					
Carbachol chloride	51-83-2	1.5E+01	1.5E+01	7.5E+00		
Carbaryl	63-25-2	1.0E+02	1.5E+01	5.0E+00	5.0E-01	1.2E-01
Health Effects	abdom cramps , blurred vision , convuls , cyan , diarr , irrit skin , lac , miosis , nau , possible repro effects , rhin , salv , sweat , tremor , vomit					
Carbazole	86-74-8	7.5E+01	1.5E+01	2.5E+00		
Carbazole violet	6358-30-1	5.0E+02	5.0E+02	2.5E+02		
Carbethoxyethylidine	5717-37-3	2.5E+02	5.0E+01	3.0E+01		
Carbitol acetate	112-15-2	5.0E+02	4.0E+02	6.0E+01		
Carbofuran	1563-66-2	5.0E-01	4.3E-01	3.0E-01	1.0E-01	2.4E-02
Health Effects	abdom cramps , blurred vision , convuls , diarr , head , inco , lass , miosis , musc twitch , nau , salv , sweat , vomit					
Carbon	7440-44-0	5.0E+02	1.0E+01	6.0E+00		
Health Effects	black sputum , cough , decr pulm func , dysp , lung fib					
Carbon black	1333-86-4	5.0E+02	1.8E+01	1.1E+01		
Health Effects	cough , in presence of polycyclic aromatic hydrocarbons: carc , irrit eyes					
Target Organs	Lungs					
Carbon dioxide	124-38-9	7.5E+04	5.0E+04	5.0E+04	1.4E+04	1.4E+04
Health Effects	asphy , coma , convuls , dizz , dysp , frostbite (liq, dry ice) , head , incr BP , incr card output , incr heart rate , mal , pares , restless , sweat					
Carbon disulfide	75-15-0	1.5E+03	5.0E+02	4.0E+01	2.1E+01	7.6E-01
Health Effects	anor , anxi , coronary heart disease , derm , dizz , eye burns , gastritis , head , kidney inj , lass , liver inj , low weight , ocular changes , Parkinson-like syndrome , polyneur , poor sleep , psychosis , repro effects , skin burns					
Target Organs	Nervous system - unspecified, PNS - unspecified					
Carbon monoxide	630-08-0	3.8E+02	9.5E+01	9.5E+01	2.9E+01	1.0E+01
Health Effects	angina , conf , cyan , depres S_T segment of electrocardiogram , dizz , halu , head , lass , nau , syncope , tachypnea					
Target Organs	CNS - unspecified, CVS - unspecified, Reproductive - unspecified by gender					
Carbon tetrabromide	558-13-4				1.4E+00	4.6E-01
Health Effects	in animals: corn damage , irrit eyes , irrit resp sys , irrit skin , kidney inj , lac , liver inj , lung inj					
Target Organs	Liver					
Carbon tetrachloride	56-23-5	3.3E+03	1.2E+03	2.8E+02	1.2E+02	7.7E+00
Health Effects	carc , CNS depres , dizz , drow , inco , irrit eyes , irrit skin , kidney inj , liver inj , nau , vomit					

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Target Organs Liver						
Carbon tetrafluoride	75-73-0	7.5E+04	1.5E+04	2.5E+03		
Carbon trifluoride	75-46-7	3.0E+05	6.0E+04	7.5E+03		
Carbonyl fluoride	353-50-4	2.2E+00	7.6E-01	7.6E-01	7.6E-01	
Health Effects chronic exposure: GI pain , chronic exposure: musc fib , chronic exposure: skeletal fluorosis , cough , dysp , eye burns , irrit eyes , irrit muc memb , irrit resp sys , irrit skin , lac , liquid: frostbite , pulm edema , skin burns						
Target Organs Bone						
Carbonyl sulfide	463-58-1	3.7E+02	1.4E+02	7.5E+01		
Carbonyldiphthalic anhydride, 4,4'-	2421-28-5	2.5E+02	5.0E+01	3.0E+01		
Carbophenothion	786-19-6	6.8E+00	6.8E+00	4.0E+00		
Carboxymethyl cellulose	9000-11-7	5.0E+02	5.0E+02	1.3E+02		
Carboxymethyl sepharose	68894-07-5	5.0E+02	1.5E+02	2.5E+01		
Casein	9000-71-9	2.5E+02	5.0E+01	3.0E+01		
Castor oil	8001-79-4	5.0E+02	5.0E+02	1.3E+02		
Catechol	120-80-9	1.0E+02	4.0E+01	2.3E+01	2.3E+01	7.7E+00
Health Effects burn eyes , convuls , derm , incr BP , irrit eyes , irrit resp sys , irrit skin , kidney inj , lac , skin sens						
Target Organs CNS - unspecified, Lungs						
Cellulase	9012-54-8	5.0E+02	3.0E+02	4.0E+01		
Cellulose	9004-34-6	5.0E+02	5.0E+02	3.0E+01	1.0E+01	3.4E+00
Health Effects irrit eyes , irrit muc memb , irrit skin						
Cellulose acetate butanoate	9004-36-8	2.5E+02	5.0E+01	3.0E+01		
Cellulose, 2-(diethylamino)ethyl ether	9013-34-7	2.5E+02	5.0E+01	3.0E+01		
Ceric ammonium nitrate	16774-21-3	2.5E+02	5.0E+01	3.0E+01		
Ceric ammonium sulfate	7637-03-8	2.5E+02	5.0E+01	3.0E+01		
Ceric ammonium sulfate, dihydrate	10378-47-9	2.5E+02	5.0E+01	3.0E+01		
Ceric oxide	1306-38-3	5.0E+02	1.5E+02	2.0E+01		
Cerium	7440-45-1	2.5E+02	5.0E+01	3.0E+01		
Cerium acetate	537-00-8	1.0E+01	2.0E+00	3.5E-01		
Cerium chloride	7790-86-5	5.0E+02	1.5E+02	2.5E+01		
Cerium fluoride	7758-88-5	5.0E+02	4.3E+01	2.6E+01		
Cerium nitrate hexahydrate	10294-41-4	5.0E+02	3.5E+02	5.0E+01		
Cerium oxalate	139-42-4	2.5E+02	5.0E+01	3.0E+01		
Cerium sulfate	13590-82-4	1.0E+02	2.0E+01	3.5E+00		
Cerium(IV) hydroxide	12014-56-1	3.5E+02	7.5E+01	4.5E+01		
Cerous sulfate	13454-94-9	5.0E+02	1.5E+02	2.5E+01		
Cesium carbonate	534-17-8	5.0E+02	2.0E+02	3.0E+01		
Cesium chloride	7647-17-8	5.0E+02	1.0E+01	1.3E+00		
Cesium fluoride	13400-13-0	5.0E+02	1.0E+02	6.0E+01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Cesium hydroxide	21351-79-1	2.5E+02	7.5E+00	2.0E+00	2.0E+00	6.8E-01
Health Effects	eye burns , irrit eyes , irrit skin , irrit upper resp sys , skin burns					
Cesium iodide	7789-17-5	5.0E+02	2.0E+02	3.0E+01		
Cesium nitrate	7789-18-6	5.0E+02	2.0E+02	3.0E+01		
Cesium oxide	20281-00-9	5.0E+02	1.1E+01	6.7E+00		
Cesium, elemental	7440-46-2	5.0E+02	1.5E+02	2.0E+01		
Charcoal, activated	64365-11-3	2.5E+02	5.0E+01	3.0E+01		
Chloral	75-87-6	2.5E+02	5.0E+01	7.5E+00		
Chloral hydrate	302-17-0	1.3E+02	1.3E+02	2.5E+01		
Chloramben	133-90-4	5.0E+02	5.0E+02	1.0E+02		
Chloramine-T	127-65-1	2.5E+02	2.0E+00	2.5E-01		
Chlordane	57-74-9	1.0E+02	5.0E+01	1.5E+00	5.0E-01	1.2E-01
Health Effects	abdom pain , anuria , ataxia , blurred vision , carc , conf , convuls , cough , delirium , diarr , in animals: kidney damage , in animals: liver damage , in animals: lung damage , irrity , nau , tremor , vomit					
Target Organs	Liver					
Chlordecone	143-50-0	4.0E+01	6.0E-01	3.0E-03		
Health Effects	anxi , ataxia , carc , chest pain , head , kidney damage , liver damage , low sperm count , skin eryt , testicular atrophy , tremor , vis dist					
Chlorfenvinphos	470-90-6	1.0E+01	1.0E+01	6.0E+00		
Chlorflurazole	3615-21-2	1.3E+01	1.3E+01	7.5E+00		
Chloride	16887-00-6	1.5E+01	3.6E+00	1.5E+00		
Chlorinated diphenyl oxide	31242-93-0				5.0E-01	1.2E-01
Health Effects	acne-form derm , liver damage					
Target Organs	Liver					
Chlorine	7782-50-5	5.8E+01	5.8E+00	1.5E+00	1.5E+00	2.9E-01
Health Effects	burning mouth , burning nose , burning of eyes , choking , cough , derm , dizz , head , hypox , irrit Throat, irrit Nose, irrit Eyes, lac , liquid: frostbite , nau , pneu , pulm edema , rhin , subs pain , syncope , vomit					
Target Organs	Lungs, Whole body					
Chlorine dioxide	10049-04-4	6.6E+00	3.0E+00	4.1E-01	2.8E-01	9.4E-02
Health Effects	bron , chronic bron , cough , irrit eyes , irrit nose , irrit throat , pulm edema , wheez					
Target Organs	Circulatory system - unspecified, Eyes, Respiration - unspecified, Salivary glands, Skin, Whole body					
Chlorine pentafluoride	13637-63-3	4.3E+01	5.3E+00	1.6E+00	1.6E+00	
Chlorine trifluoride	7790-91-2	7.9E+01	7.6E+00	4.5E-01	4.5E-01	
Health Effects	eye burns (liq or high vap conc) , in animals: corn ulcer , in animals: lac , pulm edema , resp irrit , skin burns (liq or high vap conc)					
Target Organs	Eyes, Lungs, Nasal-pharynx, Salivary glands, Whole body					
Chlorite (sodium chlorite)	7758-19-2	7.5E+01	1.5E+01	2.5E+00		
Chlormephos	24934-91-6	3.5E+01	7.0E+00	4.0E+00		
Chlormequat chloride	999-81-5	7.5E+00	7.0E+00	1.0E+00		
Chloro-1,3-butadiene	126-99-8	1.0E+03	3.6E+01	3.6E+01	3.6E+01	1.2E+01
Health Effects	alopecia , anxi , carc , derm , irrit eyes , irrit resp sys , irrit skin , irrity , repro effects					
Target Organs	Liver, Nose, Reproductive - unspecified by gender					

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Chloro-1-butanol, 4-	928-51-8	4.0E+02	4.0E+01	5.0E+00		
Chloro-2,4-dinitrobenzene, 1-	97-00-7	3.5E+02	6.0E+01	1.0E+01		
Chloro-2-nitrophenol, 4-	89-64-5	4.0E+01	7.5E+00	1.3E+00		
Chloro-4-nitrophenol, 2-	619-08-9	4.0E+02	7.5E+01	1.0E+01		
Chloroacetaldehyde	107-20-0	3.2E+01	7.1E+00	4.2E+00	7.1E-01	
Health Effects	eye damage , irrit eyes , irrit muc memb , irrit skin , pulm edema , resp sys sens , skin burns , skin sens					
Chloroacetaldehyde	107-20-0	3.2E+01	7.1E+00	4.2E+00	7.1E-01	
Chloroacetaldehyde dimethyl acetal	97-97-2	5.0E+02	1.5E+02	2.5E+01		
Chloroacetic acid	79-11-8	7.5E+01	2.6E+01	6.0E+00	5.0E-01	1.7E-01
Chloroacetic acid, sodium salt	3926-62-3	4.0E+01	4.0E+01	7.1E+00		
Chloroacetone	78-95-5	4.9E+01	1.7E+01	2.0E+00		
Chloroacetonitrile	107-14-2	2.1E+02	9.9E+01	1.3E+01		
Chloroacetophenone, 2-	532-27-4				3.2E-01	1.1E-01
Health Effects	irrit eyes , irrit resp sys , irrit skin , pulm edema					
Target Organs	Nose					
Chloroacetyl chloride	79-04-9	2.4E+02	7.4E+00	1.8E-01	1.8E-01	7.9E-02
Health Effects	cough , dysp , eye burns , irrit eyes , irrit resp sys , irrit skin , lac , skin burns , wheez					
Target Organs	Lungs					
Chloroamphenicol	56-75-7	3.5E+02	7.5E+00	1.5E+00		
Chloroaniline, 4-	106-47-8	3.0E+02	1.0E+01	1.5E+00		
Chlorobenzene	108-90-7	1.8E+03	6.9E+02	4.6E+01	4.6E+01	1.1E+01
Health Effects	CNS depres , drow , in animals: kidney inj , in animals: liver inj , in animals: lung inj , inco , irrit eyes , irrit nose , irrit skin					
Target Organs	Kidneys, Liver					
Chlorobenzene sulfonic acid, p-	98-66-8	2.0E+02	4.0E+01	6.0E+00		
Chlorobenzilate	510-15-6	3.0E+02	3.0E+01	4.0E+00		
Chlorobenzotrifluoride, 2-	88-16-4	5.0E+02	1.3E+02	2.0E+01		
Chlorobenzylidene malononitrile, o-	2698-41-1	1.1E+01	5.0E-01	5.0E-02	5.0E-02	
Health Effects	blepharospasm , burn eyes , chest tight , conj , cough , eryt , eryt eyelids , head , irrit throat , lac , pain eyes , vesic skin					
Chlorobutane, 1-	109-69-3	3.0E+03	6.0E+02	7.5E+01		
Chlorobutane, 2-	78-86-4	1.3E+04	3.5E+01	5.0E+00		
Chlorocyclohexanol, trans-2-	6628-80-4	4.0E+02	7.5E+01	1.0E+01		
Chlorodecane, 1-	1002-69-3	7.5E+03	1.5E+03	1.0E+03		
Chlorodiethylaluminum	96-10-6	5.0E+02	2.0E+02	3.5E+01		
Chlorodifluoromethane	75-45-6	3.0E+04	3.0E+04	4.0E+03	3.5E+03	8.7E+02
Health Effects	asphy , card arrhy , conf , drow , heart palp , irrit resp sys , kidney inj , liquid: frostbite , liver inj , ringing in ears , spleen inj					
Target Organs	Adrenal glands, CVS - unspecified, Kidneys, Pituitary glands					
Chloroethanesulfonyl chloride, 2-	1622-32-8	1.5E+02	2.5E+01	3.5E+00		
Chloroethyl chloroformate	627-11-2	2.0E+01	2.0E+01	1.3E+01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Chloroethyl vinyl ether, 2-	110-75-8	1.0E+02	2.0E+01	3.5E+00		
Chloroethylchloromethylsulfide, 2-	2625-76-5	1.5E+00	1.0E-01	6.0E-02		
Chloroform	67-66-3	1.6E+04	3.1E+02	4.9E+01	4.9E+01	4.9E+00
Health Effects	anes , carc , conf , dizz , enlarged liver , head , irrit eyes , irrit skin , lass , mental dullness , nau					
Target Organs	Liver, Reproductive - unspecified by gender					
Chloroform-d	865-49-6	1.5E+04	3.0E+02	1.0E+01		
Chlorohydrin	96-24-2	6.0E+01	2.0E+00	3.0E-01		
Chloro-m-cresol, p-	59-50-7	5.0E+02	1.5E+02	2.0E+01		
Chloromethyl methyl ether	107-30-2	6.6E+00	1.5E+00	7.5E-01		
Health Effects	blood stained-sputum , bronchial secretions , carc , cough , irrit eyes , irrit muc memb , irrit skin , low weight , pneu , pulm congestion , pulm edema , skin burns , skin nec , wheez					
Target Organs	Lungs					
Chloromethyl(trichloro)silane	1558-25-4	2.5E+02	5.5E+01	4.5E+00	4.5E+00	
Chloronaphthalene, alpha-	90-13-1	5.0E+02	1.3E+02	2.0E+01		
Chloronaphthalene, beta-	91-58-7	5.0E+02	1.5E+02	6.0E-01		
Chloronitrobenzene, m-	121-73-3	1.5E+02	1.3E+00	2.0E-01		
Chloronitrobenzene, p-	100-00-5	1.0E+02	1.0E+02	1.9E+00	6.4E-01	1.6E-01
Health Effects	anemia , anoxia , bone marrow changes , carc , in animals: hema , kidney changes , methemo , repro effects , spleen changes , unpleasant taste					
Target Organs	Blood, Liver, Whole body					
Chloronitropropane	600-25-9				1.0E+01	3.5E+00
Health Effects	heart damage , in animals: irrit eyes , kidney damage , liver damage , pulm edema					
Target Organs	Liver, Lungs					
Chloropentafluoroethane	76-15-3	2.0E+06	3.0E+04	1.5E+04	6.3E+03	1.5E+03
Health Effects	card arrhy , card asphy , dizz , drow , heart palp , inco , liquid: derm , liquid: frostbite , narco , nau , vomit					
Target Organs	CVS - unspecified					
Chloroperoxybenzoic acid, 3-	937-14-4	3.5E+01	6.0E+00	1.0E+00		
Chlorophacinone	3691-35-8	1.0E+00	1.0E+00	6.0E-01		
Chlorophenol, 2-	95-57-8	2.0E+03	1.5E+02	2.5E+01		
Chlorophenol, 3-	108-43-0	2.5E+02	6.0E+00	7.5E-01		
Chlorophenol, 4-	106-48-9	4.0E+02	4.0E+02	4.0E+02		
Chlorophenyl phenyl ether, 4-	7005-72-3	2.5E-01	5.0E-02	7.5E-03		
Chlorophenyl thiourea, 2-	5344-82-1	4.6E+00	4.6E+00	2.5E+00		
Chloropicrin	76-06-2	9.4E+00	1.0E+00	3.4E-01	3.4E-01	2.3E-01
Health Effects	cough , irrit eyes , irrit resp sys , irrit skin , lac , nau , pulm edema , vomit					
Target Organs	Lungs					
Chloropicrin/methyl bromide mixture	8004-09-9	9.3E+00	1.0E+00	3.3E-01		
Chloroplatanic acid	16941-12-1	8.4E+00	1.5E+00	2.5E-01		
Chloropropane, 2-	75-29-6	5.0E+04	5.0E+04	5.0E+02		
Chloropropionic acid, 2-	598-78-7				4.4E-01	1.5E-01
Chloropropionitrile, 3-	542-76-7	4.0E+01	7.5E+00	4.0E+00		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Chloropropylene, 2-	557-98-2	1.0E+05	6.0E+04	1.0E+04		
Chloropropyl-n-octylsulfoxide, 3-	3569-57-1	5.0E+02	8.0E+00	5.0E+00		
Chlorosarin	1445-76-7	1.3E-01	4.0E-02	3.0E-03		
Chlorosoman	7040-57-5	2.5E+01	5.0E+00	7.5E-01		
Chlorostyrene, o-	2039-87-4				2.8E+02	6.9E+01
Health Effects	acidosis , enlarged liver , hema , in animals: irrit eyes , in animals: irrit skin , jaun , prot					
Target Organs	CNS - unspecified, Kidneys, Liver					
Chlorosulfonic acid	7790-94-5	2.5E+01	4.4E+00	4.8E-01	1.0E-01	
Chlorothalonil	1897-45-6	3.0E+01	3.0E+01	7.5E+00		
Chlorotoluene, o-	95-49-8	2.5E+03	2.5E+03	4.0E+02	2.6E+02	8.9E+01
Health Effects	anes , cough , derm , drow , inco , irrit eyes , irrit muc memb , irrit skin , kidney inj , liver inj					
Chlorotoluene, p-	106-43-4	4.0E+03	1.5E+03	2.0E+02		
Chlorotrifluoroethene, homopolymer	9002-83-9	5.0E+02	3.0E-01	4.0E-02		
Chlorotrifluoroethylene	79-38-9	2.0E+03	4.1E+02	7.6E+01	4.8E+01	
Chlorotrifluoromethane	75-72-9	1.0E+05	2.0E+04	1.3E+04		
Chloroxuron	1982-47-4	5.0E+02	1.0E+01	6.0E+00		
Chlorpyrifos	2921-88-2	2.0E+01	1.5E+01	6.0E-01	1.0E-01	2.4E-02
Health Effects	abdom cramps , bluish lips , bluish skin , blurred vision , diarr , lar spasm , miosis , nau , salv , vomit , wheez					
Chlorsulfuron	64902-72-3	5.0E+02	2.5E+00	3.5E-01		
Chlorthiophos	21923-23-9	7.8E+00	7.8E+00	1.0E+00		
Chromate	11104-59-9	1.7E+01	3.5E+00	5.0E-01	5.0E-02	1.7E-02
Chromic acetate	1066-30-4	1.1E+02	1.1E+01	6.6E+00		
Chromic acid	7738-94-5	3.4E+01	2.3E-01	1.1E-01		
Chromic acid ester	11115-74-5	1.8E+01	1.2E-01	5.9E-02		
Chromic chloride	10025-73-7	7.6E+01	1.0E+01	4.6E+00		
Chromic hydroxide	1308-14-1	5.0E+01	5.0E+01	7.5E+00		
Chromic sulfate	10101-53-8	9.4E+01	1.5E+01	2.5E+00		
Chromic trioxide	1333-82-0	2.9E+01	1.0E-02	9.6E-03		
Health Effects	carc , eosin , eye conj , eye inj , irrit resp sys , kidney damage , leucyt , leupen , liver damage , nasal septum perf , sens derm , skin ulcers					
Chromite	1308-31-2	5.0E+02	5.4E+00	3.2E+00		
Chromium (III) acetate hydroxide	39430-51-8	1.2E+02	1.3E+01	7.2E+00		
Chromium (III) nitrate	13548-38-4	1.1E+02	1.1E+01	6.9E+00		
Chromium carbonyl	13007-92-6	6.4E+01	4.2E+01	6.0E+00		
Chromium hydroxide	12626-43-6	4.4E+01	3.0E-01	4.0E-02		
Chromium nitrate	10103-47-6	2.4E+02	2.4E+01	1.4E+01		
Chromium nitrate nonahydrate	7789-02-8	1.9E+02	2.5E+01	1.2E+01		
Chromium oxide	1308-38-9	3.7E+01	3.7E+01	1.5E+01		
Chromium perchlorate, hydrated	13537-21-8	1.7E+02	1.7E+01	1.0E+01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Chromium potassium sulfate	7788-99-0	2.4E+02	4.0E+01	1.4E+01		
Chromium trichloride hexahydrate	10060-12-5	1.3E+02	1.3E+02	1.0E+02		
Chromium(III) fluoride	7788-97-8	5.2E+01	5.2E+00	3.1E+00		
Chromium(III) oxide hydroxide	20770-05-2	4.1E+01	7.5E+00	1.0E+00		
Chromium, elemental	7440-47-3	2.5E+02	2.5E+00	1.5E+00	1.0E-02	3.4E-03
Health Effects	irrit eyes , irrit skin , lung fib (histologic)					
Chromous chloride	10049-05-5	5.0E+02	7.5E+00	3.5E+00		
Chromyl chloride	14977-61-8				1.6E-01	3.9E-02
Health Effects	carc , eye burns , irrit eyes , irrit skin , irrit upper resp sys , skin burns					
Target Organs	Kidneys, Liver, Respiration - unspecified					
Chrysazin	117-10-2	2.0E+02	2.0E+02	7.5E+01		
Chrysene	218-01-9	8.0E+01	4.0E+00	6.0E-01		
Chrysotile asbestos	12001-29-5	2.5E+02	2.5E+02	5.0E-02		
Cinnamaldehyde	104-55-2	5.0E+02	3.0E+01	4.0E+00		
Cinnamic aldehyde, trans-	14371-10-9	1.5E+03	1.0E+01	1.5E+00		
Citric acid	77-92-9	5.0E+02	1.3E+02	1.5E+01		
Citric acid monohydrate	5949-29-1	1.5E+02	3.0E+01	4.0E+00		
Citric acid, trisodium salt, dihydrate	6132-04-3	5.0E+02	1.3E+02	2.0E+01		
Clopidol	2971-90-6				1.0E+01	3.4E+00
Health Effects	cough , irrit eyes , irrit nose , irrit skin , irrit throat					
Coal dust, anthracite	Coal dust a				4.0E-01	9.8E-02
Health Effects	chronic bron , decr pulm func , emphy					
Target Organs	Lungs					
Coal dust, bituminous	Coal dust b				9.0E-01	2.2E-01
Coal tar pitch volatiles (high	65996-93-2	8.0E+01	3.0E+01	6.0E-01	2.0E-01	4.9E-02
Health Effects	bron , carc , derm					
Coal tar, aerosol	0-311*	5.0E+02	7.5E+00	1.3E+00		
Cobalt	7440-48-4	2.0E+01	2.0E+00	3.0E-01	2.0E-02	4.9E-03
Health Effects	asthma , cough , decr pulm func , derm , diffuse nodular fib , dysp , low weight , resp hypersensitivity , wheez					
Target Organs	CVS - unspecified, Respiration - generic, Respiration - unspecified					
Cobalt (II) bromide	7789-43-7	1.5E+02	3.7E-01	2.2E-01		
Cobalt (II) chloride-hexahydrate	7791-13-1	3.5E+02	2.0E+01	2.4E-01		
Cobalt (II) oxide	1307-96-6	2.5E+01	2.0E+01	1.3E-01		
Cobalt acetate tetrahydrate	6147-53-1	3.0E+02	6.0E+01	7.5E+00		
Cobalt carbonyl	10210-68-1	6.0E+01	2.7E+01	2.7E-01	1.0E-01	2.4E-02
Health Effects	cough , decr pulm func , dysp , in animals: kidney inj , in animals: liver inj , irrit eyes , irrit muc memb , irrit skin , pulm edema , wheez					
Target Organs	Lungs					
Cobalt chloride	7646-79-9	5.0E+02	2.5E+01	1.3E-01		
Cobalt hydrocarbonyl	16842-03-8	3.0E+00	9.1E-01	3.0E-01	1.0E-01	2.4E-02
Health Effects	cough , decr pulm func , dysp , in animals: irrit resp sys , pulm edema					

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Target Organs Lungs						
Cobalt hydroxide	21041-93-0	7.5E-01	1.6E-01	9.5E-02		
Cobalt nitrate	10141-05-6	1.5E+02	1.5E+00	1.9E-01		
Cobalt nitrate hexahydrate	10026-22-9	3.0E+02	5.0E-01	3.0E-01		
Cobalt oxide	1308-06-1	2.7E+01	1.4E-01	1.4E-01		
Cobalt sulfate	10124-43-3	1.5E+02	6.0E+00	1.6E-01		
Cobalt sulfate heptahydrate	10026-24-1	2.5E+02	2.5E+02	2.9E-01		
Cobalt tetraphenylporphine	14172-90-8	2.5E+02	5.0E+01	3.0E+01		
Cobalt(ii) perchlorate, hexahydrate	13478-33-6	6.0E+01	6.2E-01	3.7E-01		
Cobalt(II) sulfate hydrate	60459-08-7	1.5E+00	3.0E-01	1.8E-01		
Cobalt,bis(3-	62207-76-5	1.5E+01	3.0E+00	4.0E-01		
Cobaltous carbonate hydrate	513-79-1	2.5E+02	2.0E-01	1.2E-01		
Colchicine	64-86-8	9.0E-01	9.0E-01	1.3E-01		
Colep	2665-30-7	8.0E+00	8.0E+00	5.0E+00		
Colophony	8050-09-7	4.0E+01	4.0E+01	3.0E-01		
Coper hydroxide	20427-59-2	1.5E+02	7.7E+00	4.6E+00		
Copper (I) chloride	7758-89-6	1.6E+02	7.8E+00	4.7E+00		
Copper (II) acatate monoydrate	6046-93-1	3.1E+02	6.0E+01	7.5E+00		
Copper (II) chloride dihydrate	10125-13-0	2.7E+02	1.3E+01	8.1E+00		
Copper (II) sulfate pentahydrate	7758-99-8	3.9E+02	1.5E+02	1.2E+01		
Copper carbonate hydroxide	12069-69-1	1.7E+02	8.7E+00	5.2E+00		
Copper chloride	7447-39-4	2.1E+02	1.1E+01	6.3E+00		
Copper compounds	Cu cmpds	1.0E+02	5.0E+00	3.0E+00		
Copper cyanide	544-92-3	2.5E+01	7.0E+00	4.2E+00		
Copper fume	Cu fume				2.0E-01	6.8E-02
Copper nitrate	3251-23-8	3.0E+02	6.0E+01	7.5E+00		
Copper oxide	1317-39-1	1.1E+02	1.5E+01	6.8E-01		
Copper sulfate	7758-98-7	2.5E+02	6.0E+00	2.5E+00		
Copper sulfide	22205-45-4	1.3E+02	6.3E+00	3.8E+00		
Copper(II) perchlorate, dihydrate	17031-32-2	4.7E+02	2.4E+01	1.4E+01		
Copper(II) sulfide	1317-40-4	1.5E+02	7.5E+00	4.5E+00		
Corn oil	8001-30-7	5.0E+02	5.0E+02	1.0E+02		
Coumaphos	56-72-4	1.3E+02	3.0E+01	1.5E-01	5.0E-02	1.2E-02
Coumarin	91-64-5	1.3E+02	6.0E-01	7.5E-02		
Coumatetralyl	5836-29-3	1.7E+01	1.7E+01	1.0E+01		
Creosote	8001-58-9	8.0E+01	8.0E+01	6.0E-01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Cresol, m-	108-39-4	1.0E+03	1.0E+02	2.0E+01	2.0E+01	6.8E+00
Health Effects	CNS effects: conf , CNS effects: depres , CNS effects: resp fail , derm , dysp , eye burns , irreg rapid resp , irrit eyes , irrit muc memb , irrit skin , kidney damage , liver damage , lung damage , pancreas damage , skin burns , weak pulse					
Target Organs	CNS - unspecified, Skin					
Cresol, o-	95-48-7	1.0E+03	1.0E+02	2.0E+01	2.0E+01	6.8E+00
Health Effects	CNS effects: conf , CNS effects: depres , CNS effects: resp fail , derm , dysp , eye burns , irreg rapid resp , irrit eyes , irrit muc memb , irrit skin , kidney damage , liver damage , lung damage , pancreas damage , skin burns , weak pulse					
Target Organs	CNS - unspecified, Skin					
Cresol, p-	106-44-5	1.0E+03	1.0E+02	2.0E+01	2.0E+01	6.8E+00
Health Effects	CNS effects: conf , CNS effects: depres , CNS effects: resp fail , derm , dysp , eye burns , irreg rapid resp , irrit eyes , irrit muc memb , irrit skin , kidney damage , liver damage , lung damage , pancreas damage , skin burns , weak pulse					
Target Organs	CNS - unspecified, Skin					
Cresyl violet acetate	10510-54-0	2.5E+02	5.0E+01	3.0E+01		
Crimidine	535-89-7	1.2E+00	1.2E+00	7.5E-01		
Cristobalite	14464-46-1	2.5E+01	2.5E+01	7.5E-02	2.5E-02	6.1E-03
Crocidolite	12001-28-4	2.5E+02	1.0E+01	5.0E-02		
Crotonaldehyde	4170-30-3	4.0E+01	1.3E+01	5.4E-01	5.4E-01	
Health Effects	in animals: dysp , in animals: irrit skin , in animals: pulm edema , irrit Respiration - unspecified, irrit Nose, irrit Eyes, irrit eyes , irrit resp sys , lac Eyes, pares Eyes					
Target Organs	Eyes, Lungs, Whole body					
Crotonaldehyde, trans-	123-73-9	4.0E+01	1.3E+01	5.4E-01	5.4E-01	
Health Effects	irrit Respiration - unspecified, irrit Nose, irrit Eyes, lac Eyes, pares Eyes					
Target Organs	Eyes, Lungs, Whole body					
Crotonic acid	3724-65-0	4.0E+02	7.5E+01	1.3E+01		
Crufomate	299-86-5				5.0E+00	1.2E+00
Health Effects	abdom cramps , anor , blurred vision , diarr , dysp , irrit eyes , irrit resp sys , irrit skin , lac , nau , sweat , wheez					
Crystal violet	548-62-9	1.5E+02	1.5E+00	2.5E-01		
Cs7SB	X-209*	5.0E+02	2.0E+02	3.0E+01		
Cube resins (other than Rotenone)	0-583*	1.3E+01	2.5E+00	3.5E-01		
Cumene	98-82-8	3.6E+03	1.5E+03	2.5E+02	2.5E+02	8.4E+01
Health Effects	coma , derm , head , irrit eyes , irrit muc memb , irrit skin , narco					
Target Organs	Adrenal glands, CNS - unspecified, Kidneys, Nose					
Cumene hydroperoxide	80-15-9	1.5E+02	1.5E+02	3.0E+01		
Cumenol methylcarbamate, m-	64-00-6	1.6E+01	1.6E+01	1.0E+01		
Cupferron	135-20-6	7.5E+01	7.5E+01	2.5E+01		
Cupric acetate	142-71-2	2.0E+02	1.4E+01	8.6E+00		
Cupric nitrate hemipentahydrate	19004-19-4	3.8E+02	1.9E+01	1.1E+01		
Cupric oxalate	814-91-5	2.4E+02	1.3E+01	7.3E+00		
Cupric oxide	1317-38-0	1.3E+02	1.3E+00	7.5E-01		
Health Effects	discoloration hair , discoloration skin , irrit eyes , irrit upper resp sys , metal fume fever: chills , metal fume fever: cough , metal fume fever: dry throat , metal fume fever: fever , metal fume fever: lass , metal fume					

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
fever: musc ache , metal fume f						
Cyanamide	420-04-2	3.5E+01	1.0E+01	6.0E+00	2.0E+00	6.8E-01
Health Effects	antabuse-like effects , eye burns , irrit eyes , irrit resp sys , irrit skin , lac , miosis , salv , skin burns , twitch					
Cyanic acid	420-05-3	3.5E+02	7.5E+01	4.0E+01		
Cyanide	57-12-5	2.5E+01	5.0E+00	5.0E+00		
Cyanoacetamide	107-91-5	5.0E+02	1.5E+02	2.0E+01		
Cyanogen	460-19-5	5.3E+01	1.8E+01	4.3E+00	2.1E+00	2.1E+00
Health Effects	bradycardia , cherry red lips , convuls , dizz , head , hypernea , irrit eyes , irrit nose , irrit upper resp sys , lac , liquid: frostbite , loss of appetite , low weight , tachypnea					
Cyanogen bromide	506-68-3	4.4E+01	4.4E+01	4.4E+01		
Cyanogen chloride	506-77-4	1.0E+01	1.0E+00	7.5E-01	7.5E-01	
Health Effects	conf , cough , delayed pulm edema , dizz , head , irreg heartbeat , irrit eyes , irrit skin (liquid) , irrit upper resp sys , lass , nau , vomit					
Target Organs	Lungs					
Cyanogen iodide	506-78-5	1.8E+02	1.8E+02	8.8E+01		
Cyanoguanidine	461-58-5	2.0E+02	1.0E+01	1.5E+00		
Cyanophos	2636-26-2	2.5E+01	2.5E+01	3.5E+00		
Cyanuric acid	108-80-5	5.0E+02	2.5E+01	1.0E+01		
Cyanuric fluoride	675-14-9	4.3E+01	1.7E-01	1.7E-01		
Cyclohexane	110-82-7	4.0E+03	4.0E+03	1.0E+03	3.4E+02	8.4E+01
Health Effects	coma , derm , drow , irrit eyes , irrit resp sys , irrit skin , narco					
Target Organs	CNS - unspecified, Developmental - generic					
Cyclohexane-1,2-dinitrilotetraacetic	13291-61-7	2.5E+02	5.0E+01	3.0E+01		
Cyclohexanedimethanol, cis and trans,	105-08-8	5.0E+02	2.5E+02	4.0E+01		
Cyclohexanol	108-93-0	1.5E+03	2.0E+02	2.0E+02	2.0E+02	7.0E+01
Health Effects	irrit eyes , irrit nose , irrit skin , irrit throat , narco					
Target Organs	CNS - unspecified					
Cyclohexanone	108-94-1	2.5E+03	2.0E+02	2.0E+02	7.7E+01	1.9E+01
Health Effects	coma , derm , head , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit muc memb , irrit skin , narco					
Target Organs	CNS - unspecified, Kidneys, Liver					
Cyclohexene	110-83-8	6.0E+03	1.5E+03	1.0E+03	1.0E+03	3.5E+02
Health Effects	drow , irrit eyes , irrit resp sys , irrit skin					
Cycloheximide	66-81-9	2.0E+00	2.0E+00	3.0E-01		
Cyclohexyl isocyanate	3173-53-3	5.1E-01	1.0E-01	6.0E-02		
Cyclohexyl methyl phosphonic acid	1932-60-1	2.5E+02	5.0E+01	3.0E+01		
Cyclohexylamine	108-91-8	1.2E+02	3.5E+01	7.3E+00	7.3E+00	7.3E+00
Health Effects	cough , diarr , dizz , drow , eye burns , irrit eyes , irrit muc memb , irrit resp sys , irrit skin , nau , pulm edema , skin burns , skin sens , vomit					
Target Organs	Eyes, Respiration - unspecified, Whole body					
Cyclohexylethanol, 2-	4442-79-9	4.0E+02	7.5E+01	1.0E+01		
Cycloocta-1,5-diene	111-78-4	4.0E+04	7.5E+03	1.3E+03		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Cyclooctane	292-64-8	2.5E+03	5.0E+02	6.0E+01		
Cyclooctatetraene, 1,3,5,7-	629-20-9	1.5E+06	1.0E+06	2.5E+05		
Cyclooctene, cis-	931-87-3	3.5E+02	6.0E+01	1.0E+01		
Cyclopentadiene	542-92-7				2.0E+02	6.9E+01
Health Effects	irrit eyes , irrit nose					
Cyclopentane	287-92-3	4.0E+04	1.0E+04	5.0E+03	1.7E+03	5.9E+02
Health Effects	cracking skin , dizz , dry skin , euph , inco , irrit eyes , irrit nose , irrit skin , irrit throat , nau , stupor , vomit					
Cyclopentanone	120-92-3	2.0E+03	1.5E+02	7.5E+01		
Cyclopropane	75-19-4	1.0E+05	6.0E+03	1.0E+03		
Cyhexatin	13121-70-5				5.0E+00	1.7E+00
Health Effects	abdom pain , cough , dizz , head , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit resp sys , irrit skin , pruritus , skin burns , sore throat , vomit					
Cytidylic acid	63-37-6	5.0E+02	1.5E+02	2.5E+01		
D&C Red No. 19	81-88-9	5.0E+01	7.5E+00	1.3E+00		
D&C red no. 9	5160-02-1	5.0E+02	2.5E+02	3.5E+01		
Dalapon	75-99-0				5.0E+00	1.7E+00
Health Effects	CNS depres , diarr , irrit eyes , irrit skin , irrit upper resp sys , lass , loss of appetite , skin burns , slowing of pulse , vomit					
DDD	72-54-8	5.0E+02	2.5E+02	3.5E+01		
DDE	72-55-9	4.0E+02	7.5E+01	1.3E+01		
DDT	50-29-3	5.0E+02	2.0E+00	1.0E+00	1.0E+00	2.4E-01
Health Effects	anxi , carc , conf , convuls , dizz , head , irrit eyes , irrit skin , lass , mal , pares face , pares lips , pares tongue , paresis hands , tremor , vomit					
Target Organs	Liver					
Decaborane	17702-41-9	1.5E+01	1.0E+01	7.5E-01	2.5E-01	6.1E-02
Health Effects	convuls , dizz , drow , head , in animals: dysp , in animals: lass , inco , kidney damage , lass , liver damage , local musc spasm , nau , tremor					
Target Organs	CNS - unspecified, Lungs					
Decahydronaphthalene	91-17-8	4.0E+02	5.0E+01	7.5E+00		
Decalin, cis-	493-01-6	4.0E+02	5.0E+01	7.5E+00		
Decalin, trans-	493-02-7	4.0E+02	5.0E+01	7.5E+00		
Decamethylcyclopentasiloxane	541-02-6	5.0E+02	3.5E+02	5.0E+01		
Decanal	112-31-2	1.5E+03	3.0E+02	4.0E+01		
Decane	124-18-5	2.5E+04	7.5E+00	1.0E+00		
Decanol, 1-	112-30-1	5.0E+02	7.5E+01	1.3E+01		
Decene, homopolymer, hydrogenated,	68037-01-4	2.5E+02	5.0E+01	3.0E+01		
Demeton	8065-48-3	1.0E+01	2.0E+00	1.5E-01	5.0E-02	1.2E-02
Health Effects	abdom cramps , aching eyes , anor , ataxia , card irreg , chest tight , coma , conf , convuls , cyan , diarr , dizz , head , irrit eyes , irrit skin , lar spasm , lass , local sweat , low BP , miosis , musc fasc , nau , para , rhin , salv , vomit , wheez					
Demeton-S-methyl	919-86-8	2.0E+02	5.0E+00	1.5E-01	5.0E-02	1.2E-02
Deoxyribonucleac acid	9007-49-2	5.0E+02	2.5E+02	3.5E+01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Deuterium	7782-39-0	6.0E+04	3.5E+04	1.0E+04		
Deuterium oxide	7789-20-0	1.5E+05	3.5E+04	5.0E+03		
Deuterochloric acid	7698-05-7	1.5E+02	3.5E+01	2.5E+00		
Dextran	9004-54-0	5.0E+02	6.0E+00	1.0E+00		
Dextran sulfate sodium	9011-18-1	5.0E+02	3.0E+02	4.0E+01		
D-Gluconic acid	526-95-4	2.5E+02	5.0E+01	3.0E+01		
D-Glucose, monohydrate	14431-43-7	2.5E+02	5.0E+01	3.0E+01		
Di(2-ethylhexyl)adipate	103-23-1	5.0E+02	5.0E+02	1.5E+02		
Di(ethylene glycol) diacrylate	4074-88-8	1.0E+02	2.0E+01	3.0E+00		
Diacetone alcohol	123-42-2	7.5E+03	2.4E+02	2.4E+02	2.4E+02	8.1E+01
Health Effects	corn damage , in animals: liver damage , in animals: narco damage , irrit eyes , irrit nose , irrit skin , irrit throat					
Diacetoxydibutyl stannane	1067-33-0	7.4E+01	7.5E+00	5.9E-01		
Diacetyl	431-03-8	4.0E+02	4.0E+02	6.0E+01		
Diacetyl peroxide	110-22-5	5.0E+02	1.5E+02	2.0E+01		
Dialifor	10311-84-9	5.0E+00	5.0E+00	3.0E+00		
Diallyl glycol carbonate	142-22-3	1.3E+02	6.0E+01	1.0E+01		
Diallyl phthalate	131-17-9	2.5E+02	2.5E+02	5.0E+01		
Diallyldimethylammonium chloride	7398-69-8	5.0E+02	5.0E+02	7.5E+01		
Diallylmethylammonium chloride	26062-79-3	5.0E+02	2.5E+02	3.5E+01		
Diaminodiphenylsulfone	80-08-0	4.0E+02	2.0E+01	3.0E+00		
Diaminodipropylamine, 3,3-	56-18-8	3.0E+02	6.0E+01	7.5E+00		
Diammonium citrate	3012-65-5	2.0E+02	4.0E+01	6.0E+00		
Diammonium phosphate	7783-28-0	2.5E+02	5.0E+01	3.0E+01		
Diammonium sulfide	12135-76-1	4.0E+01	4.0E+01	2.5E+01		
Diamond	7782-40-3	5.0E+02	1.5E+02	2.0E+01		
Dianisidine dihydrochloride	20325-40-0	7.5E+00	2.5E+00	3.5E-01		
Diatomaceous earth	61790-53-2	5.0E+02	3.0E+01	1.8E+01		
Diatomaceous silica, calcined	91053-39-3	5.0E+02	1.5E+00	9.0E-01		
Diatomite	68855-54-9	5.0E+02	1.5E+00	9.0E-01		
Diazabicyclo(2,2,2)octane, 1,4-	280-57-9	5.0E+02	2.0E+01	3.0E+00		
Diazinon	333-41-5				1.0E-02	2.4E-03
Health Effects	abdom cramps , blurred vision , conf , convuls , dizz , dysp , irrit eyes , lass , miosis , nau , salv , vomit					
Target Organs	Nervous system - unspecified					
Diazoacetic acid	623-73-4	1.5E+02	4.0E+00	6.0E-01		
Diazomethane	334-88-3	3.5E+00	3.5E+00	1.0E+00	3.4E-01	1.2E-01
Health Effects	asthma , chest pain , cough , fever , flush skin , head , irrit eyes , lass , liquid: frostbite , pneu , pulm edema , short breath					
Target Organs	Lungs					
Dibenz(a,h)anthracene	53-70-3	1.5E+01	1.5E-02	2.5E-03		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Dibenzo(a,e)pyrene	192-65-4	5.0E-01	1.0E-01	1.5E-02		
Dibenzofuran	132-64-9	2.5E+02	5.0E+01	3.0E+01		
Dibenzo-p-dioxin	262-12-4	5.0E+02	3.0E+01	4.0E+00		
Diborane	19287-45-7	4.2E+00	1.1E+00	1.5E-01	1.1E-01	2.8E-02
Health Effects	chest tight , chills , dizz , fever , head , hemorr , in animals: kidney damage , in animals: liver damage , lass , musc fasc , nau , nonproductive cough , precordial pain , pulm edema , short breath , tremor					
Target Organs	CNS - unspecified, Lungs					
Dibromo-3-chloropropane, 1,2-	96-12-8	1.5E+02	5.0E+00	7.5E-01		
Health Effects	carc , drow , irrit eyes , irrit nose , irrit skin , irrit throat , kidney inj , liver inj , nau , pulm edema , sterility , vomit					
Target Organs	Nasal - pharynx, Reproductive - unspecified by gender, Testes					
Dibromo-4-nitrophenol, 2,6-	99-28-5	5.0E+01	1.0E+01	1.3E+00		
Dibromochloromethane	124-48-1	1.5E+02	4.0E+01	6.0E+00		
Dibromoethane, 1,2-	106-93-4	3.5E+02	1.8E+02	1.3E+02	3.5E+01	
Health Effects	carc , derm with vesic , heart damage , irrit eyes , irrit resp sys , irrit skin , kidney damage , liver damage , repro effects , spleen damage					
Target Organs	Kidneys, Liver, Nasal - pharynx, Nose, Sperm					
Dibromomethane	74-95-3	7.5E+03	1.5E+03	2.0E+02		
Dibromo-phenol, 2,6-	608-33-3	2.5E+00	2.5E+00	5.0E-01		
Dibromopropane, 1,3-	109-64-8	2.0E+02	4.0E+01	6.0E+00		
Dibromotetrafluoroethane	124-73-2	1.5E+05	3.5E+04	5.0E+03		
Dibutyl butylphosphonate	78-46-6	5.0E+01	1.0E+01	1.3E+00		
Dibutyl ether	142-96-1	2.0E+03	1.0E+02	1.5E+01		
Dibutyl peroxide, tert-	110-05-4	2.5E+03	1.5E+02	2.0E+01		
Dibutyl phenyl phosphate	2528-36-1				3.5E+00	1.2E+00
Dibutyl phosphate	107-66-4	2.5E+02	5.0E+01	1.5E+01	5.0E+00	1.7E+00
Health Effects	head , irrit eyes , irrit resp sys , irrit skin					
Dibutyl phosphite	1809-19-4	5.0E+02	4.0E+02	6.0E+01		
Dibutyl phthalate	84-74-2	5.0E+02	7.5E+01	1.5E+01	5.0E+00	1.7E+00
Health Effects	irrit eyes , irrit stomach , irrit upper resp sys					
Target Organs	Reproductive - unspecified by gender					
Dibutylboron triflate	60669-69-4	5.0E+02	6.0E+01	3.6E+01		
Dibutylethanolamine	102-81-8				3.5E+00	1.2E+00
Health Effects	corn nec , derm , in animals: irrit eyes , in animals: irrit nose , in animals: irrit skin , low weight , skin nec					
Dibutylhexamethylenediamine, N,N'-	4835-11-4	7.5E+01	2.2E+01	3.0E+00		
DIC hydrochloride	4261-68-1	1.3E+00	2.5E-01	3.5E-02		
Dichloran	99-30-9	5.0E+02	7.5E-02	1.3E-02		
Dichloro-1-nitroethane	594-72-9				1.2E+01	4.0E+00
Health Effects	in animals: pulm edema , in animals: heart damage , in animals: hemorr , in animals: irrit eyes , in animals: irrit skin , in animals: kidney damage , in animals: liver damage					
Dichloro-2-butene, 1,4-	764-41-0	7.5E+02	1.3E+01	7.5E-02	2.6E-02	8.8E-03

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Dichloro-2-propanol, 1,3-	96-23-1	2.5E+02	2.5E+02	1.0E+02		
Dichloro-5,5-dimethylhydantoin	118-52-5				2.0E-01	6.8E-02
Health Effects	irrit eyes , irrit muc memb , irrit resp sys					
Dichloroacetic acid	79-43-6	1.3E+03	4.0E+02	5.0E+01	2.6E+00	6.5E-01
Dichloroacetyl chloride	79-36-7	3.1E+02	9.6E+00	2.4E-01	2.4E-01	
Dichloroacetylene	7572-29-4	1.5E+02	4.0E+01	6.0E+00		
Health Effects	cranial nerve palsy , head , in animals: low-weight , in animals: brain inj , in animals: carc , in animals: kidney inj , in animals: liver inj , intense jaw pain , loss of appetite , nau , vomit					
Target Organs	GI tract - unspecified					
Dichloroamine	3400-09-7	1.0E+02	2.0E+01	3.0E+00		
Dichlorobenzene, 1,2-	95-50-1	1.3E+03	3.0E+02	3.0E+02	1.5E+02	5.1E+01
Health Effects	irrit eyes , irrit nose , kidney damage , liver damage , skin blisters					
Target Organs	Liver					
Dichlorobenzene, 1,3-	541-73-1	4.0E+02	7.5E+01	1.3E+01		
Dichlorobenzene, 1,4-	106-46-7	7.5E+02	1.5E+02	6.0E+01	6.0E+01	8.2E+00
Health Effects	anor , cirr , head , in animals: carc , in animals: kidney inj , in animals: liver inj , irrit eyes , jaun , low weight , nau , profuse rhinitis , swell periorb , vomit					
Target Organs	Eyes, Kidneys, Liver, Respiration - unspecified					
Dichlorobenzidine, 3,3'-	91-94-1	2.0E+03	4.0E+01	6.0E+00		
Health Effects	carc , caustic burns , dizz , dysuria , frequent urination , GI upset , head , hema , skin derm , skin sens , upper resp infection					
Target Organs	Skin					
Dichlorobutene-2, trans-1,4-	110-57-6	4.0E+01	4.0E+00	6.0E-01		
Dichlorocyclohexane, 1,1-	2108-92-1	1.5E+02	3.5E+01	4.0E+00		
Dichlorocyclohexane, trans-1,2-	822-86-6	3.0E+01	6.0E+00	7.5E-01		
Dichlorodifluoromethane	75-71-8	7.5E+04	5.0E+04	1.5E+04	4.9E+03	1.5E+03
Health Effects	asphy , card arrest , card arrhy , dizz , liquid: frostbite , tremor , uncon					
Target Organs	CVS - unspecified					
Dichloroethane, 1,1-	75-34-3	1.3E+04	1.3E+04	1.3E+03	4.0E+02	1.4E+02
Health Effects	CNS depres , irrit skin , kidney damage , liver damage , lung damage					
Target Organs	Kidneys, Liver					
Dichloroethane, 1,2-	107-06-2	1.2E+03	8.1E+02	2.0E+02	4.0E+01	9.9E+00
Health Effects	carc , CNS depres , corn opac , CVS damage , derm , irrit eyes , kidney damage , liver damage , nau , vomit					
Target Organs	Liver					
Dichloroethanol acetate, 1,2-	10140-87-1	4.0E+01	1.0E+01	6.0E+00		
Dichloroethylaluminum	563-43-9	1.0E+01	6.0E+00	6.0E+00		
Dichloroethylbenzene	1331-29-9	5.0E+02	5.0E+02	6.0E+01		
Dichloroethylene, 1,1-	75-35-4	4.0E+03	2.0E+03	2.5E+02	2.0E+01	5.9E-01
Health Effects	carc , dizz , dysp , head , irrit eyes , irrit skin , irrit throat , kidney dist , liver dist , nau , pneu					
Target Organs	CNS - unspecified, Kidneys, Liver					
Dichloroethylene, 1,2-	540-59-0	4.0E+03	4.0E+03	2.5E+03	7.9E+02	1.9E+02
Health Effects	CNS depres , irrit eyes , irrit resp sys					
Target Organs	Liver					

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Dichloroethylene, cis-1,2-	156-59-2	3.4E+03	2.0E+03	5.6E+02	5.6E+02	1.9E+02
Dichloroethylene, trans-	156-60-5	6.7E+03	4.0E+03	1.1E+03	1.1E+03	5.4E-01
Dichlorofluoromethane	75-43-4	2.0E+04	4.0E+02	1.3E+02	4.2E+01	4.2E+00
Health Effects	asphy , card arrest , card arrhy , liquid: frostbite					
Target Organs	Liver					
Dichlorohexane, 1,2-	2162-92-7	2.0E+02	4.0E+01	5.0E+00		
Dichlorohexane, 1,6-	2163-00-0	5.0E+02	3.5E+02	5.0E+01		
Dichloromethane-D2	1665-00-5	2.5E+04	2.0E+03	6.0E+02		
Dichloromethylphenylsilane	149-74-6	2.0E+01	2.0E+01	3.0E+00		
Dichlorooctane, 1,8-	2162-99-4	5.0E+02	2.0E+02	3.0E+01		
Dichlorophen	97-23-4	5.0E+02	1.3E+02	1.5E+01		
Dichlorophenol, 2,4-	120-83-2	1.3E+02	1.3E+01	1.3E+00		
Dichlorophenol, 2,6-	87-65-0	1.5E+02	3.5E+01	5.0E+00		
Dichlorophenoxy acetic acid, 2,4-	94-75-7	1.0E+02	4.0E+01	1.0E+01	1.0E+01	3.4E+00
Health Effects	convuls , derm , hyporeflexia , in animals: kidney inj , in animals: liver inj , lass , musc twitch , stupor					
Dichloropropane	26638-19-7	1.5E+03	1.5E+03	1.3E+03		
Dichloropropane, 1,1-	78-99-9	2.0E+03	4.0E+02	5.0E+01		
Dichloropropane, 1,2-	78-87-5	1.5E+03	1.5E+03	1.3E+03	4.6E+01	1.6E-01
Health Effects	carc , dizz , drow , in animals: CNS depres , irrit eyes , irrit resp sys , irrit skin , kidney damage , liver damage					
Target Organs	Nasal - pharynx, Nose, Respiration - unspecified					
Dichloropropane, 1,3-	142-28-9	1.5E+03	5.0E+02	7.5E+01		
Dichloropropane, 2,2-	594-20-7	2.0E+03	4.0E+02	6.0E+01		
Dichloropropene, 1,1-	563-58-6	7.5E+02	2.0E+01	1.3E+01		
Dichloropropene, 1,2-	563-54-2	7.5E+02	1.5E+02	2.5E+01		
Dichloropropene, 1,3-	542-75-6	2.0E+03	6.0E+02	1.0E+02	4.5E+00	1.6E+00
Health Effects	carc , dizz , eye burns , head , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit resp sys , irrit skin , lac , liver damage , skin burns					
Target Organs	Bronchi, Kidneys, Liver, Lungs, Nasal - pharynx, Nose, Respiration - unspecified					
Dichloropropene, 2,3-	78-88-6	4.0E+02	2.0E+01	3.0E+00		6.2E-03
Dichloropropene, cis-1,2-	6923-20-2	7.5E+02	1.5E+02	2.5E+01		
Dichloropropene, cis-1,3-	10061-01-5	2.0E+01	4.0E+00	6.0E-01		
Dichloropropene, trans-1,3-	10061-02-6	7.5E+02	6.0E+02	7.5E+01		
Dichlorosilane	4109-96-0	2.1E+02	4.5E+01	3.7E+00	3.7E+00	
Dichlorotetrafluoroethane	76-14-2	1.0E+05	1.0E+05	2.0E+04	7.0E+03	8.7E+02
Health Effects	asphy , card arrest , card arrhy , irrit resp sys , liquid: frostbite					
Target Organs	CVS - unspecified					
Dichlorotetrafluoroethane (MEG)	1320-37-2	5.0E+05	5.0E+05	2.0E+05		
Dichlorvos	62-73-7	7.2E+01	5.1E+00	9.9E-01	9.9E-01	1.2E-02
Health Effects	aching eyes , anor , ataxia , card irreg , chest tight , convuls , cyan , diarr , dizz , head , irrit eyes , irrit skin , lar spasm , low BP , miosis , musc fasc , nau , para , rhin , salv , sweat , vomit , wheez					
Target Organs	Brain, Nervous system - unspecified					

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Dicyclohexano-18-crown-6	16069-36-6	7.5E+01	4.0E+00	6.0E-01		
Dicyclohexyl	92-51-3	5.0E+02	1.5E+02	2.5E+01		
Dicyclohexylcarbodiimide	538-75-0	1.0E+02	6.0E-02	1.0E-02		
Dicyclopentadiene	77-73-6	4.1E+02	2.7E+01	5.4E-02	5.4E-02	1.4E-02
Health Effects	cough , head , in animals: kidney damage , in animals: lung damage , inco , irrit eyes , irrit nose , irrit skin , irrit throat , skin blisters , sneez					
Target Organs	Liver					
Dicyclopentadienyl iron	102-54-5				1.0E+01	3.4E+00
Health Effects	in animals: liver changes , in animals: RBC changes , in animals: testicular changes , possible irrit eyes , possible irrit resp sys , possible irrit skin					
Target Organs	Blood, Liver					
Didecyl dimethyl ammonium chloride	7173-51-5	3.5E+01	3.5E+01	5.0E+00		
Dieldrin	60-57-1	5.0E+01	2.5E+01	7.5E-01	1.0E-01	2.4E-02
Health Effects	carc , clonic convuls , coma , dizz , head , in animals: kidney damage , in animals: liver damage , mal , myoclonic limb jerks , nau , sweat , tonic convuls , vomit					
Target Organs	CNS - unspecified, Liver					
Diesel fuel marine	77650-28-3	5.0E+02	5.0E+02	3.5E+02	1.0E+02	3.4E+01
Diesel fuels	68334-30-5	5.0E+02	5.0E+02	2.5E+02	1.0E+02	3.4E+01
Diethanolamine	111-42-2	3.0E+02	3.0E+02	1.5E+02	1.0E+00	2.4E-01
Health Effects	corn nec , cough , eye burns , irrit eyes , irrit nose , irrit skin , irrit throat , lac , skin burns , sneez					
Target Organs	Blood, Kidneys, Liver					
Diethanollauramide	120-40-1	1.0E+03	1.0E+00	1.3E-01		
Diethenylethylbenzene, polymer with	69011-20-7	2.5E+02	5.0E+01	3.0E+01		
Diethoxydimethylsilane	78-62-6	3.0E+03	6.0E+02	7.5E+01		
Diethyl (methylthiomethyl) phosphonate	28460-01-7	4.0E+01	7.5E+00	1.3E+00		
Diethyl (trichloromethyl)phosphonate	866-23-9	3.0E+02	6.0E+01	7.5E+00		
Diethyl benzene isomers	25340-17-4	2.7E+03	5.5E+02	5.5E+01		
Diethyl carbonate	105-58-8	1.5E+03	3.0E+02	4.0E+01		
Diethyl chlorophosphate	814-49-3	8.0E+00	8.0E+00	5.0E+00		
Diethyl ethylphosphonate	78-38-6	5.0E+02	4.0E+01	6.0E+00		
Diethyl ketone	96-22-0	3.0E+03	1.0E+03	1.0E+03	7.0E+02	2.4E+02
Health Effects	cough , irrit eyes , irrit muc memb , irrit resp sys , irrit skin , sneez					
Diethyl malonate	105-53-3	6.0E+03	1.3E+03	1.5E+02		
Diethyl mercury	627-44-1	2.6E+00	5.2E-02	3.9E-02		
Diethyl methylphosphonate	683-08-9	5.0E+02	2.0E+02	2.5E+01		
Diethyl oxalate	95-92-1	1.5E+02	3.5E+01	5.0E+00		
Diethyl phosphite	762-04-9	5.0E+02	3.5E+02	5.0E+01		
Diethyl phthalate	84-66-2	5.0E+02	1.0E+02	1.5E+01	5.0E+00	1.7E+00
Health Effects	dizz , head , in animals: repro effects , irrit eyes , irrit nose , irrit skin , irrit throat , lac , lass in arms & legs , nau , numb in arms & legs , pain in arms & legs , possible polyneur dysfunc , possible vestibular dist , spasms in arms & legs					
Diethyl pyrocarbonate	1609-47-8	5.0E+02	2.0E+02	3.0E+01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Diethyl succinate	123-25-1	3.5E+03	7.5E+02	1.0E+02		
Diethyl sulfate	64-67-5	1.5E+02	1.0E+01	1.3E+00		
Diethyl tartrate	87-91-2	2.5E+02	5.0E+01	3.0E+01		
Diethyl telluride	627-54-3	1.0E+01	6.0E+00	3.0E-01		
Diethylamine	109-89-7	6.0E+02	2.0E+02	4.0E+01	1.5E+01	5.1E+00
Health Effects	in animals: myocardial degeneration , irrit eyes , irrit resp sys , irrit skin , myocardial degeneration					
Diethylaminoacetone	1620-14-0	2.5E+02	5.0E+01	7.5E+00		
Diethylaminoethanol, 2-	100-37-8	5.0E+02	1.0E+02	5.0E+01	9.6E+00	3.3E+00
Health Effects	irrit eyes , irrit resp sys , irrit skin , nau , vomit					
Target Organs	CNS - unspecified					
Diethylaminopropylamine	104-78-9	2.5E+02	5.0E+01	6.0E+00		
Diethylaniline, N,N-	91-66-7	5.0E+02	1.5E+02	2.0E+01		
Diethylbenzene, m-	141-93-5	5.0E+02	5.0E+02	1.3E+02		
Diethylbenzene, o-	135-01-3	5.0E+02	3.5E+01	5.0E+00		
Diethyldichlorosilane	1719-53-5	6.4E+02	1.4E+02	1.2E+01	5.8E+00	
Diethylene glycol	111-46-6	7.5E+02	7.5E+02	2.0E+02		
Diethylene glycol diacetate	628-68-2	5.0E+02	5.0E+02	3.0E+02		
Diethylene glycol dibutyl ether	112-73-2	1.5E+03	1.0E+03	1.5E+02		
Diethylene glycol diethyl ether	112-36-7	5.0E+02	5.0E+02	2.5E+02		
Diethylene glycol dimethyl ether	111-96-6	2.0E+03	2.0E+03	7.5E+01		
Diethylene glycol hexyl ether	112-59-4	5.0E+02	1.5E+02	2.5E+01		
Diethylene glycol methyl ether	111-77-3	1.0E+02	1.0E+02	2.0E+01		
Diethylene glycol monobutyl ether	112-34-5	2.5E+03	6.0E+02	1.0E+02		
Diethylene glycol monoethyl ether	111-90-0	2.0E+03	1.0E+03	1.5E+02		
Diethylene triamine	111-40-0	7.5E+00	6.0E+00	4.2E+00	4.2E+00	1.4E+00
Health Effects	cough , derm , dysp , eye nec , irrit eyes , irrit muc memb , irrit skin , irrit upper resp sys , pulm sens , skin nec , skin sens					
Diethylenetriaminepentaacetic acid	67-43-6	2.5E+02	5.0E+01	7.5E+00		
Diethylphosphatoethyltriethoxy silane	757-44-8	5.0E+02	5.0E+02	2.0E+02		
Diethylstilbestrol	56-53-1	1.5E+01	6.0E-01	7.5E-02		
Diethylthiourea, N,N'-	105-55-5	1.3E+02	1.3E+01	1.5E+00		
Diethylurea, 1,3-	623-76-7	2.5E+03	5.0E+02	7.5E+01		
Diethylzinc	557-20-0	5.0E+01	1.0E+01	1.5E+00		
Difluorodibromomethane	75-61-6				8.6E+02	2.9E+02
Health Effects	CNS symptoms , in animals: irrit resp sys , liver damage					
Target Organs	CNS - unspecified, Liver					
Difluoroethane, 1,1-	75-37-6	6.8E+04	4.1E+04	2.7E+04		
Difluoromethane	75-10-5	7.5E+05	1.0E+05	6.0E+03		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Difluorotetrachloroethane, 1,2-	76-12-0	1.5E+04	1.5E+04	1.3E+03	4.2E+02	1.0E+02
Health Effects	in animals: narco , in animals: conj , in animals: irrit eyes , in animals: irrit skin , in animals: pulm edema					
Difluorotetrachloroethane, 2,2-	76-11-9				8.3E+02	2.0E+02
Health Effects	CNS depres , drow , dysp , irrit eyes , irrit skin , pulm edema					
Digitoxin	71-63-6	2.5E-01	1.8E-01	2.5E-02		
Diglycidyl ether	2238-07-5	5.0E+01	5.0E+01	5.0E+01	5.3E-02	1.8E-02
Health Effects	carc , in animals: hemato sys effects , in animals: kidney damage , in animals: liver damage , in animals: lung damage , irrit eyes , irrit resp sys , irrit skin , repro effects , skin burns					
Diglycolamine	929-06-6	5.0E+02	2.5E+02	3.5E+01		
Digoxin	20830-75-5	3.5E-01	2.0E-01	1.3E-01		
Dihydro-2h-pyran, 3,4-	110-87-2	1.5E+02	3.0E+01	4.0E+00		
Dihydro-3-(Nonenyl)-2,5-furandione	28928-97-4	2.5E+02	5.0E+01	3.0E+01		
Dihydro-3-(tetrapropenyl)furan-2,5-	26544-38-7	5.0E+02	2.0E+02	3.0E+01		
Dihydro-4-methyl furan, 2,3-	34314-83-5	1.5E+02	3.5E+01	5.0E+00		
Dihydroxy-1,3-indandione, 2,2-	485-47-2	3.5E+01	6.0E+00	1.0E+00		
Dihydroxy-2-butene, 1,4-	110-64-5	5.0E+02	1.0E+02	1.5E+01		
Dihydroxybenzoic acid, 2,4-	89-86-1	3.5E+02	2.0E+01	3.0E+00		
Dihydroxynaphthalene-2,7-disulfonic	5808-22-0	2.5E+02	5.0E+01	3.0E+01		
Diiodomethane	75-11-6	5.0E+02	5.0E+02	2.0E+02		
Diisoamylamine	544-00-3	7.5E+02	1.5E+02	1.0E+02		
Diisobutyl ketone	108-83-8	3.0E+03	3.0E+02	3.0E+02	1.5E+02	5.0E+01
Health Effects	derm , dizz , head , irrit eyes , irrit nose , irrit skin , irrit throat , kidney damage , liver damage					
Di-isobutylaluminum hydride	1191-15-7	5.0E+03	5.0E+01	3.0E+01		
Diisobutylamine	110-96-3	1.0E+02	2.0E+01	3.0E+00		
Diisooctyl phosphate	27215-10-7	5.0E+02	1.5E+02	2.5E+01		
Diisopropyl ether	108-20-3	6.0E+03	1.3E+03	1.3E+03	1.0E+03	3.6E+02
Health Effects	derm , in animals: dizz , in animals: drow , in animals: narco , in animals: uncon , irrit eyes , irrit nose , irrit skin , resp discomfort					
Target Organs	Liver					
Diisopropyl methylphosphonate	1445-75-6	3.5E+02	4.0E+01	6.0E+00		
Diisopropyl peroxydicabonate	105-64-6	5.0E+02	1.5E+02	2.5E+01		
Diisopropylamine	108-18-9	7.5E+02	3.0E+02	4.0E+01	2.1E+01	7.1E+00
Health Effects	head , irrit eyes , irrit resp sys , irrit skin , nau , vis dist , vomit					
Target Organs	Eyes					
Diisopropylaminoethanol, 2-	96-80-0	2.5E+02	5.0E+01	7.5E+00		
Diisopropylbenzene, 1,4-	100-18-5	5.0E+02	1.5E+02	2.0E+01		
Diisopropylethylamine, n,n-	7087-68-5	1.0E+03	2.0E+02	3.0E+01		
Diisopropylfluorophosphate	55-91-4	3.6E+00	3.6E+00	2.0E+00		
Diispropylbenzene	25321-09-9	5.0E+02	1.0E+02	1.5E+01		
Diketene	674-82-8	6.2E+01	2.1E+01	3.4E+00		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Dilauroyl peroxide	105-74-8	3.5E-01	6.0E-02	1.0E-02		
Dimefox	115-26-4	1.0E+00	1.0E+00	6.0E-01		
Dimethicone	9016-00-6	5.0E+02	1.5E+02	2.5E+01		
Dimethoate	60-51-5	3.0E+01	3.0E+01	1.5E+01		
Dimethoxybenzene, 1,3-	151-10-0	4.0E+02	7.5E+01	1.0E+01		
Dimethoxybenzene, O-	91-16-7	4.0E+02	7.5E+01	1.0E+01		
Dimethoxybenzidine, 3,3'-	119-90-4	4.0E+02	2.5E+01	4.0E+00		
Health Effects	in animals: carc , in animals: kidney damage , in animals: liver damage , in animals: spleen changes , in animals: thyroid changes , irrit skin					
Dimethoxybutane, 2,2-	3453-99-4	4.0E+03	7.5E+02	1.0E+02		
Dimethoxydiphenylsilane	6843-66-9	1.5E+01	3.5E+00	5.0E-01		
Dimethoxyethane, 1,2-	110-71-4	4.0E+03	3.0E+02	4.0E+01		
Dimethyl acetamide, N, N-	127-19-5	1.0E+03	1.0E+03	2.5E+02	3.6E+01	8.7E+00
Health Effects	delusions , depres , drow , halu , irrit skin , jaun , liver damage					
Target Organs	Liver, Reproductive - unspecified by gender					
Dimethyl butane, 2,2-	75-83-2	7.5E+03	1.5E+03	1.5E+03		
Dimethyl carbamoly chloride	79-44-7	5.0E+02	1.0E+01	6.0E-02	2.2E-02	7.5E-03
Health Effects	carc , cough , dysp , eye burns , head , irrit eyes , irrit nose , irrit resp sys , irrit skin , irrit throat , larnygitis , liver inj , nau , skin burns , vomit , wheez					
Dimethyl carbonate	616-38-6	5.0E+03	1.0E+03	1.5E+02		
Dimethyl cyclopentanol, 1,3-	19550-46-0	2.5E+02	5.0E+01	3.0E+01		
Dimethyl dichlorosilane	75-78-5	2.8E+02	6.9E+01	4.8E+00	4.8E+00	
Dimethyl disulfide	624-92-0	9.6E+02	1.9E+02	3.9E-02	3.9E-02	
Dimethyl glyoxime	95-45-4	2.0E+02	4.0E+01	6.0E+00		
Dimethyl hydrogen phosphite	868-85-9	6.8E+02	4.3E+02	6.0E+01		
Dimethyl mercury	593-74-8	2.3E+00	4.6E-02	3.5E-02		
Dimethyl methylphosphonate	756-79-6	5.0E+02	5.0E+02	3.5E+02		
Dimethyl phosphorochloridothioate	2524-03-0	1.5E+02	3.2E+01	4.0E+00		
Dimethyl phthalate	131-11-3	5.0E+02	7.5E+01	1.5E+01	5.0E+00	1.7E+00
Health Effects	irrit eyes , irrit upper resp sys , stomach pain					
Dimethyl succinate	106-65-0	2.0E+03	4.0E+02	6.0E+01		
Dimethyl sulfate	77-78-1	8.3E+00	6.2E-01	1.2E-01	4.5E-02	4.5E-02
Health Effects	analgesia , aphonia , carc , chest pain , conj , cyan , delirium , diarr , dizz , dysp , dysphagia , dysphonia , dysuria , eye burns , fever , head , hema , irrit eyes , irrit nose , periorb edema , photo , productive cough , prot , skin burns , vomit					
Dimethyl sulfide	75-18-3	1.3E+04	2.5E+03	1.3E+00	1.3E+00	1.3E+00
Dimethyl sulfone	67-71-0	5.0E+02	4.0E+02	6.0E+01		
Dimethyl sulfoxide	67-68-5	6.0E+03	7.5E+02	7.5E+02		
Dimethyl(polysiloxane)	70131-67-8	5.0E+02	5.0E+02	5.0E+02		
Dimethyl-1,3-dioxolane-4-methanol,	100-79-8	3.0E+03	6.0E+02	7.5E+01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Dimethyl-2-pentene, (E)-3,4-	4914-92-5	1.5E+02	3.5E+01	5.0E+00		
Dimethyl-3-nitrobenzene, 1,2-	83-41-0	2.5E+02	5.0E+01	3.0E+01		
Dimethyl-3-pentanone, 2,4-	565-80-0	4.0E+03	5.0E+02	7.5E+01		
Dimethylacrylamide, N,N-	2680-03-7	2.0E+02	1.3E+01	1.5E+00		
Dimethylamine	124-40-3	4.6E+02	1.2E+02	1.8E+01	1.8E+01	3.2E+00
Health Effects	conj , cough , derm , dysp , irrit nose , irrit throat , liquid: frostbite , pulm edema , sneez					
Dimethylaminoazobenzene, 4-	60-11-7	7.5E+01	7.5E+01	5.0E+01		
Health Effects	bloody sputum , bronchial secretions , carc , contact derm , cough , dysp , dysuria , enlarged liver , frequent urination , hema , kidney dist , liver dist , wheez					
Dimethylaminobenzaldehyde, p-	100-10-7	2.5E+02	1.5E+02	2.5E+01		
Dimethylaminoethanol, 2-	108-01-0	6.0E+02	6.0E+02	1.3E+02		
Dimethylammonium-dimethylcarbamate	4137-10-4	1.5E+02	3.5E+01	5.0E+00		
Dimethylaniline, N,N-	121-69-7	5.0E+02	5.0E+01	5.0E+01	2.5E+01	6.1E+00
Health Effects	anoxia symptoms: ataxia , anoxia symptoms: cyan , anoxia symptoms: dizz , anoxia symptoms: lass , anoxia symptoms: methemo					
Dimethylbenzidine, 3,3'-	119-93-7	1.0E+02	1.7E+01	1.7E+01	1.7E+01	4.2E+00
Health Effects	carc , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit nose					
Target Organs	Blood, Kidneys, Liver					
Dimethylchlorosilane	1066-35-9	3.9E+02	8.5E+01	7.0E+00	7.0E+00	
Dimethylcyclohexane, cis-1,4-	624-29-3	3.5E+02	6.0E+01	1.0E+01		
Dimethyldecane, 2,2-	17302-37-3	7.5E+03	1.5E+03	3.5E+02		
Dimethyldicyclopentadiene	26472-00-4	5.0E+02	2.0E+02	2.5E+01		
Dimethyldimethoxysilane	1112-39-6	5.0E+02	4.0E+02	6.0E+01		
Dimethylethoxysilane	14857-34-2				2.1E+00	7.3E-01
Dimethylethyl hydroperoxide	75-91-2	2.0E+02	6.0E+01	1.0E+01		
Dimethylformamide	68-12-2	5.4E+02	2.7E+02	6.0E+00	6.0E+00	6.0E+00
Health Effects	colic , derm , enlarged liver , face flush , high BP , in animals: heart damage , in animals: kidney damage , irrit eyes , irrit resp sys , irrit skin , liver damage , nau , vomit					
Target Organs	GI tract - unspecified, Liver					
Dimethylheptane, 2,2-	1071-26-7	7.5E+03	1.5E+03	3.5E+02		
Dimethylhexane, 3,3-	563-16-6	7.5E+03	1.5E+03	3.5E+02		
Dimethylhydrazine, 1,1-	57-14-7	2.7E+01	7.4E+00	1.3E+00	2.5E-02	8.4E-03
Health Effects	anoxia , carc , chest pain , choking , convuls , drow , dysp , dysp , head , irrit Skin, irrit Respiration - unspecified, irrit Throat, irrit Nervous system - unspecified, irrit eyes , irrit skin , liver inj , nau , nau , tight Respiration - unspecified,					
Target Organs	Liver, Muscles (non-heart), Whole body					
Dimethylhydrazine, 1,2-	540-73-8	2.7E+01	7.4E+00	4.0E+00		
Health Effects	dysp , head , irrit Throat, irrit Skin, irrit Respiration - unspecified, irrit Nervous system - unspecified, nau , tight Respiration - unspecified, vomit , weak					
Target Organs	Muscles (non-heart), Whole body					
Dimethylphenol, 2,4-	105-67-9	5.0E+02	6.0E+00	1.0E+00		
Dimethylphenol, 2,6-	576-26-1	1.3E+02	1.5E+01	2.0E+00		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Dimethylpolysilane	28883-63-8	2.5E+01	1.0E+01	2.5E+00		
Dimethyl-p-phenylenediamine, N,N-	99-98-9	1.0E+00	1.3E-01	7.5E-02		
Dimethylpyridine, 2,4-	108-47-4	7.5E+01	1.5E+01	2.5E+00		
Dimethyltetrahydrofuran, 2,5-	1003-38-9	5.0E+02	3.5E+02	5.0E+01		
Dimethypropyl acetate, 1,1-	625-16-1				2.7E+02	9.1E+01
Dimetilan	644-64-4	2.5E+01	2.5E+01	1.5E+01		
Di-N-amylamine	2050-92-2	4.0E+01	7.5E+00	1.3E+00		
Di-n-butylamine	111-92-2	2.5E+02	2.5E+01	3.5E+00		
Dinitolmide	148-01-6				1.0E+00	2.4E-01
Health Effects	contact eczema , in animals: liver changes , in animals: methemo changes					
Dinitraniline orange	3468-63-1	2.5E+02	5.0E+01	3.0E+01		
Dinitroaniline, 2,4-	97-02-9	1.3E+01	7.5E-01	1.0E-01		
Dinitrobenzene (mixed isomers)	0-323*				1.0E+00	2.5E-01
Dinitrobenzene, 1,2-	528-29-0	5.0E+01	5.0E+00	3.0E+00	1.0E+00	2.5E-01
Health Effects	anemia , anoxia , bad taste , burning mouth , central scotomas , cyan , dry throat , liver damage , thirst , vis dist , yellowing eyes , yellowing hair , yellowing skin					
Dinitrobenzene, 1,3-	99-65-0	5.0E+01	2.5E+01	3.0E+00	1.0E+00	2.5E-01
Health Effects	anemia , anoxia , bad taste , burning mouth , central scotomas , cyan , dry throat , liver damage , thirst , vis dist , yellowing eyes , yellowing hair , yellowing skin					
Dinitrobenzene, 1,4-	100-25-4	5.0E+01	5.0E+00	3.0E+00	1.0E+00	2.5E-01
Health Effects	anemia , anoxia , bad taste , burning mouth , central scotomas , cyan , dry throat , liver damage , thirst , vis dist , yellowing eyes , yellowing hair , yellowing skin					
Dinitro-o-cresol, 4,6-	534-52-1	5.0E+00	5.0E-01	2.0E-01	2.0E-01	4.9E-02
Health Effects	coma , cough , excess thirst , fever , head , hyperpnea , lass , profuse sweat , sense of well being , short breath , tacar					
Dinitrophenol	25550-58-7	4.0E+00	7.5E-01	1.0E-01		
Dinitrophenol, 2,3-	66-56-8	7.5E+01	1.5E+01	2.0E+00		
Dinitrophenol, 2,4-	51-28-5	3.0E+01	2.5E+01	3.5E+00		
Dinitrophenol, 2,6-	573-56-8	1.5E+01	3.0E+00	4.0E-01		
Dinitrosopiperazine	140-79-4	6.0E+01	1.0E+01	1.5E+00		
Dinitrotoluene	25321-14-6	5.0E+01	1.3E+01	6.0E-01	2.0E-01	4.9E-02
Health Effects	anemia , anoxia , carc , cyan , jaun , repro effects					
Target Organs	CVS - unspecified, Reproductive - unspecified by gender					
Dinitrotoluene, 2,4-	121-14-2	5.0E+01	5.0E+01	6.0E-01		
Dinitrotoluene, 2,6-	606-20-2	5.0E+01	6.0E+00	6.0E-01		
Dinitrotoluene, 3,4-	610-39-9	5.0E+01	1.0E+00	6.0E-01		
Di-n-octadecyl phosphite	19047-85-9	2.0E+00	4.0E-01	6.0E-02		
Di-n-octyl phthalate	117-84-0	5.0E+02	4.0E+02	5.0E+01		
Dinoseb	88-85-7	1.0E+01	4.5E+00	2.5E+00		
Dinoterb	1420-07-1	2.5E+01	2.5E+01	1.5E+01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Dioctyl sebacate	122-62-3	5.0E+02	1.5E+02	2.0E+01		
Dioctyl sodium sulfosuccinate	577-11-7	5.0E+02	1.5E+02	2.0E+01		
Dioxane, 1,4-	123-91-1	2.7E+03	1.2E+03	6.1E+01	6.1E+01	4.9E+00
Health Effects	carc , drow , head , irrit eyes , irrit nose , irrit skin , irrit throat , kidney failure , liver damage , nau , vomit					
Target Organs	Eyes, Kidneys, Liver					
Dioxathion	78-34-2	1.5E+02	3.4E+00	3.0E-01	1.0E-01	2.4E-02
Health Effects	abdom cramps , chest tight , conf , diarr , dizz , drow , head , irrit eyes , irrit skin , lass , miosis , musc fasc , nau , rhin , salv , vomit					
Dioxolane	646-06-0	7.5E+03	2.1E+02	1.5E+02	6.1E+01	1.5E+01
Dipentaerythritol	126-58-9	2.5E+02	5.0E+01	3.0E+01		
Dipentyl pentylphosphonate	6418-56-0	5.0E+02	5.0E+02	7.5E+01		
Diphacinone	82-66-6	5.0E+02	9.0E-01	5.0E-01		
Diphenyl mercury	587-85-9	1.8E+01	1.8E-01	1.8E-01		
Diphenyl o-cresol phosphate	26444-49-5	5.0E+02	5.0E+01	7.5E+00		
Diphenylamine	122-39-4	5.0E+02	5.0E+02	3.0E+01	1.0E+01	2.4E+00
Health Effects	bladder inj , cough , eczema , heart rate , hema , hypertension , in animals: terato effects , incr BP , irrit eyes , irrit muc memb , irrit skin , methemo , prot , sneez , tacar					
Target Organs	Blood, Kidneys, Liver					
Diphenylboronic acid	524-95-8	5.0E+01	1.0E+01	1.3E+00		
Diphenyldichloroarsine	712-48-1	1.2E+00	3.9E-01	3.9E-01		
Diphenyldichlorosilane	80-10-4	5.2E+02	1.1E+02	9.3E+00	9.3E+00	
Diphenylguanidine, 1,3-	102-06-7	1.3E+02	4.0E+00	6.0E-01		
Diphenylhydrazine, 1,2-	122-66-7	1.3E+02	4.0E+00	6.0E-01		
Diphenylmethane	101-81-5	5.0E+02	2.0E+02	2.5E+01		
Diphenyloxazole, 2,5-	92-71-7	3.0E+02	6.0E+01	7.5E+00		
Dipicolinic acid	499-83-2	2.5E+02	5.0E+01	3.0E+01		
Dipropyl ketone	123-19-3	1.5E+03	1.5E+03	1.5E+03	2.3E+02	8.0E+01
Health Effects	CNS depres , decr breath , dizz , drow , in animals: liver inj , irrit eyes , irrit skin , narco					
Target Organs	CNS - unspecified, Kidneys, Liver					
Dipropylamine	142-84-7	5.0E+02	4.0E+00	6.0E-01		
Dipropylene glycol monomethyl ether	34590-94-8	3.5E+03	1.5E+03	7.5E+02	6.1E+02	2.1E+02
Health Effects	dizz , head , irrit eyes , irrit nose , irrit throat , lass					
Target Organs	CNS - unspecified					
Diquat	2764-72-9				1.0E-01	2.4E-02
Diquat	85-00-7				1.0E-01	3.4E-02
Health Effects	chest pain , convuls , cough , delayed healing of wounds , diarr , dysp , epis , irrit eyes , irrit muc memb , irrit resp sys , irrit skin , kidney , liver inj , mal , nau , pulm edema , rhin , skin burns , tremor , vomit					
Target Organs	Eyes					
Diquat dibromide monohydrate	6385-62-2				1.0E-01	2.4E-02
Direct black 38	1937-37-7	5.0E+02	5.0E+02	7.5E+01		
Disodium (2-ethylhexyl)phosphate	18541-72-5	2.0E+00	4.0E-01	6.0E-02		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Disodium 3,6-	129-67-9	2.0E+01	2.0E+01	3.0E+00		
Disodium ethylenediaminediacetate	38011-25-5	4.0E+02	7.5E+01	1.3E+01		
Disodium ethylenediaminetetraacetate	6381-92-6	2.5E+02	5.0E+01	3.0E+01		
Disodium pyrophosphate	7758-16-9	5.0E+02	2.0E+02	3.0E+01		
Distillates, petroleum, solvent-refined	64741-97-5	5.0E+02	2.5E+01	1.5E+01		
Disulfiram	97-77-8	1.3E+02	1.0E+01	6.0E+00	2.0E+00	4.9E-01
Health Effects	dizz , head , irrit eyes , irrit resp sys , irrit skin , lass , liver damage , metallic taste , peri neur , restless , sens derm , tremor					
Target Organs	CVS - unspecified, GI tract - unspecified					
Disulfoton	298-04-4	7.5E+01	2.0E+00	1.5E-01	5.0E-02	4.1E-03
Health Effects	abdom cramps , blurred vision , card irreg , chest tight , diarr , dizz , dysp , eye burns , head , irrit eyes , irrit skin , lass , miosis , musc fasc , nau , rhin , salv , skin burns , vomit					
Target Organs	Nervous system - unspecified					
Disulfur dichloride	10025-67-9	8.3E+01	3.5E+01	2.9E+00		
Health Effects	cough , eye burns , irrit eyes , irrit muc memb , irrit skin , lac , pulm edema , skin burns					
Di-tert-butyl dicarbonate	24424-99-5	4.0E+01	7.5E+00	1.3E+00		
Di-tert-butyl-hydroquinone, 2,5-	88-58-4	4.0E+02	2.5E+02	4.0E+01		
Dithiazanine iodide	514-73-8	2.0E+01	2.0E+01	1.3E+01		
Dithiobiuret	541-53-7	5.0E+00	5.0E+00	3.0E+00		
Dithiodiethanol, 2,2-	1892-29-1	7.5E+01	1.5E+01	2.0E+00		
Dithioertythritol, 1,4-	6892-68-8	1.3E+02	2.5E+01	4.0E+00		
Diurethane dimethacrylate	72869-86-4	5.0E+02	5.0E+02	2.5E+02		
Diuron	330-54-1				1.0E+01	3.4E+00
Health Effects	in animals: anemia , in animals: methemo , irrit eyes , irrit nose , irrit skin , irrit throat					
Target Organs	Blood					
Divinyl benzene	1321-74-0	2.0E+03	4.0E+02	6.0E+01	5.3E+01	1.8E+01
Health Effects	in animals: CNS depres , irrit eyes , irrit resp sys , irrit skin , skin burns					
Divinyl benzene, m-	108-57-6	2.0E+03	4.0E+02	5.0E+01		
Dodecamethylcyclohexasiloxane	540-97-6	5.0E+02	5.0E+01	3.0E+01		
Dodecane	112-40-3	1.5E+02	2.5E+00	3.5E-01		
Dodecenylsuccinic anhydride	25377-73-5	5.0E+02	1.0E+02	1.5E+01		
Dodecyl alcohol	112-53-8	5.0E+02	7.5E+00	1.0E+00		
Dodecyl mercaptan	112-55-0	2.0E+01	4.0E+00	8.3E-01	8.3E-01	2.8E-01
Health Effects	abdom pain , conf , cough , cyan , dizz , dysp , irrit eyes , irrit resp sys , irrit skin , lass , nau , skin sens					
Dodecyl methacrylate	142-90-5	5.0E+03	1.0E+03	1.5E+02		
Dodecylbenzene sulfonic acid	27176-87-0	2.5E+02	5.0E+01	7.5E+00		
Dodecylphenol, 4-	27193-86-8	5.0E+02	1.5E+02	2.5E+01		
Dodecyltrichlorosilane	4484-72-4	4.1E+02	9.1E+01	7.5E+00	7.5E+00	
Dowex 50WX4	11113-61-4	2.5E+02	5.0E+01	3.0E+01		
Dowex 50X8 ion-exchange resin	11119-67-8	2.5E+02	5.0E+01	3.0E+01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Dysprosium	7429-91-6	2.5E+02	5.0E+01	3.0E+01		
Dysprosium oxide	1308-87-8	5.0E+02	4.0E+02	6.0E+01		
EDTA, dipotassium salt, dihydrate	2001-94-7	2.0E+02	4.0E+01	5.0E+00		
Emetine dihydrochloride	316-42-7	4.0E-01	4.0E-01	1.5E-01		
Endosulfan	115-29-7	3.5E+01	8.0E-01	3.0E-01	1.0E-01	2.4E-02
Health Effects	agitation , conf , convuls , decr testis weight , dry mouth , flushing , head , in animals: kidney inj , in animals: liver inj , irrit skin , nau , tremor					
Target Organs	CNS - unspecified, Liver					
Endothion	2778-04-3	1.7E+01	1.7E+01	1.0E+01		
Endrin	72-20-8	2.0E+00	2.0E+00	3.0E-01	1.0E-01	2.4E-02
Health Effects	abdom discomfort , aggressiveness , anor , conf , dizz , drow , epilep convuls , head , in animals: liver damage , insom , lass , nau , stupor , vomit					
Target Organs	CNS - unspecified, Liver					
Enflurane	13838-16-9				5.7E+02	1.4E+02
Health Effects	analgesia , anes , CNS depres , convuls , irrit eyes , resp depres					
Target Organs	CNS - unspecified, CVS - unspecified					
Epibatidine	140111-52-0	2.5E-02	2.5E-02	4.0E-03		
Epibromohydrin	3132-64-7	1.3E+02	2.5E+01	3.5E+00		
Epichlorohydrin	106-89-8	2.7E+02	9.1E+01	2.2E+01	2.2E+01	6.5E-01
Health Effects	abdom pain , carc , cough , cyan , irrit eyes , irrit skin with deep pain , nau , repro effects , resp distress , vomit					
Target Organs	Kidneys, Liver, Nasal - pharynx, Nose					
Epinephrine	51-43-4	2.5E-03	2.5E-03	2.5E-03		
Epon 1001 resin	25068-38-6	5.0E+02	5.0E+02	3.5E+02		
Epoxy resin	25928-94-3	6.0E+00	1.3E+00	2.0E-01		
Epoxybutane, 1,2-	106-88-7	9.7E+02	4.1E+02	2.1E+02	2.1E+02	
Erbium (III) oxide	12061-16-4	5.0E+02	4.0E+02	6.0E+01		
Erbium nitrate pentahydrate	10031-51-3	2.5E+02	5.0E+01	3.0E+01		
Ergocalciferol	50-14-6	4.0E+01	4.0E+01	2.5E+01		
Ergotamine tartrate	379-79-3	6.0E+01	1.0E+01	6.0E+00		
Ethane	74-84-0	3.0E+04	6.0E+03	3.5E+03		
Ethanedioic acid, dimethyl ester	553-90-2	4.0E+02	7.5E+01	1.3E+01		
Ethanedithiol, 1,2-	540-63-6	1.5E+02	3.0E+01	4.0E+00		
Ethanediyl-bis, 1,1'-(1,2-	104-66-5	2.5E+02	5.0E+01	3.0E+01		
Ethanol	64-17-5	6.0E+03	1.5E+03	1.5E+03		
Health Effects	anemia , cough , drow , head , irrit eyes , irrit nose , irrit skin , lass , liver damage , narco , repro effects , terato effects					
Ethanol, titanium(4+) salt	3087-36-3	2.5E+02	5.0E+01	3.0E+01		
Ethanolamine	141-43-5	7.5E+01	7.5E+01	1.5E+01	7.5E+00	1.2E+00
Health Effects	drow , irrit eyes , irrit resp sys , irrit skin					
Ethenylsilanetriol triacetate	4130-08-9	2.5E+02	5.0E+01	3.0E+01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Ethidium bromide	1239-45-8	2.0E+01	4.0E+00	5.0E-01		
Ethienocarb	58270-08-9	9.0E+00	9.0E+00	5.0E+00		
Ethion	563-12-2	3.5E+02	1.3E+01	1.5E-01	5.0E-02	1.2E-02
Health Effects	abdom cramps , blurred vision , card irreg , chest tight , diarr , dizz , dysp , head , irrit eyes , irrit skin , lass , miosis , musc fasc , nau , rhin , salv , vomit					
Ethoprop	13194-48-4	2.6E+01	2.6E+01	1.5E+01		
Ethoxyethanol, 2-	110-80-5	1.5E+03	7.5E+01	5.0E+01	1.8E+01	4.5E+00
Health Effects	in animals: blood changes , in animals: irrit eyes , in animals: irrit resp sys , in animals: kidney damage , in animals: liver damage , in animals: lung damage , in animals: repro effects , in animals: terato effects					
Target Organs	Blood, Kidneys, RBC, Reproductive - unspecified by gender, Testes					
Ethoxyethyl acetate, 2-	111-15-9	2.5E+03	2.5E+03	4.0E+02	2.7E+01	6.6E+00
Health Effects	in animals: repro effects , in animals: terato effects , irrit eyes , irrit nose , kidney damage , para , vomit					
Target Organs	Reproductive - unspecified by gender					
Ethoxyethyl methacrylate, 2-	2370-63-0	4.0E+02	7.5E+01	1.3E+01		
Ethoxylated alcohols, C16-18	68439-49-6	5.0E+02	1.0E+02	1.5E+01		
Ethoxylated nonylphenol	9016-45-9	5.0E+02	1.0E+02	1.5E+01		
Ethyl 3-ethoxypropionate	763-69-9	5.0E+02	4.0E+02	6.0E+01		
Ethyl acetate	141-78-6	7.5E+03	1.5E+03	1.5E+03	1.4E+03	4.9E+02
Health Effects	derm , irrit eyes , irrit nose , irrit skin , irrit throat , narco					
Ethyl acetoacetate	141-97-9	5.0E+02	3.5E+02	5.0E+01		
Ethyl acrylate	140-88-5	9.8E+02	1.5E+02	3.4E+01	3.4E+01	7.0E+00
Health Effects	carc , irrit eyes , irrit resp sys , irrit skin					
Target Organs	Respiration - unspecified					
Ethyl Alcohol D	925-93-9	6.0E+03	2.0E+03	2.0E+03		
Ethyl alpha-hydroxy isobutyrate	80-55-7	5.0E+02	4.0E+02	5.0E+01		
Ethyl amyl ketone	541-85-5	5.0E+02	1.3E+02	1.3E+02	5.2E+01	1.3E+01
Health Effects	coma , derm , head , irrit eyes , irrit muc memb , irrit skin , narco					
Ethyl benzoate	93-89-0	5.0E+02	1.5E+02	2.5E+01		
Ethyl bromide	74-96-4	7.5E+03	7.5E+03	4.0E+03	2.2E+01	5.5E+00
Health Effects	card arrest , card arrhy , CNS depres , irrit eyes , irrit resp sys , irrit skin , kidney disease , liver disease , pulm edema					
Target Organs	CVS - unspecified, Kidneys, Liver					
Ethyl bromoacetate	105-36-2	6.0E-01	1.3E-01	2.0E-02		
Ethyl butyl ketone	106-35-4	4.0E+03	7.5E+02	3.5E+02	2.3E+02	8.0E+01
Health Effects	coma , derm , head , irrit eyes , irrit muc memb , irrit skin , narco					
Ethyl carbamate	51-79-6	5.0E+02	5.0E+02	5.0E+02		
Ethyl cellulose	9004-57-3	5.0E+02	4.0E+02	6.0E+01		
Ethyl chloride	75-00-3	1.0E+04	1.0E+04	5.0E+03	2.6E+02	2.7E+01
Health Effects	abdom cramps , card arrest , card arrhy , inco , inebri , kidney damage , liver damage					
Target Organs	CNS - unspecified, Developmental - generic, Liver, Reproductive - unspecified by gender					
Ethyl chloroacetate	105-39-5	7.5E+01	1.5E+01	2.0E+00		
Ethyl chloroformate	541-41-3	2.1E+01	7.1E+00	4.0E+00		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Ethyl cyanoacrylate	7085-85-0				1.0E+00	3.5E-01
Ethyl ether	60-29-7	6.0E+03	1.5E+03	1.5E+03	1.2E+03	4.2E+02
Health Effects	dizz , drow , excited , head , irrit eyes , irrit skin , irrit upper resp sys , narco , nau , vomit					
Ethyl formate	109-94-4	4.0E+03	1.5E+03	7.5E+02	3.0E+02	1.0E+02
Health Effects	in animals: narco , irrit eyes , irrit upper resp sys					
Ethyl isocyanate	109-90-0	4.7E-01	1.5E-01			
Ethyl lactate	687-47-8	5.0E+02	3.0E+02	4.0E+01		
Ethyl mercaptan	75-08-1	9.1E+02	3.0E+02	2.5E+00	2.5E+00	4.4E-01
Health Effects	cyan , head , in animals: inco , in animals: lass , irrit muc memb , kidney damage , liver damage , narco , nau					
Target Organs	CNS - unspecified					
Ethyl mercury chloride	107-27-7	2.6E+00	5.3E-02	4.0E-02		
Ethyl methacrylate	97-63-2	4.0E+03	4.0E+03	6.0E+02		
Ethyl nitrite	109-95-5	2.0E+02	4.0E+01	6.0E+00		
Ethyl O-2-	57856-11-8	2.5E+02	5.0E+01	3.0E+01		
Ethyl p-nitrophenyl	2104-64-5	5.0E+00	5.0E+00	5.0E-01	1.0E-01	2.4E-02
Health Effects	abdom cramps , anor , card irreg , chest tight , convuls , cyan , diarr , head , irrit eyes , irrit skin , lac , lar spasm , low BP , miosis , nau , para , rhin , salv , wheez					
Ethyl propionate	105-37-3	4.0E+03	7.5E+02	1.0E+02		
Ethyl silicate polymer	11099-06-2	2.5E+02	5.0E+01	3.0E+01		
Ethyl tert-butyl ether	637-92-3				2.1E+01	7.2E+00
Ethyl-1-hexanol, 2-	104-76-7	1.1E+03	5.3E+02	5.3E-01		
Ethyl-2-methylheptane, 3-	14676-29-0	1.0E+04	2.0E+03	2.5E+02		
Ethyl-4-hydroxybenzoate	120-47-8	5.0E+02	5.0E+02	5.0E+02		
Ethylamine	75-04-7	5.0E+02	9.0E+01	1.4E+01	1.4E+01	3.2E+00
Health Effects	derm , irrit eyes , irrit resp sys , irrit skin , skin burns					
Ethylbenzaldehyde	22927-13-5	6.0E+03	1.0E+03	1.5E+02		
Ethylbenzene	100-41-4	3.5E+03	5.0E+02	5.0E+02		3.0E+01
Health Effects	coma , derm , head , irrit eyes , irrit muc memb , irrit skin , narco					
Target Organs	Bone, CNS - unspecified, Developmental - generic, Reproductive - unspecified by gender					
Ethylbis(2-chloroethyl)amine	538-07-8	3.7E-01	2.2E-02	1.3E-02		
Ethylchlorothioformate	2941-64-2	4.0E+00	1.3E+00	7.5E-01		
Ethyldichloroarsine	598-14-1	8.6E-02	2.9E-02	2.3E-02		
Ethylene	74-85-1	1.0E+04	1.5E+03	6.0E+02	2.3E+02	5.6E+01
Ethylene carbonate	96-49-1	5.0E+02	5.0E+02	1.3E+02		
Ethylene chlorohydrin	107-07-3	4.0E+01	1.3E+01	3.0E+00		
Health Effects	collapse , coma , delirium , dizz , head , inco , irrit muc memb , kidney damage , liver damage , low BP , nau , numb , shock , thirst , vis dist , vomit					
Target Organs	CNS - unspecified, CVS - unspecified, GI tract - unspecified, Kidneys, Liver					
Ethylene diamine	107-15-3	4.9E+01	2.4E+01	2.4E+01	2.4E+01	8.4E+00
Health Effects	asthma , asthma , cough , irrit Nose, irrit nose , irrit resp sys , kidney damage , liver damage , phlegm , resp , sens derm , wheez					

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Target Organs	Kidneys, Lungs, Whole body					
Ethylene fluorohydrin	371-62-0	3.5E+00	6.0E-02	3.5E-02		
Ethylene glycol	107-21-1	1.5E+02	1.0E+02	2.5E+01		1.0E+01
Health Effects	abdom pain , CNS depres , convuls , dizz , irrit eyes , irrit nose , irrit skin , irrit throat , lass , nau , skin sens , stupor , vomit					
Target Organs	Kidneys					
Ethylene glycol diacetate	111-55-7	5.0E+02	5.0E+02	7.5E+01		
Ethylene glycol dimethacrylate	97-90-5	5.0E+02	3.0E+02	4.0E+01		
Ethylene glycol dinitrate	628-96-6				3.1E-01	7.6E-02
Health Effects	abdom pain , angina , CNS depres , delirium , dizz , flush , hypotension , in animals: anemia , in animals: kidney damage , in animals: liver damage , irrit skin , methemo , nau , palp , throb head , vomit					
Target Organs	CVS - unspecified					
Ethylene glycol monobutyl ether	111-76-2	3.5E+03	5.0E+02	2.5E+02	9.7E+01	2.0E+01
Health Effects	CNS depres , head , hema , hemolysis , irrit eyes , irrit nose , irrit skin , irrit throat , vomit					
Target Organs	Blood, CNS - unspecified, RBC					
Ethylene glycol monopropyl ether	2807-30-9	4.0E+03	3.5E+02	7.5E+01		
Ethylene glycol mono-sec-butyl ether	7795-91-7	3.5E+02	6.0E+01	1.0E+01		
Ethylene oxide	75-21-8	3.6E+02	8.1E+01	9.0E+00	1.8E+00	4.4E-01
Health Effects	cyan , diarr , drow , dysp , EKG abnor , eye burns (liq or high vap conc) , head , in animals: carc , in animals: convuls , in animals: kidney damage , in animals: liver damage , inco , irrit eyes , irrit nose , irrit skin , irrit throat , lass , liquid:					
Target Organs	Blood, Brain, Kidneys, Reproductive - unspecified by gender					
Ethylene thiourea	96-45-7	5.0E+02	1.5E+01	2.5E+00		
Health Effects	in animals: carc , in animals: goiter , in animals: terato effects , in animals: thickening of the skin , irrit eyes					
Ethylene/vinyl acetate copolmer	24937-78-8	2.5E+02	5.0E+01	3.0E+01		
Ethylenediamine dihydrochloride	333-18-6	6.0E+01	2.0E+00	3.0E-01		
Ethylenediaminetetraacetic acid	60-00-4	1.5E+02	1.5E+02	1.3E+02		
Ethylenediaminetetraacetic acid	10378-23-1	5.0E+02	1.5E+02	2.5E+01		
Ethylenediaminetetraacetic acid,	139-33-3	5.0E+02	5.0E+02	1.5E+02		
Ethylenediaminetetraacetic acid, ferric	21265-50-9	2.5E+02	5.0E+01	7.5E+00		
Ethylenedinitrilo)tetra-2-propanol,	102-60-3	5.0E+02	3.5E+02	5.0E+01		
Ethyleneimine	151-56-4	1.7E+01	8.1E+00	1.5E-01	8.8E-02	3.0E-02
Health Effects	carc , dizz , eye burns , head , irrit eyes , irrit nose , irrit skin , irrit throat , kidney damage , liver damage , nau , pulm edema , skin sens , vomit					
Ethylheptane, 4-	2216-32-2	1.5E+03	3.5E+02	5.0E+01		
Ethylhexanoic acid	149-57-5	5.0E+02	1.3E+02	1.5E+01	5.0E+00	1.2E+00
Ethylhexyl bromide, 2-	18908-66-2	2.5E+02	5.0E+01	3.0E+01		
Ethylhexylchloroformate, 2-	24468-13-1	2.3E+01	7.6E+00	1.0E+00		
Ethylidene norbornene	16219-75-3	2.5E+03	4.9E+02	9.8E-01		
Health Effects	bone marrow effects , chemical pneu (aspir liquid) , cough , dysp , head , in animals: kidney inj , in animals: liver inj , in animals: urogenital inj , irrit eyes , irrit nose , irrit skin , irrit throat , nau , olfactory changes , taste changes , vomit					
Ethylmagnesium chloride	2386-64-3	2.5E+02	5.0E+01	3.0E+01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Ethylphosphorodichloridate	1498-51-7	4.0E+01	4.0E+00			
Ethylpropyl ethanoate, 1-	620-11-1				2.7E+02	9.1E+01
Ethylthiocyanate	542-90-5	1.0E+02	1.0E+02	6.0E+01		
Ethyltoluene, o-	611-14-3	5.0E+02	5.0E+02	5.0E+02		
Ethyltoluene, p-	622-96-8	5.0E+02	5.0E+02	5.0E+02		
Etidronic acid	2809-21-4	5.0E+02	3.5E+00	5.0E-01		
Europium	7440-53-1	2.5E+02	5.0E+01	3.0E+01		
Europium (III) oxide	1308-96-9	5.0E+02	4.0E+02	6.0E+01		
Europium diiodide	22015-35-6	2.5E+02	5.0E+01	3.0E+01		
Extracts, petroleum, middle distillate	64742-06-9	2.5E+02	5.0E+01	3.0E+01		
Farnesol	4602-84-0	5.0E+02	5.0E+02	7.5E+01		
Fats and Glyceridic oils, neat's-foot	8002-64-0	2.5E+02	5.0E+01	3.0E+01		
Fenamiphos	22224-92-6	2.1E+00	7.0E-01	1.5E-01	5.0E-02	1.2E-02
Health Effects	abdom cramps , blurred vision , card irreg , chest tight , diarr , dizz , dysp , head , lass , miosis , musc fasc , nau , rhin , salv , vomit					
Fensulfothion	115-90-2	1.3E+01	2.0E+00	3.0E-02	1.0E-02	2.4E-03
Health Effects	abdom cramps , blurred vision , card irreg , chest tight , diarr , dizz , dysp , head , irrit skin , lass , miosis , musc fasc , nau , rhin , salv , vomit					
Fenthion	55-38-9	4.0E+01	4.0E+01	1.5E-01	5.0E-02	1.2E-02
Health Effects	abdom cramps , blurred vision , card irreg , chest tight , diarr , dizz , dysp , head , lass , miosis , musc fasc , nau , rhin , salv , vomit					
Ferbam	14484-64-1				5.0E+00	1.7E+00
Health Effects	derm , GI dist , irrit eyes , irrit resp tract					
Ferric ammonium citrate	1185-57-5	5.0E+02	5.0E+02	5.4E+00		
Ferric ammonium sulfate	7783-83-7	2.0E+02	4.3E+01	2.6E+01		
Ferric chloride	7705-08-0	1.3E+02	1.0E+01	2.9E+00		
Ferric chloride, hexahydrate	10025-77-1	1.0E+02	1.0E+02	7.5E+01		
Ferric fluoride	7783-50-8	5.0E+02	1.0E+02	1.3E+01		
Ferric hydroxide	1309-33-7	4.0E+02	7.5E+01	1.0E+01		
Ferric nitrate	10421-48-4	5.0E+02	2.2E+01	1.3E+01		
Ferric nitrate, nonahydrate	7782-61-8	5.0E+02	2.5E+02	4.0E+01		
Ferric oxide	1309-37-1	5.0E+02	4.0E+01	1.5E+01	5.0E+00	1.2E+00
Health Effects	benign pneumoconiosis with X-ray shadows indistinguishable from fibrotic pneumoconiosis (siderosis) , irrit eyes , irrit resp sys , irrit skin					
Target Organs	Lungs, Respiration - unspecified					
Ferric phosphate	10045-86-0	6.0E+01	1.4E+01	8.3E+00		
Ferric sulfate	10028-22-5	7.5E+01	1.8E+01	1.1E+01		
Ferrous ammonium sulfate	10045-89-3	1.3E+02	2.5E+01	1.5E+01		
Ferrous carbonate	563-71-3	5.0E+02	3.0E+02	4.0E+01		
Ferrous chloride	7758-94-3	2.0E+02	1.1E+01	6.8E+00		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Ferrous hydroxide	18624-44-7	4.0E+02	7.5E+01	1.0E+01		
Ferrous sulfamate	14017-39-1	6.0E+01	1.4E+01	8.4E+00		
Ferrous sulfate	7720-78-7	3.5E+02	1.4E+01	8.2E+00		
Ferrous sulfate heptahydrate	7782-63-0	5.0E+02	2.5E+01	1.5E+01		
Ferrous sulfide	12068-85-8	5.0E+01	1.1E+01	6.4E+00		
Ferrovanadium	12604-58-9				1.0E+00	3.4E-01
Health Effects	in animals: bron , in animals: pneu , irrit eyes , irrit resp sys					
Target Organs	Respiration - unspecified					
Fibrous glass filter media	65997-17-3	5.0E+02	6.0E+01	1.5E+01		
Fisherbrand vacuum pump oil	64742-65-0	5.0E+02	5.0E+02	3.0E+02		
Fluenetil	4301-50-2	6.0E+00	6.0E+00	3.5E+00		
Fluoboric acid	16872-11-0	2.9E+02	6.0E+01	7.5E+00		
Fluoranthene	206-44-0	5.0E+02	1.5E+02	2.5E+01		
Fluorene	86-73-7	5.0E+02	1.5E+02	2.5E+01		
Fluorescein	2321-07-5	2.5E+02	7.5E+00	1.3E+00		
Fluoride	16984-48-8	2.5E+02	1.3E+01	7.5E+00	2.5E+00	8.6E-01
Fluoride, sodium	7681-49-4	5.0E+02	5.5E+00	5.5E+00		
Health Effects	abdom pain , calcification of ligaments of pelvis , calcification of ligaments of ribs , derm , diarr , irrit eyes , irrit resp sys , nau , salv , stiff spine , sweat , thirst					
Fluorine	7782-41-4	2.0E+01	7.8E+00	2.6E+00	2.6E+00	1.1E-02
Health Effects	eye burns , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit nose , irrit resp sys , lar spasm , pulm edema , skin burns , wheez					
Target Organs	Respiration - unspecified					
Fluoro-4-nitrophenol, 2-	403-19-0	7.5E+01	1.5E+01	2.5E+00		
Fluoro-6-nitrophenol, 2-	1526-17-6	7.5E+01	1.5E+01	2.5E+00		
Fluoroacetamide	640-19-7	5.8E+00	5.8E+00	3.5E+00		
Fluoroacetic acid	144-49-0	2.0E+00	4.7E-01	2.5E-01		
Fluoroacetyl chloride	359-06-8	1.0E+01	1.0E+01	6.0E+00		
Fluorobenzene	462-06-6	5.0E+02	5.0E+02	3.5E+02		
Fluorosulfonic acid	7789-21-1	3.0E+01	1.0E+01	2.0E+00		
Fluorotrimethylsilane	420-56-4	1.0E+03	2.0E+02	3.0E+01		
Fluorouracil	51-21-8	1.0E+02	1.9E+01	2.5E+00		
Fonofos	944-22-9	2.0E+02	1.3E+00	3.0E-01	1.0E-02	2.4E-03
Health Effects	abdom cramps , blurred vision , card irreg , chest tight , diarr , dizz , dysp , head , lass , miosis , musc fasc , nau , rhin , salv , vomit					
Forane	26675-46-7	3.5E+04	3.5E+04	3.5E+04		
Formaldehyde	50-00-0	6.9E+01	1.7E+01	1.1E+00	1.1E+00	3.7E-01
Health Effects	carc , cough , derm , irrit eyes , irrit nose , irrit resp sys , irrit throat , lac , wheez					
Target Organs	Nasal - pharynx, Respiration - unspecified, Skin					
Formaldehyde cyanohydrin	107-16-4	1.0E+01	6.0E+00	7.5E-01		
Health Effects	abdom pain , conf , convuls , dizz , dysp , head , irrit eyes , irrit resp sys , irrit skin , lass , nau , vomit					

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Formaldehyde hydrosulfite	149-44-0	5.0E+02	3.5E+02	5.0E+01		
Formaldehyde, melamine polymer,	68002-20-0	5.0E+02	5.0E+02	1.5E+02		
Formamide	75-12-7	2.5E+03	2.5E+02	3.5E+01	1.8E+01	6.3E+00
Health Effects	acidosis , drow , in animals: repro effects , irrit eyes , irrit muc memb , irrit skin , lass , nau , skin eruptions					
Target Organs	Liver					
Formetanate hydrochloride	23422-53-9	1.8E+01	1.8E+01	1.0E+01		
Formic acid	64-18-6	5.0E+01	1.5E+01	1.5E+01	9.4E+00	3.2E+00
Health Effects	cough , derm , dysp , irrit eyes , irrit skin , irrit throat , lac , nau , rhin , skin burns					
Target Organs	Nasal-pharynx					
Formic acid butyl ester	592-84-7	4.0E+03	4.0E+03	6.0E+02		
Formothion	2540-82-1	1.0E+01	2.7E-01	1.5E-01		
Formparanate	17702-57-7	7.2E+00	7.2E+00	4.0E+00		
Formylpiperidine, 1-	2591-86-8	4.0E+02	4.0E+02	5.0E+01		
Fosthietan	21548-32-3	4.7E+00	4.7E+00	2.5E+00		
Fuberidazole	3878-19-1	1.3E+02	3.3E+00	2.0E+00		
Fuel oil no. 2	68476-30-2	5.0E+02	5.0E+02	1.0E+02	1.0E+02	1.4E-02
Fuel oil no. 2-D	68476-34-6				1.0E+02	3.4E+01
Fuel oil no. 4	68476-31-3				1.0E+02	3.4E+01
Fuel oil, residual	68476-33-5	5.0E+02	2.0E+02	3.0E+01		
Fuller's earth	8031-18-3	5.0E+02	1.3E+02	6.0E+00		
Fulminic acid	506-85-4	1.0E+02	2.0E+01	3.0E+00		
Fumaric acid	110-17-8	5.0E+02	5.0E+02	1.0E+02		
Furan	110-00-9	5.3E+01	1.9E+01	1.0E+01		
Furfural	98-01-1	3.9E+02	3.9E+01	7.9E+00	7.9E+00	2.7E+00
Health Effects	derm , head , irrit eyes , irrit skin , irrit upper resp sys					
Furfuryl alcohol	98-00-0	3.0E+02	6.0E+01	6.0E+01	4.0E+01	1.4E+01
Health Effects	body temperature depres , derm , diarr , diuresis , dizz , irrit eyes , irrit muc memb , nau , resp depres , vomit					
Furoic acid, ethyl ester	614-99-3	1.5E+02	3.0E+01	4.0E+00		
Fusariotoxin T2	21259-20-1	4.0E-01	3.0E-02	4.0E-03		
Gadolinium	7440-54-2	5.0E+02	5.0E+02	5.0E+02		
Gadolinium (III) oxide	12064-62-9	5.0E+02	5.0E+01	6.0E+00		
Gadolinium chloride hexahydrate	13450-84-5	7.5E+01	7.5E+01	7.5E+01		
Gadolinium hydroxide	16469-18-4	7.5E+01	2.5E+00	7.5E-01		
Gallic acid monohydrate	5995-86-8	5.0E+02	3.5E+02	5.0E+01		
Gallium	7440-55-3	2.5E+02	5.0E+01	3.0E+01		
Gallium arsenide	1303-00-0				3.0E-04	7.3E-05
Gallium oxide	12024-21-4	5.0E+02	4.0E+01	5.0E+00		
Gallium trichloride	13450-90-3	1.0E+02	3.2E+01	2.0E+01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Gallium trifluoride	7783-51-9	1.3E+02	2.8E+01	1.7E+01		
gamma-Aminopropyltriethoxysilane	919-30-2	5.0E+02	1.3E+02	1.5E+01		
Gasoline	8006-61-9		7.5E+03	7.3E+02	7.3E+02	
Health Effects	blurred vision , carc , chemical pneu (aspir liquid) , conf , convuls , derm , dizz , head , irrit eyes , irrit muc memb , irrit skin , lass , possible kidney damage , possible liver damage , slurred speech					
Target Organs	CNS - unspecified					
Gelatin	9000-70-8	3.0E+02	6.0E+01	7.5E+00		
Germanium	7440-56-4	5.0E+02	2.5E-01	3.5E-02		
Germanium oxide	1310-53-8	5.0E+02	1.5E+01	2.0E+00		
Germanium tetrafluoride	7783-58-6	4.9E+02	1.0E+02	1.3E+01		
Germanium tetrahydride	7782-65-2	1.6E+00	5.3E-01	5.3E-01	5.3E-01	1.5E-01
Health Effects	dizz , dysp , fainting , head , hemolytic effects , kidney inj , mal , nau , vomit					
Target Organs	Blood					
Giemsa's stain	51811-82-6	2.5E+02	5.0E+01	3.0E+01		
Glucose, alpha-D-	492-62-6	5.0E+02	7.5E+00	1.3E+00		
Glucose, d-	50-99-7	5.0E+02	7.5E+00	1.3E+00		
Glutamic acid, L-	56-86-0	2.0E+02	4.0E+01	6.0E+00		
Gluteraldehyde	111-30-8	2.0E+01	4.1E+00	8.2E-01		
Health Effects	asthma , cough , derm , irrit eyes , irrit resp sys , irrit skin , nau , sens skin , vomit					
Glycerin	56-81-5	5.0E+02	5.0E+02	1.3E+02	1.0E+01	3.4E+00
Health Effects	head , irrit eyes , irrit resp sys , irrit skin , kidney inj , nau , vomit					
Glycerine carbonate	931-40-8	2.5E+02	5.0E+01	3.0E+01		
Glyceryl monostearate	31566-31-1	7.5E+01	1.5E+01	2.5E+00		
Glycidaldehyde	765-34-4	7.5E+01	1.5E+00	2.0E-01		
Glycidol	556-52-5	4.0E+02	7.5E+01	1.3E+01	6.1E+00	2.1E+00
Health Effects	irrit eyes , irrit nose , irrit skin , irrit throat , narco					
Glycidoxypropyltrimethoxysilane	2530-83-8	5.0E+02	5.0E+02	4.0E+02		
Glycidyl acrylate	106-90-1	6.0E+01	1.3E+01	2.0E+00		
Glycine	56-40-6	5.0E+02	5.0E+02	7.5E+01		
Glycolic acid	79-14-1	5.0E+02	5.0E+02	2.5E+02		
Glycols, polyethylene, dimethyl ether	24991-55-7	5.0E+02	5.0E+02	2.0E+02		
Glycols, polyethylene, mono(p-	26636-32-8	3.0E+02	6.0E+01	7.5E+00		
Glycoluril	496-46-8	2.5E+02	5.0E+01	3.0E+01		
Glyoxal	107-22-2	7.5E+01	7.5E+01	3.5E+01	1.0E-01	3.4E-02
Gold	7440-57-5	1.0E+02	1.0E+02	2.5E+01		
Graphite	7782-42-5	5.0E+02	1.0E+01	6.0E+00	2.0E+00	4.9E-01
Health Effects	black sputum , cough , decr pulm func , dysp , lung fib					
Target Organs	Lungs					
Grease	68153-81-1	2.5E+02	5.0E+01	3.0E+01		
Guanidine hydrochloride	50-01-1	2.0E+02	4.0E+01	6.0E+00		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Guanidine thiocyanate	593-84-0	1.3E+02	2.5E+01	3.5E+00		
Guanylurea Sulfate	591-01-5	2.5E+02	5.0E+01	3.0E+01		
Gypsum	13397-24-5				1.0E+01	2.4E+00
Health Effects	cough , irrit eyes , irrit muc memb , irrit skin , irrit upper resp sys , rhin , sneez					
Hafnium	7440-58-6	5.0E+01	2.5E+00	1.5E+00	5.0E-01	1.7E-01
Health Effects	in animals: irrit eyes , in animals: irrit muc memb , in animals: irrit skin , in animals: liver damage					
Target Organs	Liver					
Hafnium oxide	12055-23-1	5.9E+01	3.0E+00	1.8E+00		
Halothane	151-67-7				4.0E+02	9.9E+01
Health Effects	analgesia , anes , card arrhy , conf , decr audio-visual performance , dizz , drow , in animals: repro effects , irrit eyes , irrit resp sys , irrit skin , kidney damage , liver damage , nau					
Target Organs	CNS - unspecified, CVS - unspecified, Liver, Reproductive - unspecified by gender					
HCFC-141b	1717-00-6	1.4E+04	8.1E+03	4.8E+03	4.8E+03	
HCFC-142b	75-68-3	1.0E+05	6.2E+04	4.1E+04		
Heavy naphthenic distillate	64741-53-3	5.0E+02	1.0E+02	1.5E+01		
Helium	7440-59-7	6.0E+04	3.5E+04	1.0E+04		
Hematoxylin	517-28-2	1.0E+01	2.0E+00	2.5E-01		
Hepes	7365-45-9	1.3E+02	2.5E+01	4.0E+00		
Heptachlor	76-44-8	3.5E+01	3.5E+01	1.5E-01	5.0E-02	1.2E-02
Health Effects	in animals: carc , in animals: convuls , in animals: liver damage , in animals: tremor					
Target Organs	Blood, CNS - unspecified, Liver					
Heptachlor epoxide	1024-57-3	6.0E+00	6.0E+00	1.5E-01	5.0E-02	1.2E-02
Heptadecane	629-78-7	1.5E+04	3.5E+03	5.0E+02		
Heptafluorobutyric acid	375-22-4	6.0E+01	1.3E+01	2.0E+00		
Heptane, n-	142-82-5	3.0E+03	1.6E+03	1.6E+03	1.6E+03	5.6E+02
Health Effects	chemical pneu (aspir liquid) , derm , dizz , inco , loss of appetite , nau , stupor , uncon					
Heptanoic acid	111-14-8	3.0E+03	6.0E+02	7.5E+01		
Heptanol, 1-	111-70-6	5.0E+02	5.0E+02	1.0E+01		
Heptene, 1-	592-76-7	7.5E+05	1.5E+05	2.0E+04		
Hexaammonium molybdate	12027-67-7	5.0E+02	4.3E+00	2.6E+00		
Hexachloroacetone	116-16-5	2.0E+02	7.5E+00	1.3E+00		
Hexachlorobenzene	118-74-1	2.0E+02	1.5E+00	6.0E-03	2.0E-03	4.9E-04
Hexachlorobutadiene	87-68-3	1.1E+02	3.2E+01	1.1E+01	2.1E-01	7.3E-02
Health Effects	in animals: carc , in animals: irrit eyes , in animals: irrit resp sys , in animals: irrit skin , in animals: kidney damage					
Target Organs	Kidneys					
Hexachlorocyclohexane, alpha-	319-84-6	5.0E+02	2.5E+00	1.5E+00		
Hexachlorocyclohexane, beta-	319-85-7	5.0E+02	2.5E+00	1.5E+00		
Hexachlorocyclohexane, technical	608-73-1	3.0E+02	4.0E+00	5.0E-01		
Hexachlorocyclopentadiene	77-47-4	2.0E-01	2.0E-01	2.0E-01	1.1E-01	7.6E-02
Health Effects	cough , diarr , dysp , eye burns , in animals: kidney inj , in animals: liver inj , irrit eyes , irrit resp sys , irrit skin					

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
, lac , nau , pulm edema , salv , skin burns , sneez , vomit						
Target Organs	Nasal - pharynx, Nose, Respiration - unspecified					
Hexachloroethane	67-72-1	3.0E+03	5.0E+01	3.0E+01	9.7E+00	9.7E+00
Health Effects	in animals: carc , in animals: kidney damage , irrit eyes , irrit muc memb , irrit skin					
Target Organs	Kidneys, Liver, Nervous system - unspecified					
Hexachloronaphthalene	1335-87-1	2.0E+00	2.0E-01	2.0E-01	2.0E-01	4.9E-02
Health Effects	acne-form derm , coma , conf , jaun , nau					
Target Organs	Liver, Skin					
Hexachlorophene	70-30-4	2.0E+02	2.0E+01	3.0E+00		
Hexachloropropene	1888-71-7	1.5E+02	3.0E+01	4.0E+00		
Hexadecanamine, 1-	143-27-1	7.5E+01	2.5E+00	3.5E-01		
Hexadecane	544-76-3	5.0E+02	6.0E+01	7.5E+00		
Hexadecanoic acid	57-10-3	5.0E+01	5.0E+01	5.0E+01		
Hexadecanol, 1-	36653-82-4	3.0E+02	6.0E+01	7.5E+00		
Hexadecene, 1-	629-73-2	4.0E+02	7.5E+01	1.3E+01		
Hexadecylpyridinium chloride, 1	123-03-5	1.0E+01	2.0E+00	2.5E-01		
Hexadecyltrimethylammonium bromide	57-09-0	1.5E+02	7.5E-01	1.0E-01		
Hexadecyltrimethylammonium chloride	112-02-7	2.5E+02	5.0E+01	7.5E+00		
Hexafluoro-2-butyne	692-50-2	2.0E+02	4.0E+01	6.0E+00		
Hexafluoroacetone	684-16-2	5.4E+02	1.4E+00	6.8E-01	6.8E-01	1.7E-01
Health Effects	in animals: kidney inj , in animals: repro effects , in animals: terato effects , irrit eyes , irrit muc memb , irrit resp sys , irrit skin , liquid: frostbite , pulm edema					
Target Organs	Kidneys, Reproductive - unspecified by gender					
Hexafluorobenzene	392-56-3	1.3E+04	1.3E+04	3.5E+03		
Hexafluorodisodium silicate, 2-	16893-85-9	5.0E+00	5.0E+00	4.1E+00		
Hexafluoroethane	76-16-4	2.5E+05	2.5E+05	2.5E+05		
Hexafluoropropylene	116-15-4	2.9E+03	5.6E+02	2.5E+02	5.1E+01	1.5E-01
Hexamethyl phosphoramide	680-31-9	1.0E+03	6.0E+00	7.5E-01		
Health Effects	abdom pain , carc , dysp , irrit eyes , irrit resp sys , irrit skin					
Target Organs	Lungs					
Hexamethylcyclotrisiloxane	541-05-9	5.0E+02	2.0E+02	3.0E+01		
Hexamethyldisilazane	999-97-3	3.5E+02	2.5E+02	4.0E+01		
Hexamethyldisiloxane	107-46-0	2.0E+03	2.0E+03	7.5E+02		
Hexamethylene diamine	124-09-4				2.4E+00	8.1E-01
Hexamethylene diisocyanate	822-06-0	2.0E+01	1.3E-01	1.0E-01	3.4E-02	1.2E-02
Health Effects	asthma , bron , corn damage , cough , dysp , irrit eyes , irrit resp sys , irrit skin , pulm edema , skin blisters , wheez					
Target Organs	Nose, Respiration - unspecified					
Hexamethylene diisocyanate polymer	28182-81-2	5.0E+02	2.0E+02	2.5E+01		
Hexamethylene glycol	629-11-8	5.0E+02	5.0E+02	1.5E+02		
Hexamethyleneimine	111-49-9	5.0E+02	3.0E+02	4.0E+01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Hexamethylenetetraamine	100-97-0	5.0E+02	5.0E+02	7.5E+01		
Hexamethylenetetramine chloroallyl	4080-31-3	2.0E+02	2.0E+01	3.0E+00		
Hexanal	66-25-1	7.5E+02	7.5E+02	1.5E+02		
Hexane, commercial	110-54-3	3.0E+04	1.2E+04	1.5E+03	1.8E+02	6.0E+01
Health Effects	chemical pneu (aspir liquid) , derm , dizz , head , irrit eyes , irrit nose , nau , peri neur: musc weak , peri neur: numb extremities					
Target Organs	CNS - unspecified, Nervous system - unspecified, Whole body					
Hexane, other isomers	Hexane isom				1.8E+03	6.0E+02
Health Effects	chemical pneu (aspir liquid) , derm , dizz , head , irrit eyes , irrit resp sys , irrit skin , nau					
Target Organs	CNS - unspecified					
Hexanehexol, 1,2,3,4,5,6-	69-65-8	5.0E+02	5.0E+02	5.0E+02		
Hexanenitrile	628-73-9	2.0E+02	4.0E+01	6.0E+00		
Hexanethiol, n-	111-31-9	5.0E+02	2.5E+00	3.5E-01		
Health Effects	cyan , drow , head , incr respiration , irrit eyes , irrit nose , irrit skin , irrit throat , lass , nau , vomit					
Hexanitrostilbene	20062-22-0	3.0E+01	6.0E+00	7.5E-01		
Hexanoic acid	142-62-1	5.0E+02	1.0E+02	1.5E+01		
Hexanol, 2-	626-93-7	5.0E+02	1.0E+02	1.5E+01		
Hexanol, n-	111-27-3	3.0E+02	6.0E+01	7.5E+00		
Hexanone, 2-	591-78-6	6.0E+03	6.0E+03	4.0E+01	2.0E+01	5.0E+00
Health Effects	derm , drow , head , irrit eyes , irrit nose , peri neur: lass , peri neur: pares					
Hexanone, 3-	589-38-8	1.5E+03	3.5E+02	5.0E+01		
Hexanoyl chloride	142-61-0	1.5E+02	3.5E+01	5.0E+00		
Hexaphenylcyclotrisiloxane	512-63-0	5.0E+02	1.5E+02	2.5E+01		
Hexene	592-41-6	1.7E+04	1.7E+03	2.5E+02	1.7E+02	4.2E+01
Hexyl acetate, sec-	108-84-9				2.9E+02	1.0E+02
Health Effects	head , in animals: narco , irrit eyes , irrit nose , irrit skin , irrit throat					
Hexylene glycol	107-41-5	1.5E+03	1.3E+02	5.0E+01		
Health Effects	CNS depres , derm , dizz , head , inco , irrit eyes , irrit resp sys , irrit skin , nau , skin sens					
Hexyltrichlorosilane	928-65-4	3.0E+02	6.6E+01	5.4E+00	5.4E+00	
HFC-134A	811-97-2	1.1E+05	5.4E+04	3.3E+04	3.3E+04	
HMX	2691-41-0	5.0E+02	7.5E-01	1.3E-01		
Holmium	7440-60-0	5.0E+02	1.5E+02	2.5E+01		
Holmium trioxide	12055-62-8	2.5E+02	5.0E+01	3.0E+01		
Humic acid, sodium salt	68131-04-4	2.0E+02	4.0E+01	6.0E+00		
Hyamine 3500	68424-85-1	1.5E+02	3.5E+01	5.0E+00		
Hydrazine	302-01-2	4.6E+01	1.7E+01	1.3E-01	1.3E-01	3.9E-02
Health Effects	carc , convuls , derm , dizz , eye burns , in animals: bron , in animals: pulm edema , irrit eyes , irrit nose , irrit skin , irrit throat , kidney damage , liver damage , nau , skin burns , temporary blindness					
Target Organs	Liver, Nasal - pharynx, Nose					
Hydrazine hydrate, aequeous solutions	10217-52-4	7.5E+00	7.5E-01	1.0E-01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Hydrazine monohydrate	7803-57-8	5.0E+01	7.5E-03	1.0E-03		
Hydrazine monohydrochloride	2644-70-4	5.0E+01	1.0E+01	1.5E+00		
Hydrazine sulfate	10034-93-2	2.5E+02	1.5E+01	2.0E+00		
Hydrazine, dihydrochloride	5341-61-7	4.0E+02	7.5E+01	1.0E+01		
Hydrogen	1333-74-0	3.0E+04	1.5E+04	5.0E+03		1.7E+02
Hydrogen bromide	10035-10-6	4.0E+02	7.3E+01	3.3E+00		
Health Effects	irrit eyes , irrit nose , irrit skin , irrit throat , liquid: frostbite , solution: eye burns , solution: skin burns					
Hydrogen chloride	7647-01-0	1.5E+02	3.3E+01	2.7E+00	2.7E+00	1.5E+00
Health Effects	choking , cough , derm , in animals: lar spasm , irrit Throat, irrit larynx , irrit nose , irrit throat , liquid: frostbite , pulm edema , solution: eye burns , solution: skin burns					
Target Organs	Larynx, Lungs, Nasal-pharynx, None, Nose, Trachea, Whole body					
Hydrogen cyanide	74-90-8	1.7E+01	7.8E+00	2.2E+00	1.1E+00	
Health Effects	anor , asphy , blood changes , conf , dizz , ftg , head , head , incr rate and depth of respiration or respiration slow and gasping , irrit Eyes, lass , nau , nau , numb , thyroid changes , tremors , vertigo , vomit , vomit , weak					
Target Organs	CNS - unspecified, Lungs, Thyroid, Whole body					
Hydrogen fluoride	7664-39-3	3.6E+01	2.0E+01	8.2E-01	8.2E-01	3.3E-02
Health Effects	bone changes , bron , cough Lungs, eye burns , irrit Throat, irrit Eyes, irrit Nose, irrit Respiration - unspecified, irrit Skin, irrit eyes , irrit nose , irrit skin , irrit throat , pulm edema , rhinitis , skin burns , tight Lungs, wheez Lungs					
Target Organs	Eyes, Lungs, Nasal-pharynx, Respiration - unspecified, Whole body					
Hydrogen iodide	10034-85-2	6.3E+02	1.2E+02	5.2E+00		
Hydrogen peroxide	7722-84-1	1.4E+02	7.0E+01	1.4E+01	1.4E+00	4.8E-01
Health Effects	bleaching hair , corn ulcer , eryt , irrit eyes , irrit nose , irrit throat , vesic skin					
Target Organs	CNS - unspecified, Lungs					
Hydrogen peroxide, 30% solution	0-314*	4.0E+02	2.0E+02	4.0E+01		
Hydrogen potassium phthalate	877-24-7	5.0E+02	2.5E+02	4.0E+01		
Hydrogen selenide	7783-07-5	7.3E+00	2.4E+00	3.5E-01	2.0E-01	5.7E-02
Health Effects	diarr , dizz , garlic breath , in animals: pneu , irrit eyes , irrit nose , irrit throat , lass , liquid: frostbite , liver damage , metallic taste , nau , vomit					
Target Organs	GI tract - unspecified					
Hydrogen sulfide	7783-06-4	7.0E+01	3.8E+01	7.1E-01	4.6E-01	4.6E-01
Health Effects	apnea , coma , conj , convuls , corn vesic , dizz , eye pain , GI dist , head , insom , irrit eyes , irrit resp sys , irrity , lac , lass , liquid: frostbite , photo					
Target Organs	Nasal - pharynx, Nose, Respiration - unspecified					
Hydrogenated terphenyls	61788-32-7	7.5E+03	3.0E+01	1.5E+01	4.9E+00	1.7E+00
Health Effects	hemato damage , irrit eyes , irrit resp sys , irrit skin , kidney damage , liver damage					
Target Organs	Liver					
Hydroquinone	123-31-9	5.0E+01	2.0E+01	3.0E+00	1.0E+00	2.4E-01
Health Effects	CNS excitement , collapse , colored urine , delirium , derm , dizz , irrit eyes: conj , irrit skin , kera , musc twitch , nau , rapid breath , sens , suffocation					
Hydrotreated heavy paraffinic distillate	64742-54-7	5.0E+02	5.0E+02	1.5E+02		3.0E-01
Hydrotreated light naphthenic distillate	64742-53-6	5.0E+02	1.0E+02	1.5E+01		
Hydroxy-2-methylpropanoic acid, 2-	594-61-6	2.5E+02	5.0E+01	3.0E+01		
Hydroxy-4'hydroxyethoxy-2-	106797-53-9	5.0E+02	3.5E+02	5.0E+01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Hydroxyapatite	1306-06-5	5.0E+02	6.0E+01	3.5E+01		
Hydroxyethyl methacrylate, 2-	868-77-9	5.0E+02	2.0E+00	3.0E-01		
Hydroxyethylenediaminetriacetic acid	150-39-0	1.5E+02	3.0E+01	4.0E+00		
Hydroxylamine	7803-49-8	2.5E+01	5.0E+00	7.5E-01		
Hydroxylamine hydrochloride	5470-11-1	6.0E+01	6.0E+01	3.5E+01		
Hydroxylamine nitrate	13465-08-2	1.5E+02	4.0E+01	1.5E+01		
Hydroxylamine sulfate	10039-54-0	4.0E+02	7.5E+01	1.0E+01		
Hydroxy-n-phenylbenzamide, N-	304-88-1	2.5E+02	5.0E+01	3.0E+01		
Hydroxyphenyl benzothiazole	3411-95-8	5.0E+02	5.0E+02	1.0E+02		
Hydroxyphenylacetic acid, 1-A	90-64-2	5.0E+02	3.5E+02	5.0E+01		
Hydroxypropyl cellulose	9004-64-2	5.0E+02	5.0E+02	1.3E+02		
Hydroxyquinoline sulfate, 8-	134-31-6	5.0E+02	1.0E+02	1.5E+01		
Hypophosphorous acid	6303-21-5	2.5E+02	5.0E+01	3.0E+01		
Hypophosphorous acid-d3	57583-56-9	6.0E+02	1.3E+02	7.5E+01		
Imidazole	288-32-4	1.0E+02	7.5E+01	1.3E+01		
Imidazole hydrochloride	1467-16-9	5.0E+02	1.5E+02	2.5E+01		
Imidazole, substituted	38668-46-1	2.5E+02	5.0E+01	3.0E+01		
Iminodiacetic acid	142-73-4	1.0E+02	2.0E+01	3.0E+00		
Iminodiacetic acid disodium salt	928-72-3	3.5E+03	6.0E+02	1.0E+02		
Iminodiacetic acid, disodium salt	17593-73-6	5.0E+02	5.0E+02	1.0E+02		
Indan	496-11-7	5.0E+02	5.0E+02	1.3E+02		
Indene	95-13-6	1.5E+03	2.4E+01	2.4E+01	2.4E+01	5.8E+00
Health Effects	in animals: chemical pneu (aspir liquid) , in animals: derm , in animals: irrit eyes , in animals: irrit muc memb , in animals: irrit skin , In animals: kidney inj , in animals: liver inj , in animals: skin sens , in animals: spleen inj					
Target Organs	Kidneys, Liver					
Indeno(1,2,3-cd)pyrene	193-39-5	1.5E+01	3.5E+00	5.0E-01		
Indigo carmine	860-22-0	7.5E+01	7.5E+01	6.0E+01		
Indium (III) oxide	1312-43-2	5.0E+02	6.0E-01	3.6E-01		
Indium and compounds	7440-74-6	3.5E+00	6.0E-01	1.0E-01	1.0E-01	2.4E-02
Health Effects	irrit eyes , irrit resp sys , irrit skin , possible blood effects , possible heart effects , possible kidney effects , possible liver effects , pulm edema					
Target Organs	Bone, GI tract -unspecified, Respiration - unspecified					
Indium oxide vapor	0-318*	5.0E+02	1.0E+02	3.2E-01		
Indium sulfate	13464-82-9	4.0E+00	1.1E+00	6.8E-01		
Indium trichloride	10025-82-8	1.0E+00	1.0E+00	5.8E-01		
Indole-3-carboxaldehyde, 1H-	487-89-8	5.0E+02	1.0E+02	1.5E+01		
Iodic acid	7782-68-5	2.0E+01	1.4E+00	1.4E+00		
Iodine	7553-56-2	5.2E+01	5.2E+00	1.0E+00	1.0E-01	2.5E-02
Health Effects	chest tight , cutaneous hypersensitivity , head , irrit eyes , irrit nose , irrit skin , lac , rash , skin burns					

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Iodine-125	17144-19-3	5.0E+01	5.0E+00	1.0E+00		
Iodobenzene	591-50-4	2.7E+01	2.7E+01	1.6E+00		
Iodoethane	75-03-6	1.5E+01	7.5E-01	7.5E-01		
Iodoform	75-47-8				9.7E+00	2.4E+00
Health Effects	CNS depres , dizz , dysp , heart damage , inco , irrit eyes , irrit skin , kidney damage , liver damage , nau , vis dist					
Target Organs	CNS - unspecified, CVS - unspecified, Kidneys, Liver					
Iodopropynyl butylcarbamate	55406-53-6	5.0E+02	1.0E+02	1.3E+01		
Iotalamic acid	2276-90-6	8.1E+01	1.6E+00	1.6E+00		
Iridium, elemental	7439-88-5	5.0E+02	1.3E+02	2.0E+01		
Iron	7439-89-6	5.0E+02	3.0E+01	4.0E+00		
Iron (II) chloride tetrahydrate	13478-10-9	4.0E+01	7.5E+00	3.6E+00		
Iron carbide	12011-67-5	5.0E+02	2.7E+01	1.6E+01		
Iron hydroxide oxide	20344-49-4	5.0E+02	4.0E+01	2.4E+01		
Iron oxide	1317-61-9	5.0E+02	3.5E+01	2.1E+01		
Iron pentacarbonyl	13463-40-6	1.4E+00	4.8E-01	4.8E-01	4.8E-01	2.0E-01
Health Effects	cough , cyan , degenerative changes in CNS , dizz , dysp , fever , head , irrit eyes , irrit muc memb , irrit resp sys , kidney inj , liver inj , lung inj , nau , vomit					
Target Organs	CNS - unspecified, Whole body					
Iron salts, soluble	Fe salts				1.0E+00	3.4E-01
Health Effects	abdom pain , diarr , irrit eyes , irrit muc memb , irrit skin , possible liver damage , vomit					
Iron(II) perchlorate hexahydrate	13520-69-9	1.5E+02	3.2E+01	1.9E+01		
Iron(III) perchlorate	13537-24-1	1.5E+02	3.2E+01	1.9E+01		
Iron(III) sulfate heptahydrate	35139-28-7	5.0E+02	2.5E+01	1.5E+01		
Isoamyl acetate	123-92-2	5.0E+03	1.0E+03	5.0E+02	2.7E+02	9.1E+01
Health Effects	derm , in animals: narco , irrit eyes , irrit nose , irrit skin , irrit throat					
Isoamyl alcohol	123-51-3	1.5E+03	4.0E+02	4.0E+02	3.6E+02	1.2E+02
Health Effects	cough , diarr , dizz , dysp , head , in animals: narco , irrit eyes , irrit nose , irrit skin , irrit throat , nau , skin cracking , vomit					
Isoamyl nitrite	110-46-3	1.5E+03	3.0E+02	4.0E+01		
Isobenzan	297-78-9	2.0E+00	2.0E+00	1.5E+00		
Isobutanol-2-amine	124-68-5	5.0E+02	6.0E-01	7.5E-02		
Isobutenyl chloride	563-47-3	3.0E+02	6.0E+01	7.5E+00		
Isobutyl acetate	110-19-0	6.0E+03	1.3E+03	7.1E+02	7.1E+02	2.4E+02
Health Effects	anes , drow , head , in animals: narco , irrit eyes , irrit skin , irrit upper resp sys					
Isobutyl alcohol	78-83-1	5.0E+03	5.0E+03	3.5E+03	1.5E+02	5.2E+01
Health Effects	drow , head , in animals: narco , irrit eyes , irrit skin , irrit throat , skin cracking					
Target Organs	Eyes					
Isobutyl chloride	513-36-0	1.5E+02	3.0E+01	4.0E+00		
Isobutyl chloroformate	543-27-1	3.7E+01	1.2E+01	3.5E+00		
Isobutyl isobutyrate	97-85-8	5.0E+02	5.0E+02	5.0E+02		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Isobutylamine	78-81-9	1.0E+02	2.0E+01	6.0E+00		
Isobutyraldehyde	78-84-2	5.0E+03	5.0E+03	7.5E+02		
Isobutyric acid	79-31-2	1.3E+02	2.5E+01	3.5E+00		
Isobutyric anhydride	97-72-3	6.0E+01	1.3E+01	2.0E+00		
Isobutyronitrile	78-82-0	1.9E+02	5.1E+01	2.8E+01		
Health Effects	abdom pain , conf , convuls , dizz , dysp , head , irrit eyes , irrit nose , irrit skin , irrit throat , lass , nau , vomit					
Isocyanatoethyl methacrylate	30674-80-7	6.3E+00	6.3E-01	3.5E-01		
Isocyanic acid	75-13-8	6.0E+00	1.3E+00	2.0E-01		
Isocyanic acid 3,4-dichlorophenyl ester	102-36-3	5.0E+02	1.4E+01	7.5E+00		
Isodrin	465-73-6	7.0E+00	7.0E+00	4.0E+00		
Isolan	119-38-0	5.6E+00	5.6E+00	3.5E+00		
Isonate 181	0-310*	7.5E+01	6.0E+00	7.5E-01		
Isooctyl alcohol	26952-21-6				2.7E+02	9.1E+01
Health Effects	eye burns , irrit eyes , irrit nose , irrit skin , irrit throat , skin burns					
Isopentane	78-78-4	6.0E+04	1.8E+03	1.8E+03	1.8E+03	6.1E+02
Isophorone	78-59-1	1.0E+03	2.5E+01	2.0E+01		
Health Effects	derm , dizz , head , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit nose , irrit throat , lass , mal , narco , nau					
Isophorone diisocyanate	4098-71-9	1.3E+01	1.2E+00	1.5E-01	4.5E-02	1.1E-02
Health Effects	asthma , bron , chest tight , cough , dysp , irrit eyes , irrit resp sys , irrit skin , possible resp sens , pulm edema , sore throat , wheez					
Target Organs	Skin					
Isoprene	78-79-5	1.1E+04	2.8E+03	1.4E+01		
Isopropanol	67-63-0	5.0E+03	1.0E+03	1.0E+03	4.9E+02	2.5E+00
Health Effects	dizz , drow , dry cracking skin , head , in animals: narco , irrit eyes , irrit nose , irrit throat					
Target Organs	CNS - unspecified					
Isopropoxyethanol	109-59-1				1.1E+02	2.6E+01
Health Effects	in animals: anemia , in animals: hema , in animals: irrit eyes , in animals: irrit skin , in animals: pulm edema					
Target Organs	Blood					
Isopropyl acetate	108-21-4	7.5E+03	7.5E+02	7.5E+02	4.2E+02	1.4E+02
Health Effects	derm , in animals: narco , irrit eyes , irrit nose , irrit skin					
Target Organs	Eyes					
Isopropyl chloroformate	108-23-6	5.0E+01	1.7E+01	2.0E+00		
Isopropyl glycidyl ether	4016-14-2				2.4E+02	8.1E+01
Health Effects	irrit eyes , irrit skin , irrit upper resp sys , possible hemato effects , possible repro effects , skin sens					
Target Organs	Skin					
Isopropyl myristate	110-27-0	5.0E+02	5.0E+02	5.0E+02		
Isopropyl nitrate	1712-64-7	3.0E+03	6.0E+02	2.0E+01		
Isopropylamine	75-31-0	1.5E+03	3.0E+02	2.5E+01	1.2E+01	4.1E+00
Health Effects	derm , eye burns , irrit eyes , irrit nose , irrit skin , irrit throat , pulm edema , skin burns , vis dist					
Isopropylaniline, N-	768-52-5				1.1E+01	2.7E+00
Health Effects	ataxia , cyan , dizz , dysp on effort , head , irrit eyes , irrit skin , lass , methemo , tacar					

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Target Organs Blood						
Isopropylmagnesium chloride	1068-55-9	1.0E+02	2.0E+01	3.0E+00		
Isopropyltoluene, p-	99-87-6	5.0E+02	5.0E+02	2.5E+02		
Jeffamine M-600	77110-54-4	2.5E+02	5.0E+01	3.0E+01		
Jet Fuel-5 (JP-5)	70892-10-3		1.1E+03	2.9E+02	2.9E+02	
JP-5/JP-8 jet fuel	94114-58-6	1.1E+03	1.1E+03	2.9E+02		
Kaolin	1332-58-7	5.0E+02	1.3E+02	6.0E+00	2.0E+00	4.9E-01
Health Effects chronic pulm fib , stomach granuloma						
Target Organs Lungs						
Kerosene	8008-20-6	1.1E+03	1.1E+03	2.9E+02	2.9E+02	6.8E+01
Health Effects burning sensation in chest , chemical pneu (aspir liquid) , conf , derm , diarr , drow , head , inco , irrit eyes , irrit nose , irrit skin , irrit throat , lass , nau , restless , vomit						
Target Organs CNS - unspecified, Liver, Skin						
Kerosene, hydrodesulfurized	64742-81-0				2.0E+02	4.9E+01
Ketene	463-51-4	3.4E+00	1.1E+00	3.3E-01	1.5E-01	2.9E-01
Health Effects irrit eyes , irrit nose , irrit resp sys , irrit skin , irrit throat , pulm edema						
Target Organs Lungs						
Ketene	463-51-4	3.4E+00	1.1E+00	3.3E-01	1.5E-01	1.5E-01
Krypton	7439-90-9	1.3E+06	7.5E+05	2.0E+05		
Kyanite	1302-76-7	4.0E+02	7.5E+01	1.5E+01		
Lactic acid	50-21-5	5.0E+02	1.0E+02	1.5E+01		
Lactic acid, monosodium salt	312-85-6	2.5E+02	5.0E+01	3.0E+01		
Lactonitrile	78-97-7	1.5E+02	1.8E+01	1.0E+01		
Lactose, beta-D	5965-66-2	2.5E+02	5.0E+01	3.0E+01		
Lanthanum	7439-91-0	2.5E+02	5.0E+01	3.0E+01		
Lanthanum (III) nitrate, hexahydrate	10277-43-7	1.5E+02	3.5E+01	5.0E+00		
Lanthanum boride	12008-21-8	2.5E+02	5.0E+01	3.0E+01		
Lanthanum carbonate	6487-39-4	2.5E+02	5.0E+01	3.0E+01		
Lanthanum chloride	10099-58-8	5.0E+02	1.5E+02	2.0E+01		
Lanthanum fluoride	13709-38-1	5.0E+02	4.3E+01	2.6E+01		
Lanthanum hydroxide	14507-19-8	2.5E+00	2.0E+00	7.5E-01		
Lanthanum oxide	1312-81-8	5.0E+02	2.0E+02	3.0E+01		
Lanthanum phosphate	14913-14-5	3.0E+00	3.0E+00	7.5E-01		
Laromin C 260	6864-37-5	1.5E+02	3.5E+01	5.0E+00		
Laureth 4 [USAN]	9002-92-0	4.0E+02	3.5E+00	5.0E-01		
Lauryl sulfate	151-41-7	5.0E+02	1.0E+02	1.5E+01		
Lead (II) arsenite	10031-13-7	1.4E+01	1.4E-01	8.4E-02		
Lead acetate	301-04-2	5.0E+02	7.5E+01	1.0E+01		
Lead acetate (II), trihydrate	6080-56-4	5.0E+02	5.0E+02	1.3E+02		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Lead acid arsenate	7784-40-9	2.3E+01	2.3E+01	1.4E-01		
Lead and compounds (inorganic)	7439-92-1	1.0E+02	2.5E-01	1.5E-01	5.0E-02	1.2E-02
Health Effects	abdom pain , anemia , anor , colic , constip , encephalopathy , facial pallor , gingival lead line , hypotension , insom , irrit eyes , kidney disease , lass , low weight , malnut , para ankles , para wrist , tremor					
Target Organs	Blood, CNS - unspecified, Kidneys, Reproductive - unspecified by gender					
Lead arsenate	3687-31-8	3.0E+01	2.0E+01	1.8E-01		
Lead bromide	10031-22-8	1.8E+02	4.4E-01	2.7E-01		
Lead carbonate	598-63-0	1.3E+02	4.0E+00	1.9E-01		
Lead chloride	7758-95-4	1.3E+02	7.5E+00	2.0E-01		
Lead chromate	7758-97-6	9.3E+01	1.0E+00	1.5E-01	1.2E-02	2.9E-03
Lead dioxide	1309-60-0	1.2E+02	2.0E+01	3.0E+00		
Lead fluoborate	13814-96-5	1.8E+02	4.6E-01	2.8E-01		
Lead fluoride	7783-46-2	1.2E+02	1.5E+01	1.8E-01		
Lead hydroxide	19783-14-3	1.2E+02	3.0E-01	1.7E-01		
Lead iodide	10101-63-0	2.2E+02	5.6E-01	3.3E-01		
Lead nitrate	10099-74-8	1.6E+02	4.0E+00	6.0E-01		
Lead oxide	1317-36-8	1.1E+02	5.4E-02	5.4E-02		
Lead phosphate	7446-27-7	1.3E+02	3.0E+01	2.0E-01		
Lead subacetate	1335-32-6	5.0E+02	5.0E+02	1.0E+02		
Lead sulfate	7446-14-2	1.5E+02	3.0E+01	4.0E+00		
Lead sulfide	1314-87-0	1.2E+02	1.2E+02	1.7E-01		
Lead tetroxide	1314-41-6	1.1E+02	2.8E-01	1.7E-01		
Lead(II) perchlorate hydrate	13453-62-8	2.2E+02	5.6E-01	3.3E-01		
Leptophos	21609-90-5	3.0E+01	3.0E+01	1.5E+01		
Lethane 384	112-56-1	4.0E+01	7.5E+00	1.0E+00		
Lewisite 2	40334-69-8	7.4E-01	1.2E-01	1.2E-01		
Lewisite 3	40334-70-1	7.4E-01	1.2E-01	1.2E-01		
Lignosulfonic acid	8062-15-5	5.0E+02	5.0E+02	1.5E+02		
Limonene, D-	5989-27-5	2.0E+03	5.0E+02	3.5E+02		
Lindane	58-89-9	5.0E+01	5.0E+01	1.5E+00	5.0E-01	1.2E-01
Health Effects	aplastic anemia , clonic convuls , cyan , head , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit nose , irrit skin , irrit throat , musc spasm , nau , resp difficulty					
Target Organs	CNS - unspecified, Liver					
Linseed oil	8001-26-1	6.0E+01	1.0E+01	1.5E+00		
Lithium	7439-93-2	4.0E+02	7.5E+01	1.3E+01		
Lithium acetate dihydrate	6108-17-4	5.0E+02	2.5E+02	3.5E+01		
Lithium aluminate	12003-67-7	3.0E+02	6.1E+01	3.7E+01		
Lithium aluminum hydride	16853-85-3	3.5E+01	7.5E+00	2.8E+00		
Lithium aluminum oxide	11089-89-7	6.0E+01	1.3E+01	7.3E+00		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Lithium azide	19597-69-4	2.5E+02	5.0E+01	3.0E+01		
Lithium borohydride	16949-15-8	4.0E+01	1.2E+01	1.2E+01		
Lithium bromide	7550-35-8	5.0E+02	1.5E+01	2.0E+00		1.0E+00
Lithium carbonate	554-13-2	2.0E+02	4.0E+00	6.0E-01		
Lithium chloride	7447-41-8	6.0E+01	1.0E+01	1.5E+00		
Lithium chromate	14307-35-8	3.8E+01	7.5E+00	1.0E+00		
Lithium deuteride	13587-16-1	5.0E-01	1.0E-01	2.5E-02		
Lithium diisopropylamide	4111-54-0	2.5E+02	5.0E+01	3.0E+01		
Lithium fluoride	7789-24-4	3.4E+02	1.7E+01	1.0E+01		
Lithium hydride	7580-67-8	5.0E-01	1.0E-01	2.5E-02	2.5E-02	8.6E-03
Health Effects	blurred vision , esophagus burns (if ingested) , eye burns , irrit eyes , irrit skin , mental conf , mouth burns (if ingested) , musc twitches , nau , skin burns					
Lithium hydroxide	1310-65-2	1.0E+02	1.0E+00	1.5E-01		
Lithium hydroxide monohydrate	1310-66-3	1.0E+02	1.0E+00	1.5E-01		
Lithium iodide	10377-51-2	2.5E+02	5.0E+01	3.0E+01		
Lithium metaborate	13453-69-5	2.0E+02	4.6E+01	2.8E+01		
Lithium molybdate	13568-40-6	5.0E+02	9.1E+00	9.1E+00		
Lithium niobium oxide	12031-63-9	5.0E+02	5.0E+02	2.0E+02		
Lithium nitrate	7790-69-4	5.0E+01	1.0E+01	1.5E+00		
Lithium nitride	26134-62-3	2.5E+02	5.0E+01	3.0E+01		
Lithium perchlorate	7791-03-9	6.0E-02	1.0E-02	1.5E-03		
Lithium silicon	68848-64-6	4.0E+02	7.5E+01	1.3E+01		
Lithium stearate	4485-12-5	5.0E+02	5.0E+02	1.5E+02		
Lithium sulfate	10377-48-7	5.0E+02	3.5E+00	5.0E-01		
Lithium tetraborate	12007-60-2	5.0E+02	1.6E+02	9.4E+01		
Lithium triethylborodeuteride	74540-86-6	2.5E+02	5.0E+01	3.0E+01		
Lithium triethylborohydride, super-	22560-16-3	1.5E+02	3.5E+01	5.0E+00		
LPG	68476-85-7	3.5E+03	3.5E+03	3.5E+03		
Health Effects	asphy , dizz , drow , liquid: frostbite					
Target Organs	CNS - unspecified, CVS - unspecified					
Lubricating oils, refined used	68476-77-7	2.5E+02	5.0E+01	3.0E+01		
Lutetium	7439-94-3	1.5E+02	3.5E+01	5.0E+00		
Lutetium oxide	12032-20-1	2.5E+02	5.0E+01	3.0E+01		
Magnesite	546-93-0	5.0E+02	2.0E+02	4.5E+01		
Health Effects	cough , irrit eyes , irrit resp sys , irrit skin					
Magnesite	7760-50-1	2.5E+02	5.0E+01	3.0E+01		
Magnesium	7439-95-4	1.5E+02	3.0E+01	4.0E+00		
Magnesium acetate tetrahydrate	16674-78-5	1.0E+02	2.0E+01	2.5E+00		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Magnesium aluminum phosphide	z-139	9.5E+00	5.3E+00			
Magnesium aluminum phosphide	0-139*	9.0E+00	5.0E+00	5.0E+00		
Magnesium carbonate basic	39409-82-0	5.0E+02	2.5E+02	1.5E+02		
Magnesium chloride	7786-30-3	5.0E+02	3.0E+02	4.0E+01		
Magnesium chloride hexahydrate	7791-18-6	5.0E+02	5.0E+02	2.5E+02		
Magnesium ethoxide	2414-98-4	5.0E+02	2.4E+02	1.4E+02		
Magnesium fluoride	7783-40-6	4.1E+02	2.1E+01	1.2E+01		
Magnesium hydroxide	1309-42-8	5.0E+02	5.0E+02	2.0E+02		
Magnesium iodate tetrahydrate	7790-32-1	2.5E+02	5.0E+01	3.0E+01		
Magnesium nitrate	10377-60-3	2.5E+02	5.0E+01	3.0E+01		
Magnesium oxide	1309-48-4	5.0E+02	1.5E+02	3.0E+01	1.0E+01	3.4E+00
Health Effects	irrit eyes , irrit nose , metal fume fever: chest pain , metal fume fever: cough , metal fume fever: flu-like fever					
Magnesium Phosphide	12057-74-8	9.9E+00	5.5E+00	3.0E+00		
Magnesium silicate	1343-88-0	5.0E+02	5.0E+01	3.0E+01		
Magnesium sulfate	7487-88-9	1.3E+02	1.0E+01	1.5E+00		
Magnesium sulfate heptahydrate	10034-99-8	5.0E+02	1.0E+02	1.5E+01		
Malachite green	569-64-2	3.5E+01	6.0E+00	1.0E+00		
Malathion	121-75-5	3.9E+02	1.2E+02	1.5E+01	1.5E+01	1.4E-01
Health Effects	abdom cramps , aching eyes , anor , ataxia , blurred vision , chest tight , conf , diarr , dizz , head , irrit eyes , irrit skin , lac , lar spasm , miosis , nau , rhin , salv , vomit , wheez					
Target Organs	Nervous system - unspecified, Respiration - unspecified					
Maleic acid	110-16-7	3.0E+02	6.0E+01	7.5E+00		
Maleic acid, disodium salt	371-47-1	5.0E+02	5.0E+02	7.5E+01		
Maleic anhydride	108-31-6	8.0E+01	8.0E+00	8.0E-01		
Health Effects	bronchial asthma , conj , derm , double vision , irrit nose , irrit upper resp sys , photo vision					
Maleic hydrazide	123-33-1	5.0E+02	1.3E+01	2.0E+00		
Malic acid	617-48-1	5.0E+02	1.3E+02	2.0E+01		
Malonic acid	141-82-2	5.0E+02	4.0E+02	6.0E+01		
Malononitrile	109-77-3	2.7E+01	1.3E+01	7.5E+00		
Health Effects	abdom pain , conf , convuls , dizz , dysp , head , irrit eyes , irrit nose , irrit skin , irrit throat , lass , nau , vomit					
Mancozeb	8018-01-7	5.0E+02	2.0E+02	3.0E+00		
Manganese	7439-96-5	5.0E+02	5.0E+00	3.0E+00		
Health Effects	asthenia , insom , kidney damage , lass , low-back pain , mal , mental conf , metal fume fever: chest tight , metal fume fever: cough , metal fume fever: dry throat , metal fume fever: dysp , metal fume fever: flu-like fever , metal fume fever: rales , Pa					
Target Organs	CNS - unspecified, Lungs, Nervous system - unspecified, Reproductive - unspecified by gender					
Manganese (II) chloride	7773-01-5	5.0E+02	1.2E+01	6.9E+00		
Manganese (II) chloride tetrahydrate	13446-34-9	5.0E+02	1.8E+02	1.1E+01		
Manganese (II) nitrate	10377-66-9	5.0E+02	1.6E+01	9.8E+00		
Manganese (II) sulfate monohydrate	10034-96-5	5.0E+02	1.5E+01	9.2E+00		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Manganese carbonate	598-62-9	5.0E+02	1.1E+01	6.3E+00		
Manganese cyclopentadienyl	12079-65-1				1.0E-01	2.4E-02
Health Effects	CNS changes , convuls , decr resistance to infection , in animals: irrit skin , kidney changes , pulm edema , resp sys changes					
Target Organs	CNS - unspecified					
Manganese dioxide	1313-13-9	5.0E+02	7.9E+01	4.8E+00		
Manganese hydroxide	18933-05-6	5.0E+02	8.1E+00	4.9E+00		
Manganese oxide	1317-35-7	5.0E+02	6.9E+01	4.2E+00		
Health Effects	asthenia , insom , kidney damage , lass , low-back pain , mal , mental conf , pneu , vomit					
Manganese oxide	1344-43-0	5.0E+02	6.5E+00	7.5E-01		
Manganese sulfate	7785-87-7	5.0E+02	1.4E+01	8.3E+00		
Manganese sulfide	18820-29-6	5.0E+02	7.9E+00	9.5E-01		
Manganese(II) nitrate hydrate	15710-66-4	5.0E+02	1.8E+01	1.1E+01		
Manganese(III) oxide	1317-34-6	5.0E+02	7.2E+01	4.3E+00		
Mastic absolute	61789-92-2	5.0E+02	1.0E+02	1.3E+01		
Melamine	108-78-1	5.0E+02	5.0E+01	3.0E+01		
Menadione	66-71-7	3.0E+01	2.0E+00	3.0E-01		
Mephosfolan	950-10-7	9.0E+00	9.0E+00	5.0E+00		
Mercaptobenzothiazole, 2-	149-30-4	4.0E+01	4.0E+01	1.5E+01		
Mercaptoethanol, 2-	60-24-2	6.0E+02	4.0E+01	6.0E+00		
Mercuric acetate	1600-27-7	3.2E+00	3.2E+00	4.8E-02		
Mercuric chloride	7487-94-7	1.4E+01	1.4E+01	2.0E+00		
Mercuric cyanide	592-04-1	1.3E+01	1.3E+01	1.5E+00		
Mercuric iodide	7774-29-0	2.3E+01	2.3E-01	5.7E-02		
Mercuric nitrate monohydrate	7782-86-7	1.4E+01	1.4E-01	3.5E-02		
Mercuric sulfate	7783-35-9	1.5E+01	1.5E-01	3.7E-02		
Mercuric thiocyanate	592-85-8	1.6E+01	1.6E-01	4.0E-02		
Mercuric trifluoroacetate	13257-51-7	4.3E+00	8.5E-02	6.4E-02		
Mercurol	12002-19-6	1.0E+01	1.0E-01	2.5E-02		
Mercurous chloride	7546-30-7	1.2E+01	1.2E-01	2.9E-02		
Mercurous nitrate	10415-75-5	1.3E+01	1.3E-01	3.3E-02		
Mercurous oxide	15829-53-5	1.0E+01	1.0E-01	2.6E-02		
Mercury (II) oxide	21908-53-2	1.1E+01	1.1E+00	1.5E-01		
Mercury nitrate	10045-94-0	1.6E+01	1.6E-01	4.1E-02		
Mercury(I) chloride	10112-91-1	1.2E+01	1.2E+00	1.5E-01		
Mercury(II) nitrate monohydrate	7783-34-8	1.7E+01	1.7E-01	4.3E-02		
Mercury, alkyl compounds	Hg alkyl				1.0E-02	2.4E-03
Health Effects	ataxia , constip , diarr , dizz , dysarthria , emotional dist , hearing dist , jerking limbs , kidney inj , lac , nau , pares , possible terato effects , salv , skin burns , spasticity , vis dist , vomit					

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Target Organs	CNS - unspecified					
Mercury, aryl compounds	Hg aryl				1.0E-01	2.4E-02
Mercury, elemental	7439-97-6	8.9E+00	1.7E+00	3.0E-01	2.5E-02	1.0E-02
Health Effects	anor , bron , chest pain , cough , dysp , GI dist , head , indecision , insom , irrit eyes , irrit skin , irrity , lass , low weight , pneu , prot , salv , stomatitis , tremor					
Target Organs	CNS - unspecified, Kidneys, Nervous system - unspecified, Reproductive - unspecified by gender					
Mesityl oxide	141-79-7	5.0E+03	1.0E+02	1.0E+02	6.0E+01	2.1E+01
Health Effects	CNS effects , coma , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit muc memb , irrit skin , narco					
Target Organs	Kidneys, Liver					
Metaphosphoric acid	37267-86-0	2.5E+02	5.0E+01	3.0E+01		
Methacrolein diacetate	10476-95-6	4.4E+01	4.4E+01	2.5E+01		
Methacrylaldehyde	78-85-3	1.3E+01	8.0E+00	5.7E-01	5.7E-01	
Methacrylamide	79-39-0	2.0E+02	3.0E-01	4.0E-02		
Methacrylic acid	79-41-4	7.7E+02	2.1E+02	2.4E+01	2.4E+01	2.4E+01
Health Effects	eye burns , irrit eyes , irrit muc memb , irrit skin , skin burns					
Methacrylic anhydride	760-93-0	1.5E+02	4.5E+00	2.5E+00		
Methacrylonitrile	126-98-7	6.9E+01	3.6E+01	2.7E+00	2.7E+00	
Health Effects	in animals: convuls , in animals: loss of motor control in hind limbs , irrit eyes , irrit skin , lac					
Target Organs	CNS - unspecified					
Methacryloyl chloride	920-46-7	2.5E+01	6.0E-01	3.5E-01		
Methamidophos	10265-92-6	8.1E+00	3.6E+00	1.9E+00	6.1E-01	
Methan-d3-ol-d	811-98-3	1.0E+04	3.0E+03	7.5E+02		
Methane	74-82-8	1.3E+05	3.0E+03	2.0E+03	6.6E+02	6.6E+02
Methane-d3	676-80-2	4.0E+04	4.0E+03	2.0E+03		
Methanesulfonic acid	75-75-2	4.0E+02	7.5E+01	1.3E+01		
Methanesulfonic acid ethyl ester	62-50-0	1.5E+02	1.0E+01	1.5E+00		
Methanesulfonyl chloride	124-63-0	2.9E+01	9.8E+00	1.3E+00		
Methanesulfonyl fluoride	558-25-8	1.4E+01	1.4E+01	7.5E+00		
Methanol	67-56-1	9.3E+03	2.8E+03	6.9E+02	3.5E+02	1.3E+01
Health Effects	derm , dizz , drow , head , irrit eyes , irrit skin , irrit upper resp sys , nau , optic nerve damage (blindness) , vis dist , vomit					
Target Organs	CNS - unspecified, Eyes					
Methidathion	950-37-8	4.0E+02	2.0E+01	3.0E+00		
Methiocarb	2032-65-7	1.5E+01	1.5E+01	7.5E+00		
Methomyl	16752-77-5	1.7E+01	5.7E+00	5.7E+00	2.5E+00	6.1E-01
Health Effects	abdom cramps , blurred vision , dysp , irrit eyes , kidney damage , lass , liver damage , miosis , musc twitch , nau , salv , vomit					
Methoxybenzaldehyde	123-11-5	5.0E+02	1.5E+00	2.0E-01		
Methoxychlor	72-43-5	5.0E+02	2.5E+02	3.0E+01	1.0E+01	2.4E+00
Health Effects	in animals: carc , in animals: convuls , in animals: fasc , in animals: kidney damage , in animals: liver damage , in animals: trembling					

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Target Organs	CNS - unspecified, Liver					
Methoxyethanol, 2-	109-86-4	6.0E+02	7.5E+00	1.0E+00	3.1E-01	7.6E-02
Health Effects	anemic pallor , ataxia , drow , head , in animals: repro effects , in animals: terato effects , irrit eyes , irrit nose , irrit throat , lass , tremor					
Target Organs	Blood, Reproductive - unspecified by gender, Testes					
Methoxyethyl acetate, 2-	110-49-6	1.0E+03	2.5E+01	1.5E+00	4.8E-01	1.2E-01
Health Effects	brain damage , in animals: narco , irrit eyes , irrit nose , irrit throat , kidney damage , repro effects , terato effects					
Target Organs	Blood, Reproductive - unspecified by gender					
Methoxyethyl mercuric acetate	151-38-2	3.2E+00	3.2E+00	4.8E-02		
Methoxyethylamine, 2-	109-85-3	1.5E+02	3.5E+01	5.0E+00		
Methoxyphenol, 4-	150-76-5	5.0E+02	1.0E+02	1.5E+01	5.0E+00	1.2E+00
Health Effects	CNS depres , eye burns , irrit eyes , irrit nose , irrit skin , irrit throat , irrit upper resp sys , skin burns					
Target Organs	Eyes					
Methoxypropylamine, 3-	5332-73-0	1.5E+02	5.0E+01	5.0E+01		
Methoxytrimethylsilane	1825-61-2	2.0E+01	7.5E+00	2.0E+00		
Methyl 2-chloroacrylate	80-63-7	3.5E+01	5.0E+00	7.5E-01		
Methyl 2-cyanoacrylate	137-05-3	6.0E+01	6.0E+01	1.5E+01	9.1E-01	3.1E-01
Health Effects	blurred vision , irrit eyes , irrit nose , irrit skin , lac , rhinitis					
Target Organs	Skin					
Methyl 3-(2,2-dichlorovinyl)-2,2-	61898-95-1	2.5E+02	5.0E+01	3.0E+01		
Methyl acetate	79-20-9	7.5E+03	1.5E+03	7.5E+02	6.1E+02	2.1E+02
Health Effects	chest tight , drow , head , in animals: narco , irrit eyes , irrit nose , irrit skin , irrit throat , optic nerve atrophy					
Methyl acetylene	74-99-7	2.5E+03	2.5E+03	2.5E+03	1.6E+03	4.0E+02
Health Effects	anes , hyperexcitability , irrit resp sys , liquid: frostbite , tremor					
Methyl acetylene-propadiene mixture	59355-75-8	1.0E+04	4.0E+03	4.0E+03	1.6E+03	4.0E+02
Health Effects	anes , conf , excitement , irrit resp sys , liquid: frostbite					
Methyl acrylate	96-33-3	7.5E+02	2.5E+01	7.0E+00	7.0E+00	2.4E+00
Health Effects	irrit eyes , irrit skin , irrit upper resp sys					
Methyl alcohol-d	1455-13-6	1.0E+04	2.5E+03	7.5E+02		
Methyl aniline, N-	100-61-8	4.0E+02	1.0E+01	7.5E+00	2.2E+00	5.4E-01
Health Effects	cyan , dizz , dysp , head , kidney damage , lass , liver damage , methemo , pulm edema					
Target Organs	Blood					
Methyl benzoate	93-58-3	5.0E+02	2.5E+02	3.5E+01		
Methyl bromide	74-83-9	2.9E+03	8.2E+02	8.0E+01	4.0E+00	1.3E-01
Health Effects	carc , convuls , dizz , dysp , hand tremor , head , inco , irrit eyes , irrit resp sys , irrit skin , liquid: frostbite , mal , musc weak , nau , skin vesic , vis dist , vomit					
Target Organs	Nervous system - unspecified, Nose					
Methyl bromoacetate	96-32-2	2.5E+01	5.0E+00	7.5E-01		
Methyl chloride	74-87-3	6.2E+03	1.9E+03	2.0E+02	1.0E+02	7.1E-01
Health Effects	carc , coma , convuls , dizz , kidney damage , liquid: frostbite , liver damage , nau , repro effects , slurred speech , stagger , terato effects , vis dist , vomit					
Target Organs	Brain, CNS - unspecified, Kidneys, Liver, Nervous system - unspecified, Reproductive - unspecified by gender					
Methyl chlorocarbonate	79-22-1	2.6E+01	8.5E+00	1.3E+00		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Methyl chlorosilane	68937-17-7	3.3E+02	7.3E+01	5.9E+00	5.9E+00	
Methyl chlorosilane	993-00-0	3.3E+02	7.3E+01	5.9E+00		
Methyl cyclopentadienyl manganese	12108-13-3	7.5E+00	6.0E-01	6.0E-01	2.0E-01	4.9E-02
Health Effects	dizz , head , in animals: kidney inj , in animals: lass , in animals: liver inj , in animals: severe clonic spasms , in animals: slow respiration , in animals: tremor , irrit eyes , nau					
Target Organs	CNS - unspecified, Kidneys, Liver					
Methyl demeton	8022-00-2				5.0E-02	1.2E-02
Health Effects	aching eyes , dizz , head , irrit eyes , irrit skin , nau , rhin , vomit					
Methyl demeton methyl	2587-90-8	2.0E+01	2.0E+01	1.3E+01		
Methyl dichloroarsine	593-89-5	1.6E-01	5.3E-02	5.3E-02		
Methyl dichlorosilane	75-54-7	2.2E+02	5.2E+01	4.2E+00	4.2E+00	
Methyl ether	115-10-6	1.3E+05	7.5E+03	5.0E+03		
Methyl ethyl ketone	78-93-3	1.2E+04	8.0E+03	5.9E+02	5.9E+02	2.0E+02
Health Effects	derm , dizz , head , irrit eyes , irrit nose , irrit skin , vomit					
Target Organs	CNS - unspecified, Conceptuses/Fetuses, Developmental - generic					
Methyl ethyl ketone peroxide	1338-23-4	1.5E+02	1.5E+02	2.0E+01		
Health Effects	abdom pain , blisters , blurred vision , cough , derm , diarr , dysp , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit nose , irrit skin , irrit throat , pulm edema , scars skin , vomit					
Target Organs	Kidneys, Liver					
Methyl fluoride	593-53-3	4.5E+02	2.2E+01	1.3E+01		
Methyl fluoroacetate	453-18-9	5.0E+00	3.5E-01	5.0E-02		
Methyl fluorosulfate	421-20-5	1.3E+00	2.5E-01	3.5E-02		
Methyl formate	107-31-3	1.0E+04	2.0E+03	3.5E+02	2.5E+02	8.4E+01
Health Effects	chest tight , CNS depres , dysp , in animals: narco , in animals: pulm edema , irrit eyes , irrit nose , vis dist					
Target Organs	Lungs					
Methyl hydrazine	60-34-4	5.1E+00	1.7E+00	3.5E-01	2.0E-02	6.5E-03
Health Effects	anoxia , ataxia , carc , convuls , cyan , diarr , irrit eyes , irrit resp sys , irrit skin , tremor , vomit					
Target Organs	Liver					
Methyl iodide	74-88-4	1.7E+03	4.8E+02	1.3E+02	6.4E+01	4.0E+00
Health Effects	ataxia , carc , derm , dizz , drow , irrit eyes , irrit resp sys , irrit skin , nau , slurred speech , vomit					
Target Organs	CNS - unspecified					
Methyl isoamyl ketone	110-12-3	7.5E+03	7.5E+03	6.0E+02	2.3E+02	8.0E+01
Health Effects	coma , derm , head , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit muc memb , irrit skin , narco					
Target Organs	Kidneys, Liver					
Methyl isobutyl carbinol	108-11-2				1.0E+02	3.6E+01
Health Effects	derm , drow , head , in animals: narco , irrit eyes , irrit skin					
Methyl isobutyl ketone	108-10-1	2.0E+03	3.0E+02	3.0E+02	8.2E+01	2.8E+01
Health Effects	coma , derm , head , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit muc memb , irrit skin , narco					
Target Organs	Bone, Developmental - generic, Kidneys					
Methyl isocyanate	624-83-9	4.7E-01	1.6E-01	5.8E-02	2.0E-02	1.6E-02
Health Effects	asthma , chest pain , cough , dysp , eye damage , in animals: pulm edema , irrit upper respiratory tract, irrit Eyes, irrit Nasal-pharynx, irrit eyes , irrit nose , irrit skin , irrit throat , lac , pulm secretions , resp sens , skin damage					

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Target Organs	Developmental - generic, Heart, Lungs					
Methyl isopropyl ketone	563-80-4	2.0E+03	7.0E+02	7.0E+02	7.0E+02	2.4E+02
Health Effects	cough , irrit eyes , irrit muc memb , irrit resp sys , irrit skin					
Methyl isothiocyanate	556-61-6	2.1E+02	6.9E+01	2.4E+00	2.4E+00	
Methyl magnesium bromide	75-16-1	2.0E+02	4.0E+01	6.0E+00		
Methyl mercaptan	74-93-1	1.3E+02	9.2E+01	9.8E-03	9.8E-03	9.8E-03
Health Effects	convuls , cyan , irrit eyes , irrit resp sys , irrit skin , liquid: frostbite , narco					
Target Organs	Liver, Whole body					
Methyl methacrylate	80-62-6	2.3E+03	4.9E+02	7.0E+01	7.0E+01	7.0E+01
Health Effects	derm , irrit eyes , irrit nose , irrit skin , irrit throat					
Target Organs	Nose, Skin					
Methyl n-amyl ketone	110-43-0	3.5E+03	6.0E+02	4.0E+02	2.3E+02	8.0E+01
Health Effects	coma , derm , head , irrit eyes , irrit muc memb , irrit skin , narco					
Methyl nitrate	598-58-3	1.5E+03	3.5E+02	5.0E+01		
Methyl nonafluorobutyl ether	163702-07-6	1.5E+05	8.4E+04	2.6E+04	2.6E+04	
Methyl orange,sodium salt	547-58-0	2.5E+01	5.0E+00	7.5E-01		
Methyl parathion	298-00-0	3.5E+00	1.2E+00	6.0E-02	2.0E-02	4.9E-03
Health Effects	abdom cramps , blurred vision , card irreg , chest tight , diarr , dizz , dysp , head , irrit eyes , irrit skin , lass , miosis , musc fasc , nau , rhin , salv , vomit					
Methyl phencapton	3735-23-7	1.0E+02	1.1E+01	6.0E+00		
Methyl phosphonothioic dichloride	676-98-2	1.5E+02	3.0E+01	4.0E+00		
Methyl phosphonous dichloride	676-83-5	5.0E+01	1.0E+01	1.5E+00		
Methyl propyl ketone	107-87-9	5.0E+03	5.0E+02	5.0E+02		
Health Effects	coma , derm , head , irrit eyes , irrit muc memb , irrit skin , narco					
Methyl salicylate	119-36-8	7.5E+01	1.5E+01	2.5E+00		
Methyl sulfoxide-d6	2206-27-1	6.0E+03	7.5E+02	7.5E+02		
Methyl tertiary butyl ether	1634-04-4	1.9E+04	2.1E+03	1.8E+02	1.8E+02	4.9E+00
Methyl thiocyanate	556-64-9	7.5E+01	7.5E+01	4.0E+01		
Methyl trifluoromethanesulfonate	333-27-7	5.0E+02	3.6E+01	2.2E+01		
Methyl vinyl carbinol	598-32-3	7.5E+01	1.5E+01	2.0E+00		
Methyl vinyl ketone	78-94-4	6.9E+00	3.4E+00	4.9E-01	4.9E-01	
Methyl vinyl ketone	98-94-4	6.9E+00	3.4E+00	4.9E-01	4.9E-01	
Methyl-1H-benzotriazole	29385-43-1	3.0E+02	6.0E+01	7.5E+00		
Methyl-1-phenyl-2-pyrazolin-5-one, 3-	89-25-8	5.0E+02	3.0E+02	4.0E+01		
Methyl-1-propen-1-one, 2-	598-26-5	1.0E+01	2.0E+00	2.5E-01		
Methyl-2-pyrrolidinone, 1-	872-50-4	1.0E+02	1.0E+02	4.0E+01		
Methyl-5-nitroaniline, 2-	99-55-8	2.5E+02	1.5E+02	3.0E+00	1.0E+00	2.4E-01
Methyl-5-vinylpyridine, 2-	140-76-1	4.0E+01	1.9E+00	1.0E+00		
Methylal	109-87-5	6.0E+03	6.0E+03	6.0E+03	3.1E+03	1.1E+03
Health Effects	anes , irrit eyes , irrit skin , irrit upper resp sys					

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Target Organs	CNS - unspecified					
Methylamine hydrochloride	593-51-1	5.0E+02	6.0E+01	1.0E+01		
Methylaniline, 2-	95-53-4	2.0E+02	2.0E+01	2.0E+01	8.8E+00	2.1E+00
Health Effects	anoxia , carc , cyan , derm , dizz , drow , eye burns , head , irrit eyes , lass , micro hema					
Target Organs	Kidneys					
Methylaziridine, 1-	1072-44-2	2.0E+02	4.0E+00	4.0E+00		
Methylbutanamide, 3-	541-46-8	5.0E+02	1.3E+02	2.0E+01		
Methylbutene	563-46-2	1.0E+06	6.0E+05	1.5E+05		
Methylcellulose	9004-67-5	5.0E+02	3.5E+02	5.0E+01		
Methylcholanthrene, 3-	56-49-5	7.5E+01	4.0E+00	6.0E-01		
Methylcyclohexane	108-87-2	5.0E+03	5.0E+03	5.0E+03	1.6E+03	5.5E+02
Health Effects	dizz , drow , in animals: narco , irrit eyes , irrit nose , irrit skin , irrit throat					
Methylcyclohexanol	25639-42-3				2.3E+02	8.0E+01
Health Effects	head , in animals: narco , irrit eyes , irrit skin , irrit upper resp sys , kidney damage , liver damage					
Target Organs	Kidneys, Liver					
Methylcyclohexanone	1331-22-2	7.5E+02	1.5E+02	2.5E+01		
Methylcyclohexanone, o-	583-60-8	2.5E+03	5.0E+02	3.5E+02	2.3E+02	7.9E+01
Health Effects	derm , in animals: irrit eyes , in animals: irrit muc memb , narco					
Methylcyclopentane	96-37-7	1.3E+04	3.0E+02	4.0E+01		
Methylene chloride	75-09-2	2.4E+04	1.9E+03	6.9E+02	1.7E+02	1.4E+00
Health Effects	carc , dizz , drow , irrit eyes , irrit skin , lass , nau , numb limbs , tingle limbs					
Target Organs	CNS - unspecified, Liver, Nervous system - unspecified, Unspecified					
Methylene diphenyl diisocyanate	101-68-8	2.5E+01	2.0E+00	2.0E-01	5.1E-02	1.3E-02
Health Effects	asthma , chest pain , cough , dysp , irrit eyes , irrit nose , irrit throat , pulm secretions , resp sens					
Target Organs	Lungs, Nasal - pharynx, Nose					
Methylene-bis(2-chroloaniline), 4,4'-	101-14-4	5.0E+02	5.0E+00	3.0E-01	1.1E-01	2.7E-02
Health Effects	carc , cyan , hema , kidney irrit , methemo , nau					
Target Organs	Lungs					
Methylene-bis(4-cyclohexylisocyanate)	5124-30-1	2.0E+00	1.0E-01	5.4E-02	5.4E-02	1.8E-02
Health Effects	chest tight , cough , dry throat , dysp , irrit eyes , irrit resp sys , irrit skin , pulm edema , resp sens , skin blisters , skin sens , wheez					
Methylenebis(isocyanatobenzene),	68092-58-0	2.5E+02	5.0E+01	3.0E+01		
Methylenedianiline, 4,4'-	101-77-9	1.5E+02	4.0E+00	8.1E-01	8.1E-01	2.0E-01
Health Effects	hepatitis , in animals: carc , in animals: heart damage , in animals: liver damage , in animals: spleen damage , irrit eyes , jaun , myocardial damage					
Target Organs	Liver					
Methylethyl hydroperoxide, 1-	3031-75-2	6.0E+01	1.3E+01	2.0E+00		
Methylfuran, 2-	534-22-5	1.5E+02	1.5E+02	6.0E+01		
Methylheptane, 4-	589-53-7	2.0E+02	4.0E+01	6.0E+00		
Methylimidazole	822-36-6	3.0E+02	3.0E+02	6.0E+01		
Methylimidazole, 1-	616-47-7	5.0E+02	1.3E+02	1.5E+01		
Methyllithium	917-54-4	1.0E+02	2.0E+01	3.0E+00		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Methylmagnesium chloride	676-58-4	1.5E+02	3.5E+01	5.0E+00		
Methylmercuric dicyanamide	502-39-6	3.0E+00	3.0E+00	4.5E-02		
Methylmercury	22967-92-6	2.1E+00	4.3E-02	3.2E-02		
Methylnaphthalene, 1-	90-12-0	5.0E+02	2.0E+01	2.0E+01	2.9E+00	1.0E+00
Methylnapthalene, 2-	91-57-6	5.0E+02	3.5E+00	3.0E+00	2.9E+00	1.0E+00
Methylnitrosopiperidine, 3-	13603-07-1	3.0E+01	6.0E+00	7.5E-01		
Methyl-N'-nitro-N-nitrosoguanidine, N-	70-25-7	4.0E+01	2.5E+00	3.5E-01		
Methyl-N-nitroso-1-propanamine, N-	924-46-9	1.5E+01	7.5E-01	1.3E-01		
Methylpentane, 2-	107-83-5	7.5E+03	1.5E+03	1.5E+03		
Methylphenylthiourea, 2-	614-78-8	5.0E+01	5.0E+01	3.0E+01		
Methylphosphonic acid	993-13-5	1.0E+01	1.0E+01	1.0E+01		
Methylphosphonic dichloride	676-97-1	1.5E+01	1.4E+00	2.0E-01		
Methylphosphonic difluoride	676-99-3	1.0E+02	2.0E+01	2.5E+00		
Methylphosphonothioic acid-O-ethyl O-	2703-13-1	1.0E+01	1.0E+01	6.0E+00		
Methylpropane, 2-	75-28-5	3.5E+04	1.0E+04	6.0E+03		
Health Effects	asphy , drow , liquid: frostbite , narco					
Methylpropene, 2-	115-11-7	2.0E+05	3.0E+03	1.5E+03	5.7E+02	1.4E+02
Methylpyridine, 2-	109-06-8	1.3E+03	2.0E+01	2.0E+01		
Methylpyridine, 3-	108-99-6	2.5E+03	5.0E+02	2.0E+01		
Methylpyrrolidine	120-94-5	7.5E+01	1.5E+01	2.0E+00		
Methylstyrene, alpha-	98-83-9	3.5E+03	5.0E+02	5.0E+02	4.8E+01	1.7E+01
Health Effects	derm , drow , irrit eyes , irrit nose , irrit skin , irrit throat					
Methyltetrahydrofuran, 2-	96-47-9	2.0E+03	4.0E+02	6.0E+01		
Methyltetrahydrophthalic anhydride	26590-20-5	5.0E+02	2.0E+02	3.0E+01		
Methylthiophenyl dimethyl phosphate,	3254-63-5	7.0E+00	7.0E+00	4.0E+00		
Methyltriacetoxysilane	4253-34-3	5.0E+02	1.5E+02	2.5E+01		
Methyltrichlorosilane	75-79-6	2.0E+02	4.5E+01	3.7E+00	3.7E+00	
Methyltriethoxysilane	2031-67-6	4.0E+03	7.5E+02	1.3E+02		
Methyltrimethoxysilane	1185-55-3	5.0E+02	5.0E+02	1.5E+02		
Methyltrioctylammonium chloride	5137-55-3	1.0E+02	2.0E+01	2.5E+00		
Methylvinyldichlorosilane	124-70-9	2.9E+02	6.3E+01	5.2E+00	5.2E+00	
Metolcarb	1129-41-5	2.0E+02	4.8E+00	3.0E+00		
Metribuzin	21087-64-9				5.0E+00	1.2E+00
Health Effects	in animals: CNS depres , liver enzyme changes , thyroid changes					
Target Organs	Blood, Liver					
Mexacarbate	315-18-4	1.4E+01	1.4E+01	7.5E+00		
Mica	12001-26-2	5.0E+02	1.5E+01	9.0E+00	3.0E+00	7.3E-01
Health Effects	cough , dysp , irrit eyes , lass , low weight , pneumoconiosis					

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Target Organs Lungs						
Michler's ketone	90-94-8	4.0E+01	2.5E+01	3.5E+00		
Mineral oil, white	8042-47-5	5.0E+02	5.0E+02	1.5E+01		
Mineral spirits	64475-85-0	7.5E+03	1.5E+03	2.5E+02		
Mirex	2385-85-5	1.0E+02	6.0E-01	7.5E-02		
Mitomycin C	50-07-7	2.3E+01	2.3E+01	1.3E+01		
Molybdenum	7439-98-7	5.0E+02	5.0E+01	3.0E+01	5.0E-01	1.2E-01
Health Effects anemia , in animals: anor , in animals: diarr , in animals: dysp , in animals: inco , in animals: irrit eyes , in animals: irrit nose , in animals: irrit throat , in animals: kidney damage , in animals: listlessness , in animals: liver damage , in animals						
Target Organs CNS - unspecified, Lungs						
Molybdenum (IV) oxide	18868-43-4	5.0E+02	3.5E+00	2.0E+00		
Molybdenum (IV) sulfide	1317-33-5	5.0E+02	8.3E+01	5.0E+01		
Molybdenum carbide	12069-89-5	5.0E+02	5.6E+01	3.4E+01		
Molybdenum hexacarbonyl	13939-06-5	5.0E+02	1.4E+02	8.3E+01		
Molybdenum orange	12656-85-8	5.0E+02	5.0E+02	1.5E+02		
Molybdenum pentachloride	10241-05-1	5.0E+02	5.0E+02	4.3E+00		
Molybdenum silicide	12136-78-6	5.0E+02	7.9E+01	4.8E+01		
Molybdenum trioxide	1313-27-5	5.0E+02	7.5E-01	7.5E-01		
Molybdic acid	7782-91-4	5.0E+02	4.2E+00	2.5E+00		
Molybdophosphoric acid hydrate	51429-74-4	5.0E+02	4.0E+00	2.4E+00		
Molybdophosphoric acid, X-hydrate	12026-57-2	5.0E+02	4.0E+00	2.4E+00		
Monoammonium phosphate	7722-76-1	5.0E+02	3.5E+02	5.0E+01		
Monochloramine	10599-90-3	1.0E+01	2.0E+00	3.5E-01		
Monocrotophos	6923-22-4	7.3E-01	2.4E-01	1.5E-01	5.0E-02	1.2E-02
Health Effects abdom cramps , blurred vision , convuls , diarr , dizz , dysp , in animals: possible terato effects , irrit eyes , miosis , nau , salv , vomit						
Monomethylamine	74-89-5	4.4E+02	8.0E+01	1.9E+01	1.9E+01	2.2E+00
Health Effects conj , cough , derm , irrit eyes , irrit resp sys , irrit skin , liquid: frostbite , muc memb burns , skin burns						
Monosodium citrate	18996-35-5	5.0E+02	1.0E+02	1.5E+01		
Montmorillonite	1318-93-0	3.0E+01	6.0E+00	7.5E-01		
Morpholine	110-91-8	5.0E+03	1.0E+02	1.0E+02	7.1E+01	2.4E+01
Health Effects cough , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit nose , irrit resp sys , irrit skin , vis dist						
Target Organs Eyes						
Morpholinepropanesulfonic acid, 4-	1132-61-2	1.3E+02	2.5E+01	4.0E+00		
Muscimol	2763-96-4	2.0E+01	1.7E+01	1.0E+01		
Mustard gas sulfoxide	5819-08-9	4.0E+01	7.5E+00	1.3E+00		
Myoglobins	9008-45-1	2.5E+02	5.0E+01	3.0E+01		
N-(3-Trimethoxysilylpropyl)	1760-24-3	5.0E+02	5.0E+02	7.5E+01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
N,n,n-Tributyl-1-butanaminium iodide	311-28-4	5.0E+02	1.5E+02	2.5E+01		
N,N-Dimethyl-1,3-propanediamine	109-55-7	7.5E+02	2.0E+02	3.0E+01		
N,N-Dimethyl-1-butanamine	927-62-8	5.0E+02	5.0E+02	5.0E+02		
N,N-dimethyl-2-Propanamine	996-35-0	7.5E+01	1.8E+01	1.1E+01		
N,N'-Methylenebisacrylamide	110-26-9	1.5E+02	3.5E+01	5.0E+00		
Nabumetone	42924-53-8	5.0E+02	1.5E+01	2.5E+00		
Nadic methyl anhydride	25134-21-8	7.5E+01	1.5E+01	2.0E+00		
Naled	300-76-5				1.0E-01	2.4E-02
Health Effects	abdom cramps , anor , ataxia , card irreg , chest tight , convuls , cyan , diarr , dizz , head , irrit eyes , irrit skin , lac , lar spasm , lass , low BP , miosis , nau , para , salv , twitch , vomit , wheez					
Naphtha	8030-30-6	4.0E+03	4.0E+03	1.5E+03		
Health Effects	derm , dizz , drow , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit nose , irrit skin					
Target Organs	CNS - unspecified					
Naphtha, hydrotreated heavy	64742-48-9	7.5E+03	6.0E+03	3.5E+03		
Naphtha, petroleum, light straight-run	64741-46-4	4.0E+03	4.0E+03	1.5E+03		
Naphthalenamine, 1-	134-32-7	3.5E+02	1.3E+01	1.5E+00		
Health Effects	ataxia , carc , derm , dysp , dysuria , hema , hemorrhagic cystitis , methemo					
Naphthalene	91-20-3	1.3E+03	7.5E+01	7.5E+01	5.2E+01	1.8E+01
Health Effects	abdom pain , conf , corn damage , derm , excitement , head , hema , irrit bladder , irrit eyes , jaun , mal , nau , optical neuritis , profuse sweat , renal shutdown , vomit					
Target Organs	Blood, Eyes, Nose, Respiration - unspecified					
Naphthalene, bis(1-methylethyl)-	38640-62-9	5.0E+02	3.0E+02	4.0E+01		
Naphthenic acid, lead salts	61790-14-5	5.0E+02	3.0E+01	4.0E+00		
Naphthoquinone, 1,4-	130-15-4	7.5E+01	7.5E+01	2.5E+01		
Naphthylamine, 2-	91-59-8	3.0E+02	3.5E+01	5.0E+00		
Health Effects	ataxia , carc , derm , dysp , dysuria , hema , hemorrhagic cystitis , methemo					
Target Organs	Bladder					
Naptha (petroleum), heavy catalytic	64741-54-4	5.0E+02	3.0E+02	4.0E+01		
Napthtalene acetamide, 1-	86-86-2	5.0E+02	1.5E+02	2.0E+01		
n-Butanol-d10	34193-38-9	5.0E+03	1.5E+02	6.0E+01		
n-Butyl bromide	109-65-9	1.0E+04	2.0E+03	3.0E+02		
Neodecanoic acid	26896-20-8	5.0E+02	3.0E+02	4.0E+01		
Neodecanoic acid, calcium salt (2:1)	27253-33-4	5.0E+02	3.0E+02	4.0E+01		
Neodymium	7440-00-8	1.0E-01	2.0E-02	2.5E-03		
Neodymium (III) oxide	1313-97-9	5.0E+02	5.0E+01	3.0E+01		
Neodymium bromide	13536-80-6	5.0E+02	1.0E+02	1.5E+01		
Neodymium fluoride	13709-42-7	5.0E+02	4.4E+01	2.7E+01		
Neodymium nitrate, pentahydrate	14517-29-4	2.5E+02	5.0E+01	3.0E+01		
Neodymium trichloride	10024-93-8	6.0E+01	1.3E+01	1.5E+00		
Neon	7440-01-9	3.0E+05	1.5E+05	5.0E+04		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
N-Ethylmorpholine	100-74-3				2.4E+01	8.1E+00
Health Effects	irrit eyes , irrit nose , irrit throat , vis dist: blue-gray vision , vis dist: colored haloes , vis dist: corn edema					
Target Organs	Eyes					
Nickel	7440-02-0				1.5E+00	3.7E-01
Health Effects	allergic asthma , carc , pneu , sens derm					
Target Organs	Lungs, Respiration - unspecified, Skin					
Nickel (II) bromide	13462-88-9	3.7E+01	1.9E+00	1.1E+00		
Nickel (II) chloride hexahydrate	7791-20-0	4.1E+01	4.1E+01	1.2E+00		
Nickel (II) formate	3349-06-2	2.5E+01	5.0E+00	7.5E-01		
Nickel (II) hydroxide	12054-48-7	1.6E+01	1.6E+00	9.5E-01		
Nickel (II) hydroxide carbonate hydrate	39430-27-8	2.1E+01	4.0E+00	6.0E-01		
Nickel (II) nitrate hexahydrate	13478-00-7	5.0E+01	5.0E+01	1.5E+00		
Nickel (II) nitrite	17861-62-0	1.0E+01	5.0E-01	3.0E-01		
Nickel (III) hydroxide	12125-56-3	1.9E+01	1.9E+00	1.1E+00		
Nickel acetate tetrahydrate	6018-89-9	4.2E+01	3.2E-01	1.9E-01		
Nickel aluminide	12003-78-0	1.4E+01	1.4E+00	8.1E-01		
Nickel ammonium sulfate	15699-18-0	4.9E+01	5.0E+00	4.9E+00		
Nickel carbonate	3333-67-3	2.0E+01	2.0E+00	1.2E+00		
Nickel carbonyl	13463-39-3	1.1E+00	2.5E-01	2.5E-01	2.5E-01	2.5E-01
Health Effects	carc , convuls , cough , cyan , delirium , dizz , epigastric pain , head , hyperpnea , in animals: repro effects , in animals: terato effects , lass , leucyt , nau , pneu , subs pain , vomit					
Target Organs	CNS - unspecified, Lungs, Whole body					
Nickel chloride	7718-54-9	2.2E+01	1.1E+00	6.6E-01		
Nickel compounds	Ni cmpds	1.0E+02	5.0E+01	4.5E+00		
Nickel cyanide	557-19-7	1.9E+01	9.4E+00	1.1E+00		
Nickel fluoride	13940-83-5	2.9E+01	3.0E+00	1.7E+00		
Nickel insoluble inorganic compounds	Ni insol inorg				2.0E-01	6.8E-02
Nickel oxalate dihydrate	6018-94-6	2.5E+01	1.3E+01	7.5E+00		
Nickel oxide	1313-99-1	1.3E+01	1.3E+01	7.6E-01		
Nickel perchlorate	13637-71-3	6.2E+01	6.2E+00	3.7E+00		
Nickel subsulfide	12035-72-2				1.0E-01	3.4E-02
Nickel sulfamate	13770-89-3	4.3E+01	2.1E+00	1.3E+00		
Nickel sulfate	7786-81-4	2.6E+01	2.6E-01	2.6E-01		
Nickel sulfate hexahydrate	10101-97-0	4.5E+01	1.0E+01	1.3E+00		
Nickel(2+) stearate	2223-95-2	1.1E+02	5.3E+01	3.2E+01		
Nickel, (carbonato(2-))tet	12607-70-4	1.7E+01	1.7E+00	1.0E+00		
Nickel, soluble salts	Ni sol salts				1.0E-01	2.4E-02
Nickelous nitrate	13138-45-9	3.1E+01	1.3E+01	1.5E+00		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Nicotinamide	98-92-0	5.0E+02	1.5E+02	2.0E+01		
Nicotine	54-11-5	5.0E+00	3.5E+00	1.5E+00	5.0E-01	1.2E-01
Health Effects	abdom pain , card arrhy , conf , convuls , diarr , dizz , dysp , head , hearing dist , in animals: terato effects , inco , lass , nau , salv , vis dist , vomit					
Target Organs	CNS - unspecified, CVS - unspecified, GI tract - unspecified					
Nicotine sulfate	65-30-5	9.0E+00	9.0E+00	9.0E+00		
Nicotinic acid	59-67-6	5.0E+02	1.5E+01	2.5E+00		
Niobium carbide	12069-94-2	2.5E+02	5.0E+01	3.0E+01		
Niobium chloride	10026-12-7	5.0E+02	4.0E+00	6.0E-01		
Niobium pentoxide	1313-96-8	5.0E+02	2.0E+02	3.0E+01		
Nitrapyrin	1929-82-4	4.0E+02	2.0E+01	2.0E+01	1.0E+01	2.4E+00
Health Effects	no adverse effects noted in ingestion studies with animals					
Target Organs	Liver					
Nitrate	14797-55-8	2.5E+02	5.0E+01	3.0E+01		
Nitric acid	7697-37-2	2.4E+02	6.2E+01	1.4E+00	1.4E+00	1.4E+00
Health Effects	bron , delayed pulm edema , dental erosion , irrit eyes , irrit muc memb , irrit skin , pneu					
Target Organs	Lungs					
Nitric acid, butyl ester	928-45-0	2.5E+02	5.0E+01	3.0E+01		
Nitric acid, cerium(4+) salt (4:1)	13093-17-9	2.5E+02	5.0E+01	3.0E+01		
Nitric acid, ethyl ester	625-58-1	1.3E+02	2.5E+01	3.5E+00		
Nitric acid, pentyl ester	1002-16-0	1.3E+04	2.5E+03	4.0E+02		
Nitric acid, praseodymium (3+) salt	10361-80-5	5.0E+02	1.5E+02	2.0E+01		
Nitric oxide	10102-43-9				3.7E+00	3.7E+00
Health Effects	drow , irrit eyes , irrit nose , irrit throat , methemo , uncon , wet skin					
Nitrilotriacetic acid	139-13-9	5.0E+02	5.0E+02	1.0E+02		
Nitrilotriacetic acid trisodium salt	18662-53-8	5.0E+02	1.3E+00	2.0E-01		
Nitrilotriacetic acid, disodium salt	15467-20-6	5.0E+02	1.3E+02	1.5E+01		
Nitrilotris tri-phosphonic acid	6419-19-8	5.0E+02	3.5E+01	1.0E+01		
Nitroaniline, 2-	88-74-4	5.0E+02	1.3E+02	2.0E+01		
Nitroaniline, 3-	99-09-2	2.0E+02	1.3E+01	1.5E+00		
Nitroaniline, 4-	100-01-6	3.0E+02	3.0E+02	9.0E+00	3.0E+00	7.3E-01
Health Effects	anemia , ataxia , convuls , cyan , diarr , dysp , irrit nose , irrit throat , irrity , jaun , methemo , resp arrest , tacar , tachypnea , vomit					
Target Organs	Blood, Liver					
Nitrobenzene	98-95-3	1.0E+03	1.0E+02	1.5E+01	5.0E+00	1.2E+00
Health Effects	anemia , anoxia , derm , in animals: kidney damage , in animals: liver damage , in animals: testicular effects , irrit eyes , irrit skin , methemo					
Nitrobenzyl chloride, 4-	100-14-1	1.3E+02	2.8E+01	1.5E+01		
Nitrocellulose	9004-70-0	5.0E+02	4.0E+02	6.0E+01		
Nitrocyclohexane	1122-60-7	6.0E+01	1.5E+00	7.5E-01		
Nitrocyclohexene, 1-	2562-37-0	2.0E+02	4.0E+01	5.0E+00		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Nitrodiphenyl, 4-	92-93-3	5.0E+02	5.0E+00	7.5E-01		
Health Effects	acute hemorrhagic cystitis , ataxia , carc , dizz , drow , dysp , head , lass , methemo , urinary burning					
Target Organs	Bladder					
Nitrodiphenylamine, 2-	119-75-5	5.0E+02	5.0E+02	1.0E+02		
Nitroethane	79-24-3	3.0E+03	6.0E+02	3.1E+02	3.1E+02	1.1E+02
Health Effects	derm , in animals: dysp , in animals: edema , in animals: kidney inj , in animals: lac , in animals: liver inj , in animals: narco , in animals: pulm rales					
Target Organs	Liver					
Nitrogen	7727-37-9	1.0E+06	1.0E+06	7.5E+05		
Nitrogen chloride	10025-85-1	1.0E+02	1.3E+01	1.5E+00		
Nitrogen dioxide	10102-44-0	3.8E+01	2.3E+01	9.4E-01	9.4E-01	9.4E-01
Health Effects	chest pain , chronic bron , cough , cyan , decr pulm func , dysp , irrit eyes , irrit nose , irrit throat , mucoid frothy sputum , pulm edema , tacar , tachypnea					
Target Organs	Lungs					
Nitrogen mustard	51-75-2	3.7E-01	2.2E-02	3.0E-03		
Nitrogen mustard hydrochloride	55-86-7	4.0E+00	4.0E+00	2.5E+00		
Nitrogen tetroxide	10544-72-6	3.8E+01	2.3E+01	9.4E-01	9.4E-01	
Nitrogen trifluoride	7783-54-2	2.5E+03	1.5E+03	5.8E+02	7.3E+01	7.1E+00
Health Effects	dizz , head , in animals: anoxia , in animals: cyan , kidney inj , lass , liver inj , methemo					
Target Organs	Blood, Kidneys, Liver					
Nitrogen trioxide	10544-73-7	1.5E+03	3.0E+02	4.0E+01		
Nitroglycerin	55-63-0	7.5E+01	2.0E+00	4.6E-01	4.6E-01	1.1E-01
Health Effects	abdom pain , angina , CNS depres , delirium , dizz , flush , hypotension , irrit skin , methemo , nau , palp , throb head , vomit					
Target Organs	CVS - unspecified					
Nitromethane	75-52-5	1.5E+03	1.5E+03	1.5E+02	5.0E+01	1.2E+01
Health Effects	convuls , derm , in animals: irrit eyes , in animals: irrit resp sys , liver damage , narco					
Target Organs	Breast, Nasal-pharynx, Thyroid					
Nitromethane d3	13031-32-8	2.0E+03	2.5E+02	1.5E+02		
Nitronium Tetrafluoroborate	13826-86-3	4.4E+02	2.2E+01	1.3E+01		
Nitrophenol (mixed isomers)	25154-55-6	7.5E+01	1.5E+01	2.5E+00		
Nitrophenol, 2-	88-75-5	1.5E+02	3.0E+01	4.0E+00		
Nitrophenol, 3-	554-84-7	1.5E+02	3.0E+01	4.0E+00		
Nitrophenol, 4-	100-02-7	7.5E+01	1.5E+01	2.5E+00		
Nitropropane, 1-	108-03-2	3.5E+03	4.0E+02	2.5E+02	9.1E+01	3.1E+01
Health Effects	diarr , head , in animals: kidney damage , in animals: liver damage , irrit eyes , nau , vomit					
Target Organs	Liver					
Nitropropane, 2-	79-46-9	3.5E+02	1.5E+02	1.0E+02	3.6E+01	8.9E+00
Health Effects	anor , carc , diarr , head , irrit eyes , irrit nose , irrit resp sys , irrit skin , kidney damage , liver damage , nau , vomit					
Target Organs	Liver					
Nitropyrene, 1-	5522-43-0	1.0E+01	2.0E+00	3.0E-01		
Nitropyridine N-oxide, 4-	1124-33-0	8.0E+01	8.0E+01	5.0E+01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Nitrosodimethylamine, N-	62-75-9	1.0E+02	1.9E+01	1.0E+01		
Health Effects	abdom cramps , carc , decr kidney func , decr liver func , decr pulm func , diarr , enlarged liver , fever , head , jaun , nau , vomit					
Target Organs	Liver					
Nitrosodiphenylamine, 4-	156-10-5	1.5E+02	2.0E+00	3.0E-01		
Nitrosodiphenylamine, N-	86-30-6	5.0E+02	1.5E+02	2.5E+01		
Nitrosodipropylamine, N-	621-64-7	2.0E+02	1.3E+00	2.0E-01		
Nitrosomorpholine	59-89-2	3.0E+01	7.5E+00	1.3E+00		
Nitroso-N-methylurea, N-	684-93-5	5.0E+01	5.0E+00	7.5E-01		
Nitrosophenol, 4-	104-91-6	2.0E+02	4.0E+01	6.0E+00		
Nitrosotoluene, o-	611-23-4	5.0E+02	1.5E+02	2.5E+01		
Nitrosyl chloride	2696-92-6	6.0E+00	1.3E+00	2.0E-01		
Nitrosylsulfuric acid	7782-78-7	1.5E+02	3.5E+01	5.0E+00		
Nitrotoluene, m-	99-08-1	1.0E+03	5.0E+01	3.5E+01	1.1E+01	2.7E+00
Health Effects	anoxia , ataxia , cyan , dizz , dysp , head , lass , nau , tacar , vomit					
Nitrotoluene, o-	88-72-2	1.0E+03	5.0E+01	3.5E+01	1.1E+01	2.7E+00
Health Effects	anoxia , ataxia , cyan , dizz , dysp , head , lass , nau , tacar , vomit					
Nitrotoluene, p-	99-99-0	1.0E+03	5.0E+02	3.5E+01	1.1E+01	2.7E+00
Health Effects	anoxia , ataxia , cyan , dizz , dysp , head , lass , nau , tacar , vomit					
Nitrous acid	7782-77-6	1.8E+02	4.6E+01	1.0E+00		
Nitrous oxide	10024-97-2	3.5E+04	1.5E+04	2.5E+02	9.0E+01	2.2E+01
Health Effects	asphy , drow , head , liquid: frostbite , repro effects					
Target Organs	Blood, CNS - unspecified, Reproductive - unspecified by gender					
N-Methylbutylamine	110-68-9	7.5E+02	1.5E+02	2.0E+01		
N-Methylformamide	123-39-7	1.0E+03	7.5E+02	1.3E+02		
N-Methylpyrrole	96-54-8	5.0E+02	5.0E+02	2.5E+02		
n-Nonanoic acid	112-05-0	5.0E+02	5.0E+02	7.5E+01		
n-Octadecane	593-45-3	7.5E+03	1.5E+03	3.5E+02		
Nonacosane	630-03-5	2.5E+02	5.0E+01	3.0E+01		
Nonanal	124-19-6	5.0E+02	4.0E+01	6.0E+00		
Nonane	111-84-2	7.5E+03	5.0E+03	3.0E+03	1.0E+03	3.6E+02
Health Effects	chemical pneu (aspir liquid) , conf , dizz , drow , head , inco , irrit eyes , irrit nose , irrit skin , irrit throat , nau , tremor					
Target Organs	CNS - unspecified, Skin					
Nonanenitrile	2243-27-8	7.5E+02	1.5E+02	1.5E+02		
Nonanone, 2-	821-55-6	5.0E+02	1.3E+02	1.5E+01		
Nonyl alcohol	143-08-8	5.0E+02	5.0E+02	7.5E+01		
Nonyl phenol (mixed isomers)	25154-52-3	5.0E+02	1.3E+02	2.0E+01		
Nonyl phenol, 4- (branched)	84852-15-3	5.0E+02	1.0E+02	1.5E+01		
Nonylphenol ethoxylate	127087-87-0	5.0E+02	2.0E+02	3.0E+01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Nonylphenol, 4-	104-40-5	5.0E+02	1.3E+02	2.0E+01		
Nonylphenoxypolyethoxyethanol	68412-54-4	2.5E+02	5.0E+01	3.0E+01		
Nonyltrichlorosilane	5283-67-0	3.5E+02	7.8E+01	6.4E+00	6.4E+00	
Norbormide	991-42-4	3.8E+00	3.8E+00	2.0E+00		
N-Vinylformamide	13162-05-5	5.0E+02	1.0E+02	1.5E+01		
Octachloronaphthalene	2234-13-1	1.0E+00	3.0E-01	3.0E-01	1.0E-01	2.4E-02
Health Effects	acne-form derm , jaun , liver damage					
Target Organs	Liver, Skin					
Octacosane	630-02-4	7.5E+03	1.5E+03	3.5E+02		
Octadecanoic acid	57-11-4	5.0E+02	5.0E+02	1.5E+02		
Octadecanol, 1-	112-92-5	7.5E+03	6.0E+02	7.5E+01		
Octadecyl methacrylate	32360-05-7	2.5E+02	5.0E+01	3.0E+01		
Octadecyltrichlorosilane	112-04-9	5.2E+02	1.2E+02	9.5E+00	9.5E+00	
Octafluorocyclobutane	115-25-3	2.5E+06	2.5E+06	6.0E+05		
Octamethylcyclotetrasiloxane	556-67-2	4.0E+03	3.0E+03	4.0E+02		
Octamethylpyrophosphoramide	152-16-9	3.5E+00	8.0E-01	5.0E-01		
Octanal, 1-	124-13-0	5.0E+02	5.0E+02	6.0E+01		
Octane	111-65-9	4.0E+03	1.5E+03	1.4E+03	1.4E+03	4.8E+02
Health Effects	chemical pneu (aspir liquid) , derm , drow , in animals: narco , irrit eyes , irrit nose					
Octanedione, 2,5-	3214-41-3	5.0E+02	5.0E+02	6.0E+01		
Octanenitrile	124-12-9	7.5E+02	1.5E+02	2.0E+01		
Octanethiol, 1-	111-88-6	7.5E+02	3.0E+00	4.0E-01		
Health Effects	cyan , drow , head , incr respiration , irrit eyes , irrit nose , irrit skin , irrit throat , lass , nau , vomit					
Octanoic acid	124-07-2	5.0E+02	5.0E+02	1.3E+02		
Octanone, 2-	111-13-7	5.0E+02	5.0E+02	2.0E+02		
Octaphenylcyclotetrasiloxane	546-56-5	5.0E+02	4.0E+02	6.0E+01		
Octene, 1-	111-66-0	9.2E+03	3.7E+03	1.8E+02		
Octyl alcohol	111-87-5	3.5E+02	5.0E+01	5.0E+01		
Octyl(phenyl)-N,N-	83242-95-9	2.5E+02	5.0E+01	3.0E+01		
Octyltrichlorosilane	5283-66-9	3.3E+02	7.4E+01	6.1E+00	6.1E+00	
Oil gas	z-0035	1.3E+04	3.5E+03	5.0E+02		
Oil mist, mineral	8012-95-1	5.0E+02	2.5E+01	1.0E+01	5.0E+00	1.2E+00
Health Effects	irrit eyes , irrit resp sys , irrit skin					
Target Organs	Lungs					
Oleum	8014-95-7	1.6E+02	6.3E+01	2.0E-01	2.0E-01	
Orthoarsenic acid	7778-39-4	9.5E+00	3.0E+00	4.0E-01		
Orthoformic acid, trimethyl ester	149-73-5	4.0E+01	7.5E+00	1.3E+00		
Osmium	7440-04-2	3.0E+01	6.0E+00	7.5E-01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Osmium tetroxide	20816-12-0	4.2E+01	8.7E-02	6.0E-03	2.1E-03	7.1E-04
Health Effects	conj , cough , derm , dysp , head , irrit eyes , irrit resp sys , lac , vis dist					
Target Organs	Eyes					
Otto fuel	106602-80-6	9.0E+01	7.0E+00	1.2E+00		
Ouabain	630-60-4	1.3E+01	8.3E+00	5.0E+00		
Oxalic acid	144-62-7	5.0E+02	4.0E+01	2.0E+00	1.0E+00	3.4E-01
Health Effects	collapse , convuls , cyan , eye burns , irrit eyes , irrit muc memb , irrit skin , kidney damage , local pain , shock					
Oxalic acid dihydrate	6153-56-6	5.0E+02	1.0E+02	2.0E+00		
Oxalyl chlorine	79-37-8	1.0E+03	2.0E+02	3.0E+01		
Oxamide	471-46-5	2.0E+02	4.0E+01	5.0E+00		
Oxamyl	23135-22-0	5.3E+00	1.8E+00	1.2E+00	3.2E-01	
Oxathiane, 1,4-	15980-15-1	1.5E+03	3.5E+02	5.0E+01		
Oxone, monopersulfate compound	37222-66-5	2.5E+02	5.0E+01	3.0E+01		
Oxybis(benzenesulfonyl hydrazide),	80-51-3				1.0E-01	3.4E-02
Oxydiacetic acid	110-99-6	2.0E+02	4.0E+01	6.0E+00		
Oxydianiline	101-80-4	3.0E+02	1.0E+01	1.5E+00		
Oxydiphenoxarsine, 10,10'-	58-36-6	1.4E+01	1.4E+01	2.0E+00		
Oxydisulfoton	2497-07-6	3.5E+00	3.5E+00	2.0E+00		
Oxygen difluoride	7783-41-7	5.5E+00	1.8E+00	2.5E-01		
Health Effects	eye burns (from contact with the gas under pressure) , head , irrit eyes , irrit resp sys , irrit skin , pulm edema , skin burns (from contact with the gas under pressure)					
Target Organs	Kidneys					
Ozone	10028-15-6	1.0E+01	2.0E+00	4.0E-01	3.9E-01	3.9E-02
Health Effects	chronic resp disease , irrit eyes , irrit muc memb , pulm edema					
Target Organs	Lungs					
Palladium	7440-05-3	2.0E+02	4.0E+01	6.0E+00		
Palladium chloride	7647-10-1	5.0E+02	3.0E+00	4.0E-01		
Palladium hydroxide	12135-22-7	7.5E+01	2.5E+00	3.0E-01		
Paraffin liquid	8020-83-5	5.0E+02	5.0E+02	1.5E+01		
Paraffin wax fume	8002-74-2	5.0E+02	1.0E+02	1.5E+01	2.0E+00	6.8E-01
Health Effects	discomfort , irrit eyes , irrit resp sys , irrit skin , nau					
Paraffins, petroleum, normal C5-C20	64771-72-8	5.0E+04	1.0E+04	6.0E+03		
Paraformaldehyde	30525-89-4	1.0E+02	7.5E+01	1.3E+01		
Paraldehyde	123-63-7	5.0E+02	3.0E+02	4.0E+01		
Paraquat	4685-14-7	1.5E+02	1.3E+01	1.5E+00	1.0E-01	3.4E-02
Paraquat dichloride	1910-42-5	1.0E+00	5.0E-01	5.0E-01		
Health Effects	derm , epis , fingernail damage , heart damage , irrit eyes , irrit GI tract , irrit nose , irrit resp sys , irrit skin , irrit throat , kidney damage , liver damage					
Paraquat methosulfate	2074-50-2	4.0E+01	1.5E+01	2.0E+00		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Parathion	56-38-2	2.0E+00	1.5E+00	3.0E-01	5.0E-02	1.2E-02
Health Effects	abdom cramps , anor , ataxia , card irreg , chest tight , coma , conf , convuls , cyan , diarr , dizz , head , irrit eyes , irrit resp sys , irrit skin , lar spasm , lass , low BP , miosis , musc fasc , nau , para , rhin , salv , sweat , vomit , wheez					
Paris green	12002-03-8	2.2E+01	2.2E+01	3.4E+00		
Particulate material, unspecified	PNOS	2.5E+02	5.0E+01	3.0E+01		
Health Effects	irrit eyes , irrit skin , irrit throat , irrit upper resp sys					
Pentaborane	19624-22-7	1.8E+00	3.6E-01	4.0E-02	1.3E-02	3.2E-03
Health Effects	behavioral changes , convuls , dizz , drow , head , inco , irrit eyes , irrit skin , tonic spasm abdom , tonic spasm face , tonic spasm limbs , tonic spasm neck , tremor					
Target Organs	CNS - unspecified					
Pentachlorobenzene	608-93-5	4.0E+02	1.5E+02	2.5E+01		
Pentachloroethane	76-01-7	5.0E+02	5.0E+02	1.3E+02		
Health Effects	in animals: irreg respiration , in animals: irrit eyes , in animals: irrit skin , in animals: kidney changes , in animals: lass , in animals: liver changes , in animals: lung changes , in animals: musc inco , in animals: restless					
Pentachloronaphthalene	1321-64-8				5.0E-01	1.2E-01
Health Effects	acne-form skin eruptions , anor , dizz , head , jaun , lass , liver nec , pruritus					
Target Organs	Liver, Skin					
Pentachloronitrobenzene	82-68-8	5.0E+02	3.0E+02	1.5E+00	5.0E-01	1.2E-01
Pentachlorophenol	87-86-5	2.5E+00	2.5E+00	2.5E+00	5.0E-01	1.2E-01
Health Effects	anor , chest pain , cough , derm , dizz , dysp , head , high fever , irrit eyes , irrit nose , irrit throat , lass , low weight , nau , sneez , sweat , vomit					
Target Organs	CNS - unspecified, CVS - unspecified					
Pentadecane	629-62-9	3.0E+03	6.0E+02	7.5E+01		
Pentadecanoic acid	1002-84-2	4.0E+01	7.5E+00	1.3E+00		
Pentadecylamine	2570-26-5	1.0E+02	2.0E+00	3.0E-01		
Pentaerythritol	115-77-5	5.0E+02	5.0E+01	3.0E+01	1.0E+01	3.4E+00
Health Effects	irrit eyes , irrit resp sys					
Pentaerythritol tetra(3-	95823-35-1	2.5E+02	5.0E+01	3.0E+01		
Pentaerythritol tetranitrate	78-11-5	5.0E+02	3.5E-01	5.0E-02		
Pentafluorobenzoic acid	602-94-8	7.5E+01	1.5E+01	2.0E+00		
Pentane, n-	109-66-0	4.0E+03	1.8E+03	1.8E+03	1.8E+03	6.1E+02
Health Effects	chemical pneu (aspir liquid) , derm , drow , in animals: narco , irrit eyes , irrit nose , irrit skin					
Pentanedione, 2,4-	123-54-6	4.0E+02	4.0E+02	2.0E+02		
Pentanenitrile	110-59-8	7.5E+01	7.5E+01	1.5E+01		
Pentanol, 2-	6032-29-7	1.3E+03	3.5E+02	3.5E+02		
Health Effects	cough , diarr , dizz , dysp , head , in animals: narco , irrit eyes , irrit nose , irrit skin , irrit throat , nau , skin cracking , vomit					
Pentanol, 3-	584-02-1	1.5E+03	4.0E+02	4.0E+02		
Pentatriacontane	630-07-9	2.5E+02	5.0E+01	3.0E+01		
Pentene, 1-	109-67-1	2.0E+05	1.5E+04	2.5E+03		
Pentobarbital sodium	57-33-0	5.0E+01	3.5E+00	5.0E-01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Peptone	73049-73-7	2.5E+02	5.0E+01	3.0E+01		
Peracetic acid	79-21-0	1.5E+01	1.6E+00	5.3E-01	5.3E-01	
Perchloric acid	7601-90-3	5.0E+02	1.0E+02	1.3E+01		
Perchloroethylene	127-18-4	8.1E+03	1.6E+03	2.4E+02	2.4E+02	9.3E-01
Health Effects	carc , dizz , drow , flush face , flush neck , head , inco , irrit eyes , irrit nose , irrit resp sys , irrit skin , irrit throat , liver damage , nau , skin eryt					
Target Organs	CNS - unspecified, Nervous system - unspecified					
Perchloromethyl mercaptan	594-42-3	6.8E+00	2.3E+00	9.9E-02	9.9E-02	9.9E-02
Health Effects	acidosis , anuria , coarse rales , cough , deep breath pain , dysp , irrit eyes , irrit nose , irrit skin , irrit throat , kidney damage , lac , liver damage , pallor , tacar , vomit					
Target Organs	Lungs					
Perchloryl fluoride	7616-94-6	5.0E+01	1.7E+01	6.3E+00	2.5E+00	2.5E+00
Health Effects	in animals: anoxia , in animals: cyan , in animals: dizz , in animals: head , in animals: lass , in animals: methemo , in animals: pneu , in animals: pulm edema , irrit resp sys , liquid: frostbite					
Target Organs	Blood					
Percoll	65455-52-9	2.5E+02	5.0E+01	3.0E+01		
Perfluoro compounds	86508-42-1	3.5E+05	6.0E+04	7.5E+03		
Perfluoro-2-butyltetrahydrofuran	335-36-4	3.4E+02	1.7E+01	1.0E+01		
Perfluorobutyl ethylene	19430-93-4				1.0E+03	2.5E+02
Perfluoroisobutylene	382-21-8	2.7E+00	9.0E-01	1.0E-01		
Perfluorooctanic acid	335-67-1	7.5E+01	7.5E+01	1.3E+01		
Perfluorophenanthrene	306-91-2	3.4E+02	1.7E+01	1.0E+01		
Perfluoropolyalkylether	60164-51-4	5.0E+02	5.0E+02	2.5E+02		
Periodic acid	10450-60-9	2.6E+01	1.8E+00	1.8E+00		
Perlite	93763-70-3	5.0E+02	7.5E+01	4.5E+01		
Health Effects	irrit eyes , irrit skin , irrit throat , irrit upper resp sys					
Peroxydicarbonic acid, disodium salt	3313-92-6	5.0E+02	1.5E+02	2.5E+01		
Persulfate, potassium	7727-21-1	3.5E+02	6.0E+01	1.0E+01		
Persulfates	persufate				1.0E-01	3.4E-02
Petalite	1302-66-5	2.5E+02	5.7E+01	3.4E+01		
Petrolatum	8009-03-8	5.0E+02	3.5E+02	5.0E+01		
Petroleum	8002-05-9	4.0E+03	1.5E+03	3.5E+02		
Health Effects	chemical pneu (aspir liquid) , dizz , drow , dry cracked skin , head , irrit eyes , irrit nose , irrit throat , nau					
Petroleum coke, calcined	64743-05-1	5.0E+02	5.0E+01	3.0E+01		
Petroleum distillates, clay-treated light	64742-45-6	5.0E+02	4.0E+02	6.0E+01		
Petroleum distillates, hydrotreated	64742-46-7	3.0E+02	6.0E+01	7.5E+00		
Petroleum distillates, low boiling	68477-31-6	5.0E+02	5.0E+02	3.5E+02		
Petroleum ether	8032-32-4	4.0E+03	1.5E+03	3.5E+02		
Health Effects	chemical pneu (aspir liquid) , CNS depres , derm , irrit eyes , irrit upper resp sys					
Target Organs	CNS - unspecified					
Petroleum sulfonates	61789-85-3	2.5E+02	5.0E+01	3.0E+01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
p-Fluoroaniline	371-40-4	1.5E+02	3.5E+01	5.0E+00		
Phenacetin	62-44-2	6.0E+01	1.0E+01	1.5E+00		
Phenaglycodol	79-93-6	3.5E+02	7.5E+01	1.0E+01		
Phenanthrene	85-01-8	2.0E+01	2.0E+01	6.0E+00		
Phenanthroline ferrous sulfate, 1,10-	14634-91-4	2.5E+02	5.0E+01	3.0E+01		
Phenol	108-95-2	7.7E+02	8.9E+01	5.8E+01	2.4E+01	6.6E+00
Health Effects	anor , convuls , cyan , dark urine , derm , irrit eyes , irrit nose , irrit throat , kidney damage , lass , liver damage , low weight , musc ache , musc pain , ochronosis , skin burns , tremor , twitch					
Target Organs	Blood, CNS - unspecified, Respiration - unspecified					
Phenol red, sodium salt	34487-61-1	5.0E+02	1.5E+02	2.5E+01		
Phenol, 2,6-bis(1,1-dimethylethyl)-4-	4130-42-1	4.0E+02	7.5E+01	1.3E+01		
Phenol, polymer with formaldehyde,	28064-14-4	5.0E+02	3.5E+02	5.0E+01		
Phenolphthalein	77-09-8	4.0E+02	1.5E+01	2.5E+00		
Phenothiazine	92-84-2				5.0E+00	1.7E+00
Health Effects	abdom cramps , hemolytic anemia , hepatitis , irrit skin , itch , kidney damage , reddening skin , skin photo sens , tacar					
Target Organs	Eyes, Kidneys, Liver					
Phenyl chloroformate	1885-14-9	3.7E+00	1.2E+00	1.5E-01		
Phenyl dichloroarsine	696-28-6	1.8E-01	6.1E-02	6.1E-02		
Phenyl ether vapor	101-84-8	6.0E+02	1.3E+02	1.3E+01	7.0E+00	2.4E+00
Health Effects	irrit eyes , irrit nose , irrit skin , nau					
Phenyl glycidyl ether	122-60-1				6.1E-01	2.1E-01
Health Effects	carc , irrit eyes , irrit skin , irrit upper resp sys , narco , possible hemato effects , possible repro effects , skin sens					
Target Organs	Skin					
Phenyl isocyanate.	103-71-9	1.2E+00	7.3E-01	9.7E-02	9.7E-02	
Phenyl isopropanol	617-94-7	5.0E+02	1.0E+02	1.5E+01		
Phenyl mercaptan	108-98-5	7.2E+00	2.4E+00	4.5E-01	4.5E-01	1.1E-01
Phenyl sepharose	69106-59-8	2.5E+02	5.0E+01	3.0E+01		
Phenyl-1,2-propanedione, 1-	579-07-7	2.5E+02	5.0E+01	7.5E+00		
Phenylacetylene	536-74-3	5.0E+02	5.0E+02	1.0E+02		
Phenylazophenylamine, p-	60-09-3	7.5E+01	1.3E+01	2.0E+00		
Phenylborinic acid	98-80-6	3.0E+02	6.0E+01	7.5E+00		
Phenylcyclohexane	827-52-1	5.0E+02	5.0E+02	1.3E+02		
Phenylene diisocyanate, 1,4-	104-49-4	3.5E+01	3.5E+01	1.0E+01		
Phenylenediamine dihydrochloride, 1,2-	615-28-1	1.3E+02	1.3E+02	3.0E+01		
Phenylenediamine dihydrochloride, 1,4-	624-18-0	6.0E+01	1.3E+01	1.5E+00		
Phenylenediamine, m-	108-45-2	1.3E+02	1.0E+01	3.0E-01	1.0E-01	3.4E-02
Phenylenediamine, o-	95-54-5	5.0E+02	2.0E+02	3.0E-01	1.0E-01	3.4E-02

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Phenylenediamine, p-	106-50-3	2.5E+01	4.0E+00	6.0E-01	1.0E-01	2.4E-02
Health Effects	bronchial asthma , irrit larynx , irrit pharynx , sens derm					
Target Organs	Eyes, Skin					
Phenylhydrazine	100-63-0	6.0E+01	2.0E+00	1.3E+00	4.4E-01	1.1E-01
Health Effects	carc , cyan , dysp , hemolytic anemia , jaun , kidney damage , skin sens , vascular thrombosis					
Target Organs	Skin					
Phenylhydrazine hydrochloride	59-88-1	2.5E+02	2.5E+02	1.5E+02		
Phenylmagnesium bromide	100-58-3	1.5E+02	3.5E+01	5.0E+00		
Phenylmercuric acetate	62-38-4	1.7E+01	1.7E+01	1.7E+01		
Phenylphenol, 2-	90-43-7	5.0E+02	5.0E+02	7.5E+01		
Phenylphenol, o-	132-27-4	3.0E+02	6.0E+01	7.5E+00		
Phenylphosphine	638-21-1	7.5E+01	2.0E-01	1.3E-01		
Health Effects	in animals: loss of appetite , in animals: anemia , in animals: blood changes , in animals: derm , in animals: diarr , in animals: hind leg tremor , in animals: lac , in animals: testicular degeneration					
Target Organs	Blood, Reproductive - unspecified by gender, Skin					
Phenylpropanolamine hydrochloride	154-41-6	5.0E+02	1.3E+00	1.5E-01		
Phenylsilatrane	2097-19-0	1.0E+00	1.0E+00	6.0E-01		
Phenylthiourea	103-85-5	3.0E+00	3.0E+00	1.5E+00		
Phenyltriethoxysilane	780-69-8	5.0E+02	2.5E+02	3.5E+01		
Phenyltrimethoxysilane	2996-92-1	1.5E+02	3.0E+01	4.0E+00		
Phenylxylyl ethane	40766-31-2	5.0E+02	7.5E+01	1.3E+01		
Phenylxylylethane	6196-95-8	2.5E+02	5.0E+01	3.0E+01		
Phloroglucinol dihydrate	6099-90-7	4.0E+02	7.5E+01	1.3E+01		
Phorate	298-02-2	1.2E-01	4.0E-02	4.0E-02	4.0E-02	1.2E-02
Health Effects	abdom cramps , anor , ataxia , card irreg , chest tight , coma , conf , convuls , cyan , diarr , dizz , head , irrit eyes , irrit resp sys , irrit skin , lar spasm , lass , low BP , miosis , musc fasc , nau , para , rhin , salv , sweat , vomit , wheez					
Phosacetim	4104-14-7	3.7E+00	3.7E+00	2.0E+00		
Phosdrin	7786-34-7	3.7E+01	4.0E+00	3.0E-01	1.0E-02	2.4E-03
Health Effects	abdom cramps , anor , ataxia , card irreg , chest tight , convuls , cyan , diarr , head , irrit eyes , irrit resp sys , irrit skin , lar spasm , low BP , miosis , nau , para , rhin , salv , vomit , wheez					
Phosfolan	947-02-4	9.0E+00	9.0E+00	5.0E+00		
Phosgene	75-44-5	3.0E+00	1.2E+00	4.0E-01	1.6E-01	4.0E-02
Health Effects	chest pain , cough Lungs, cough , cyan , dry burning throat , dysp , foamy sputum , inj Lungs, irrit Throat, irrit Respiration - unspecified, irrit Eyes, irrit eyes , liquid: frostbite , pulmonary edema Lungs, vomit					
Target Organs	Lungs, None					
Phosgene oxime	1794-86-1	1.3E+01	8.3E-02	2.8E-02	3.5E-03	
Phosmet	732-11-6	4.0E+01	5.4E-01	7.5E-02		
Phosphamidon	13171-21-6	9.0E-01	3.0E-01	1.5E-01		
Phosphine	7803-51-2	5.0E+00	2.8E+00	1.3E+00	4.2E-01	1.4E-01
Health Effects	abdom pain , chest tight , chills , diarr , dysp , liquid: frostbite , musc pain , nau , pulm edema , stupor or syncope , thirst , vomit					
Target Organs	CNS - unspecified, GI tract - unspecified, Nose, Whole body					

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Phosphomolybdic acid	11104-88-4	5.0E+02	4.2E+00	2.5E+00		
Phosphonic acid	13598-36-2	5.0E+02	1.3E-01	1.5E-02		
Phosphoric acid	7664-38-2	5.0E+02	5.0E+02	3.0E+00	1.0E+00	3.4E-01
Health Effects	burns , derm , eye burns , irrit eyes , irrit skin , irrit upper resp sys , skin burns					
Target Organs	Bronchi					
Phosphoric acid, sodium salt	7632-05-5	7.5E+01	1.5E+01	2.5E+00		
Phosphorous acid	10294-56-1	5.0E+02	2.0E+02	3.0E+00		
Phosphorous pentafluoride	7647-19-0	3.0E+02	1.5E+01	1.0E+01		
Phosphorous trifluoride	7783-55-3	4.0E+02	2.0E+01	1.0E+01		
Phosphorus	7723-14-0	4.7E+01	1.1E+01	3.7E+00	4.7E-01	
Health Effects	abdom pain , anemia , cachexia , dental pain , eye burns , irrit eyes , jaun , jaw pain , nau , resp tract burns , salv , skin burns , swell					
Phosphorus (red)	0-142*	5.0E+00	3.0E+00	1.5E-01		
Phosphorus (yellow)	0-143*				1.0E-01	2.4E-02
Phosphorus oxychloride	10025-87-3	5.3E+00	3.0E+00	3.0E+00	6.0E-01	2.1E-01
Health Effects	abdom pain , cough , dizz , dysp , eye burns , head , irrit eyes , irrit resp sys , irrit skin , lass , nau , neph , pulm edema , skin burns , vomit					
Target Organs	Kidneys					
Phosphorus pentachloride	10026-13-8	7.0E+01	2.0E+01	3.0E+00	8.5E-01	2.9E-01
Health Effects	bron , derm , irrit eyes , irrit resp sys , irrit skin					
Phosphorus pentasulfide	1314-80-3	2.5E+02	5.0E+01	3.0E+00	1.0E+00	3.4E-01
Health Effects	apnea , coma , conj pain , convuls , corn vesic , dizz , GI dist , head , insom , irrit eyes , irrit resp sys , irrit skin , irrity , kerato-conj , lac , lass , photo					
Phosphorus pentoxide	1314-56-3	5.0E+01	1.0E+01	1.0E+00		
Phosphorus trichloride	7719-12-2	3.2E+01	1.1E+01	1.9E+00	1.9E+00	3.8E-01
Health Effects	eye burns , irrit eyes , irrit nose , irrit skin , irrit throat , pulm edema , skin burns					
Phosphorus trioxide	1314-24-5	4.0E+01	7.5E+00	1.3E+00		
Phosphorus, white	12185-10-3	6.0E-01	6.0E-01	2.0E-01		1.4E-02
Phthalic acid, m-	121-91-5	5.0E+02	5.0E+01	3.0E+01		
Phthalic acid, o-	88-99-3	5.0E+02	5.0E-01	6.0E-02		
Phthalic acid, p-	100-21-0	5.0E+02	5.0E+02	1.3E+02	1.0E+01	2.4E+00
Phthalic anhydride	85-44-9	6.0E+01	4.0E+01	1.2E+01	6.1E+00	2.1E+00
Health Effects	bron , bronchial asthma , conj , derm , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit skin , irrit upper resp sys , nasal ulcer bleeding					
Target Organs	Lungs, Nose					
Phthalodinitrile, m-	626-17-5				5.0E+00	1.7E+00
Health Effects	conf , head , in animals: irrit eyes , in animals: irrit skin , nau					
Phthaloyl dichloride	88-95-9	7.5E+01	1.5E+01	2.5E+00		
Phyllomedusin	26145-48-2	2.5E+02	5.0E+01	3.0E+01		
Physostigmine	57-47-6	4.5E+00	4.5E+00	2.5E+00		
Physostigmine, salicylate (1:1)	57-64-7	2.5E+00	2.5E+00	1.5E+00		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Picloram	1918-02-1				1.0E+01	2.4E+00
Health Effects	in animals: kidney changes , in animals: liver changes , irrit eyes , irrit resp sys , irrit skin , nau					
Picolinic acid	98-98-6	1.5E+02	1.5E+02	3.5E+01		
Picric acid	88-89-1	7.5E+01	1.5E+01	3.0E-01	1.0E-01	3.4E-02
Health Effects	album prot , anuria , bitter taste , GI dist , hema , hepatitis , irrit eyes , irrit skin , lass , myalgia , neph , polyuria , sens derm , yellow-stained hair , yellow-stained skin					
Target Organs	Eyes, Skin					
Picrotoxin	124-87-8	1.5E+01	1.5E+01	7.5E+00		
Pigment green 36	14302-13-7	5.0E+02	3.5E+02	5.0E+01		
Pigment yellow 14	5468-75-7	5.0E+02	4.0E+02	6.0E+01		
Pinacolone	75-97-8	4.0E+03	7.5E+02	2.0E+01		
Pinacolyl alcohol	464-07-3	3.5E+03	3.5E+03	3.0E+03		
Pindone	83-26-1				1.0E-01	2.4E-02
Health Effects	abdom pain , back pain , black tarry stools , bruises , epis , excess bleeding from minor cuts , smoky urine					
Target Organs	Kidneys, Liver					
Pinene, alpha-	80-56-8	1.5E-02	3.5E-03	5.0E-04	2.0E+01	4.9E+00
Piperazine	110-85-0	5.0E+02	4.0E+01	6.0E+00		
Piperazine dihydrochloride	142-64-3				5.0E+00	1.7E+00
Health Effects	asthma , GI upset , head , inco , irrit eyes , irrit resp sys , irrit skin , musc weak , nau , skin burns , skin sens , vomit					
Piperidine	110-89-4	3.8E+02	1.1E+02	2.3E+01	5.9E+00	
Piperonyl butoxide	51-03-6	5.0E+02	5.0E+02	3.0E+02		
Pirimifos-ethyl	23505-41-1	6.0E+01	2.5E+01	1.5E+01		
Pivalic anhydride	1538-75-6	2.5E+02	5.0E+01	3.0E+01		
Platinum (II) cyanide	592-06-3	5.1E+00	1.3E-02	7.6E-03		
Platinum, metal	7440-06-4	4.0E+00	4.0E+00	3.0E+00	1.0E+00	3.4E-01
Health Effects	derm , irrit resp sys , irrit skin					
Platinum, soluble salts	Pt sol salts				2.0E-03	6.8E-04
Health Effects	cough , cyan , derm , dysp , irrit eyes , irrit nose , lymphocytosis , sens skin , wheez					
Poloxanlene	9003-11-6	5.0E+02	2.0E+02	3.0E+01		
Poly(dimethylsiloxane), ethoxylated,	68037-63-8	5.0E+02	5.0E+02	2.5E+02		
Poly(dimethylsiloxane), hydride	70900-21-9	2.5E+02	5.0E+01	3.0E+01		
Poly(ethylene glycol methyl ether)	9004-74-4	5.0E+02	5.0E+02	2.5E+02		
Poly(ethylene glycol)diacrylate	26570-48-9	1.5E+02	3.5E+01	5.0E+00		
Poly(oxyethylene)(2) stearyl ether	9005-00-9	5.0E+02	1.5E+02	2.0E+01		
Poly(sodium 4-styrenesulfonate)	25704-18-1	5.0E+02	5.0E+02	5.0E+02		
Poly(Styrene-co-divinylbenzene)	69011-14-9	2.5E+02	5.0E+01	3.0E+01		
Polyacrylic acid	9003-01-4	5.0E+02	2.0E+02	3.0E+01		
Polyamide 6	25038-54-4	5.0E+02	2.0E+02	3.0E+01		
Polychlorinated biphenyls	1336-36-3	5.0E+00	5.0E+00	3.0E+00		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Polyether polyol ester	X-212*	5.0E+02	3.5E+02	5.0E+01		
Polyethylbenzene residue	68987-42-8	7.5E+02	1.5E+02	2.0E+01		
Polyethylene	9002-88-4	5.0E+02	3.0E+01	4.0E+00		
Polyethylene glycol	25322-68-3	5.0E+02	5.0E+02	6.0E+01		
Polyethylene glycol 20M	37225-26-6	5.0E+02	5.0E+02	5.0E+02		
Polyethylene glycol dimethacrylate	25852-47-5	2.5E+02	5.0E+01	3.0E+01		
Polyethylene glycol mono-4-	26027-38-3	6.0E+01	6.0E-01	7.5E-02		
Polyethyleneimine	9002-98-6	5.0E+02	1.0E+02	1.5E+01		
Polyglycol 15-200: (Calthane NF and	9082-00-2	5.0E+02	5.0E+02	1.3E+02		
Polyisocyanate prepolymer mixture	0-309*	6.0E+01	1.3E+01	1.5E+00		
Polymaleic acid	26099-09-2	2.5E+02	5.0E+01	3.0E+01		
Polymeric MDI	9016-87-9	2.0E+02	4.0E+01	6.0E+00		
Polymerized linseed oil	67746-08-1	5.0E+02	1.5E+02	2.5E+01		
Polymethyl methacrylate	9011-14-7	5.0E+02	1.0E+02	1.5E+01		
Polymethylhydrosiloxane	63148-57-2	2.5E+02	5.0E+01	3.0E+01		
Polyoxyethylene (20) sorbitan	9005-64-5	5.0E+02	6.0E+01	7.5E+00		
Polyoxyethylene monooctylphenyl ether	9036-19-5	5.0E+02	3.5E+02	5.0E+01		
Polyoxyethylene sorbitan	9005-66-7	5.0E+02	2.5E+02	4.0E+01		
Polyoxyethylene(4)lauryl ether	5274-68-0	2.5E+02	5.0E+01	3.0E+01		
Polyoxypropylene polyamine	39423-51-3	2.5E+02	5.0E+01	3.0E+01		
Polyphosphoric acid	8017-16-1	2.0E+02	4.0E+01	5.0E+00		
Polypropylene	9003-07-0	5.0E+02	2.5E+02	4.0E+01		
Polypropylene glycol	25322-69-4	5.0E+02	2.0E+02	3.0E+01		
Polypropylene glycol,	9072-62-2	5.0E+02	1.5E+02	2.5E+01		
Polyquaternium-7	26590-05-6	2.5E+02	5.0E+01	3.0E+01		
Polysorbate 85	9005-70-3	5.0E+02	5.0E+02	2.5E+02		
Polysulfone resin	25135-51-7	2.5E+02	5.0E+01	3.0E+01		
Polytetrafluoroethylene	9002-84-0	3.5E+02	6.0E+01	1.0E+01		
Polytetramethylene glycol,	65636-36-4	2.5E+02	5.0E+01	3.0E+01		
Polyurethane foam	9009-54-5	2.5E+01	5.0E+00	6.0E-01		
Polyvinyl alcohol	9002-89-5	5.0E+02	5.0E+02	1.3E+02		
Polyvinyl chloride	9002-86-2	2.0E+02	4.0E+01	3.0E+00	1.0E+00	2.4E-01
Polyvinylpyrrolidone K-30	9003-39-8	5.0E+02	5.0E+02	3.0E+02		
Polyvinylpyrrolidone-iodine complex	25655-41-8	5.0E+02	4.0E+02	5.0E+01		
Portland cement	65997-15-1				1.0E+00	3.4E-01
Health Effects	chronic bron , cough , derm , exertional dysp , expectoration , irrit eyes , irrit nose , irrit skin , wheez					
Potassium	7440-09-7	3.0E+02	1.5E+00	2.0E-01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Potassium acetate	127-08-2	5.0E+02	2.5E+02	4.0E+01		
Potassium acid fluoride	7789-29-9	5.0E+02	2.6E+01	1.5E+01		
Potassium antimonate	29638-69-5	1.1E+02	5.3E+00	3.1E+00		
Potassium arsenate	7784-41-0	1.2E+01	2.5E+00	3.5E-01		
Potassium arsenite	10124-50-2	2.7E+01	1.4E+01	2.0E+00		
Potassium arsenite	13464-35-2	9.7E+00	6.0E+00	5.9E-02		
Potassium bicarbonate	298-14-6	5.0E+02	6.0E+01	3.5E+01		
Potassium bi-iodate	13455-24-8	4.0E+02	7.5E+01	1.3E+01		
Potassium bisulfate	7646-93-7	5.0E+02	2.0E+02	3.0E+01		
Potassium bromate	7758-01-2	6.0E+01	6.0E+01	3.0E-01		
Potassium bromide	7758-02-3	5.0E+02	2.5E+02	4.0E+01		
Potassium carbonate	584-08-7	5.0E+02	1.5E+02	2.0E+01		
Potassium chlorate	3811-04-9	3.5E+02	3.0E+02	4.0E+01		
Potassium chloride	7447-40-7	1.5E+01	1.5E+01	5.0E+00		
Potassium chromate (VI)	7789-00-6	5.6E+01	6.0E+00	7.5E-01		
Potassium citrate	866-84-2	1.5E+02	3.0E+01	4.0E+00		
Potassium citrate, monohydrate	6100-05-6	2.5E+02	5.0E+01	3.0E+01		
Potassium cyanide	151-50-8	4.0E+01	1.9E+01	5.3E+00	2.7E+00	
Health Effects	asphy , blood changes , conf , head , incr rate resp , irrit eyes , irrit skin , irrit upper resp sys , lass , nau , slow gasping resp , thyroid changes , vomit					
Target Organs	CNS - unspecified, Lungs, Thyroid					
Potassium dichromate	7778-50-9	4.2E+01	1.0E+01	1.5E+00		
Potassium dideuterium phosphate	13761-79-0	1.5E-02	7.5E-03	4.0E-03		
Potassium ferricyanide	13746-66-2	5.0E+02	3.0E+01	1.8E+01		
Potassium ferrocyanide	13943-58-3	5.9E+01	5.9E+01	3.5E+01		
Potassium fluoride	7789-23-3	5.0E+02	3.8E+01	2.3E+01		
Potassium fluoride dihydrate	13455-21-5	5.0E+02	6.2E+01	3.7E+01		
Potassium formate	590-29-4	5.0E+02	5.0E+02	6.0E+01		
Potassium glycolate	1932-50-9	3.5E+03	6.0E+02	7.5E+01		
Potassium gold cyanide	554-07-4	1.4E+02	1.4E+02	8.3E+01		
Potassium hexacyanoferate (II)	14459-95-1	6.8E+01	6.8E+01	4.1E+01		
Potassium hexafluorosilicate	16871-90-2	6.0E+01	7.5E+00	1.3E+00		
Potassium hexahydroxoantimonate (V)	12208-13-8	1.1E+02	5.4E+00	3.2E+00		
Potassium hydride	7693-26-7	1.5E+02	3.5E+01	5.0E+00		
Potassium hydroxide	1310-58-3	1.3E+02	2.0E+00	3.0E-01		
Health Effects	cough , diarr , eye burns , irrit eyes , irrit resp sys , irrit skin , skin burns , sneez , vomit					
Potassium iodate	7758-05-6	6.0E+01	6.0E+01	6.0E+01		
Potassium iodide	7681-11-0	3.0E+02	6.0E+00	7.5E-01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Potassium metaborate	13709-94-9	5.0E+02	2.5E+02	3.5E+01		
Potassium molybdate	13446-49-6	5.0E+02	6.2E+00	3.7E+00		
Potassium niobate	12030-85-2	5.0E+02	2.5E+02	3.5E+01		
Potassium nitrate	7757-79-1	5.0E+02	2.5E+01	3.5E+00		
Potassium nitrite	7758-09-0	5.0E+02	7.5E-01	1.0E-01		
Potassium oxalate	583-52-8	5.0E+02	1.5E+02	2.5E+01		
Potassium oxalate monohydrate	6487-48-5	5.0E+02	1.5E+02	2.5E+01		
Potassium oxide	12136-45-7	1.3E+02	2.0E+00	3.0E-01		
Potassium perchlorate	7778-74-7	5.0E+02	5.0E+02	4.0E+02		
Potassium periodate	7790-21-8	1.0E+02	2.0E+01	3.0E+00		
Potassium permanganate	7722-64-7	5.0E+02	1.4E+01	8.6E+00		
Potassium phosphate dibasic trihydrate	16788-57-1	5.0E+02	5.0E+02	5.0E+02		
Potassium phosphate, dibasic	7758-11-4	2.5E+02	5.0E+01	3.0E+01		
Potassium phosphate, monobasic	7778-77-0	5.0E+02	5.0E+01	3.0E+01		
Potassium phosphate, tribasic	7778-53-2	5.0E+02	5.0E+01	3.0E+01		
Potassium Phosphide	20770-41-6	2.2E+01	1.2E+01	7.5E+00		
Potassium polysilicate	1312-76-1	2.5E+02	5.0E+01	3.0E+01		
Potassium pyrophosphate	7320-34-5	5.0E+02	5.0E+02	3.5E+02		
Potassium pyrosulfate	7790-62-7	2.5E+02	5.0E+01	3.0E+01		
Potassium pyrosulfite	16731-55-8	5.0E+02	4.0E+02	6.0E+01		
Potassium selenate	7790-59-2	2.8E+00	2.8E+00	1.7E+00		
Potassium selenite	10431-47-7	2.6E+00	2.6E+00	1.6E+00		
Potassium silicate	10006-28-7	5.0E+02	1.3E+02	1.5E+01		
Potassium silver cyanide	506-61-6	1.8E+01	1.8E+01	2.5E+00		
Potassium stannate trihydrate	12142-33-5	1.3E+02	1.3E+01	7.5E+00		
Potassium sulfate	7778-80-5	5.0E+02	4.0E+01	6.0E+00		
Potassium sulfite	10117-38-1	5.0E+02	1.5E+02	2.5E+01		
Potassium tellurite	7790-58-1	5.0E+01	3.5E+00	6.0E-01		
Potassium tert-butoxide	865-47-4	1.5E+02	3.5E+01	5.0E+00		
Potassium tetrafluoroborate(1-)	14075-53-7	4.1E+02	2.1E+02	1.2E+02		
Potassium tetraphenyl boron	3244-41-5	2.5E+01	5.0E+00	3.0E+00		
Potassium thiocyanate	333-20-0	6.0E+01	6.0E+01	3.5E+01		
Potassium tungstate	7790-60-5	5.3E+00	5.3E+00	5.3E+00		
Praseodymium (stable)	7440-10-0	1.5E+02	3.5E+01	5.0E+00		
Praseodymium oxide	11113-81-8	5.0E+02	1.5E+02	2.5E+01		
Praseodymium(III,IV) oxide	12037-29-5	5.0E+02	4.0E+02	6.0E+01		
Promecarb	2631-37-0	2.5E+01	1.6E+01	1.0E+01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Propanamine, 1-	107-10-8	6.0E+02	6.0E+02	1.3E+02		
Propane	74-98-6	6.0E+04	3.1E+04	9.9E+03	9.9E+03	4.4E+02
Health Effects	asphy , conf , dizz , excitation , liquid: frostbite					
Propane sultone	1120-71-4	2.0E+01	7.5E+00	1.3E+00		
Health Effects	carc , irrit eyes , irrit resp sys , irrit skin					
Propanediamine, 1,2-	78-90-0	5.0E+02	2.0E+02	2.5E+01		
Propanediamine, 1,3-	109-76-2	1.3E+02	1.3E+01	1.5E+00		
Propanethiol, 1-	107-03-9	2.5E+03	1.5E+00	2.0E-01		
Health Effects	cyan , dizz , head , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit nose , irrit resp sys , irrit skin , irrit throat , nau					
Propanol, ((1-methyl-1,2-	24800-44-0	1.3E+03	2.5E+02	3.5E+01		
Propanol, 1(or 2)-propoxy-	30136-13-1	1.3E+03	2.5E+02	3.5E+01		
Propargyl alcohol	107-19-7	1.7E+02	3.7E+01	5.7E+00	5.7E+00	7.9E-01
Health Effects	CNS depres , in animals: kidney damage , in animals: liver damage , irrit muc memb , irrit skin					
Target Organs	Kidneys, Liver					
Propargyl bromide	106-96-7	2.0E+01	3.0E-02	3.0E-02		
Propiolactone, beta-	57-57-8	4.0E+01	1.5E+01	1.5E+00	1.5E+00	5.0E-01
Health Effects	carc , corn opac , dysuria , frequent urination , hema , irrit skin , skin blisters , skin burns					
Propionaldehyde	123-38-6	2.0E+03	6.2E+02	1.1E+02	1.1E+02	1.6E+01
Propionic acid	79-09-4	1.0E+03	4.0E+01	4.0E+01	3.0E+01	1.0E+01
Health Effects	abdom pain , blurred vision , corn burns , irrit eyes , irrit nose , irrit skin , irrit throat , nau , skin burns , vomit					
Propionic acid, sodium salt	137-40-6	5.0E+02	3.5E+02	5.0E+01		
Propionic anhydride	123-62-6	5.0E+02	2.0E+02	3.0E+01		
Propionitrile	107-12-0	8.3E+01	1.6E+01	1.3E+01		
Health Effects	chest pain , convuls , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit resp sys , irrit skin , lass , nau , stupor , vomit					
Propionyl chloride	79-03-8	3.0E+01	6.0E+00	7.5E-01		
Propyl acetate, n-	109-60-4	6.0E+03	1.0E+03	1.0E+03	8.4E+02	2.9E+02
Health Effects	in animals: derm , in animals: irrit eyes , in animals: irrit nose , in animals: irrit throat , in animals: narco					
Propyl alcohol, n-	71-23-8	2.0E+03	6.0E+02	6.0E+02	2.5E+02	8.4E+01
Health Effects	abdom cramps , ataxia , diarr , drow , dry cracking skin , GI pain , head , in animals: narco , irrit eyes , irrit nose , irrit throat , nau , vomit					
Propyl chlorocarbonate	109-61-5	5.5E+01	1.9E+01	1.0E+01		
Propyl nitrate, n-	627-13-4	2.0E+03	4.0E+02	1.5E+02	1.1E+02	2.6E+01
Health Effects	anoxia , cyan , dizz , dysp , head , in animals: irrit eyes , in animals: irrit skin , lass , methemo					
Target Organs	Blood					
Propyl-1-butanamine, N-	20193-21-9	5.0E+02	3.5E+02	5.0E+01		
Propylbenzene, n-	103-65-1	1.5E+04	3.0E+03	4.0E+02		
Propylene	115-07-1	3.5E+04	4.0E+03	2.5E+03	8.6E+02	2.9E+02
Propylene carbonate, 1,2-	108-32-7	1.3E+01	2.5E+00	3.5E-01		
Propylene chlorohydrin	127-00-4				3.9E+00	9.5E-01

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Propylene glycol	57-55-6	5.0E+02	1.0E+01	1.0E+01		
Propylene glycol dinitrate	6423-43-4	8.8E+01	6.8E+00	1.2E+00	2.0E-01	2.7E-02
Health Effects	conj , head , head , impaired balance , in animals: kidney damage , in animals: liver damage , irrit Eyes, irrit eyes , methemo , vis dist					
Target Organs	Blood, CNS - unspecified, CVS - unspecified, Nervous system - unspecified, Whole body					
Propylene glycol monoacrylate	999-61-1				2.7E+00	9.1E-01
Health Effects	cough , dysp , eye burns , irrit eyes , irrit resp sys , irrit skin , skin burns					
Propylene glycol monomethyl ether	107-98-2	2.5E+03	1.0E+03	5.0E+02	3.7E+02	1.3E+02
Health Effects	diarr , dizz , drow , head , inco , irrit eyes , irrit nose , irrit skin , irrit throat , nau , vomit					
Target Organs	CNS - unspecified					
Propylene glycol monomethyl ether	108-65-6	2.7E+04	5.4E+03	2.7E+02		
Propylene glycol mono-n-butyl ether	10215-33-5	2.5E+03	1.5E+03	2.5E+02		
Propylene oxide	75-56-9	2.1E+03	6.9E+02	1.7E+02	1.7E+02	1.6E+00
Health Effects	carc , irrit eyes , irrit resp sys , irrit skin , skin blisters , skin burns					
Target Organs	Epithelium, Nasal - pharynx, Nose					
Propylenechlorohydrin	78-89-7				3.9E+00	9.5E-01
Propyleneimine	75-55-8	5.4E+01	2.8E+01	7.5E-01	4.7E-01	1.6E-01
Health Effects	carc , eye burns , skin burns					
Target Organs	CNS - unspecified					
Propyltrichlorosilane	141-57-1	1.6E+02	3.5E+01	2.9E+00	2.9E+00	
Prothoate	2275-18-5	7.5E+00	1.7E+00	1.0E+00		
P-Tert-butyl benzoic acid	98-73-7	2.0E+02	5.0E+01	6.0E+00		
P-Tert-butylphenol	98-54-4	5.0E+02	7.5E-01	5.0E-01		
p-Thiocresol	106-45-6	7.5E+01	1.5E+01	2.5E+00		
P-Toluenesulfonamide	70-55-3	1.0E+02	2.0E+01	3.0E+00		
P-Toluenesulfonic acid, methyl ester	80-48-8	1.5E+02	1.5E+01	2.5E+00		
Pyrene	129-00-0	1.5E+01	1.5E+01	2.5E+00		
Pyrethrin I	121-21-1	1.0E+02	2.5E+01	1.0E+01		
Pyrethrins and Rotenone mixture	0-581*	2.0E+02	6.0E+01	1.0E+01		
Pyrethrum	8003-34-7				5.0E+00	1.2E+00
Health Effects	asthma , derm , eryt , papules , pruritus , rhin , sneez					
Target Organs	CNS - unspecified, Liver, Skin					
Pyridine	110-86-1	3.0E+03	1.5E+01	1.0E+01	2.9E+00	9.8E-01
Health Effects	anor , anxi , derm , dizz , head , insom , irrit eyes , kidney damage , liver damage , nau					
Target Organs	CNS - unspecified, Kidneys, Liver					
Pyridine-D5	7291-22-7	3.5E+03	1.5E+01	1.0E+01		
Pyriminil	53558-25-1	2.0E+01	6.2E+00	3.5E+00		
Pyrogallic acid	87-66-1	2.5E+01	1.5E+01	2.5E+00		
Pyromellitic acid	89-05-4	1.3E+02	2.5E+01	3.5E+00		
Pyrrole	109-97-7	1.0E+01	2.0E+00	3.0E-01		
Pyrrolidine	123-75-1	5.0E+02	1.0E+02	1.5E+01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Pyrrolidinone, 2-	616-45-5	1.5E+02	6.0E+01	1.0E+01		
Quaternary ammonium compounds,	70750-47-9	1.5E+02	3.5E+01	5.0E+00		
Quaternary ammonium compounds,	71487-00-8	1.5E+02	3.5E+01	5.0E+00		
Quinhydrone	106-34-3	3.0E+01	6.0E+00	7.5E-01		
Quinoline	91-22-5	1.5E+02	2.5E+01	3.5E+00		
Quinolinol, 8-	148-24-3	5.0E+02	5.0E+01	7.5E+00		
Quinone	106-51-4	1.0E+02	2.0E+01	1.3E+00	4.4E-01	1.5E-01
Health Effects	conj , irrit eyes , irrit skin , kera					
Target Organs	Eyes					
RDX	121-82-4	4.0E+01	4.0E+01	3.0E+00	5.0E-01	1.7E-01
Health Effects	convuls , dizz , head , insom , irrit eyes , irrit skin , irrity , lass , nau , tremor , vomit					
Target Organs	Blood, CNS - unspecified, Liver					
Resorcinol	108-46-3	7.5E+01	7.5E+01	7.5E+01	4.5E+01	1.5E+01
Health Effects	bluish skin , convuls , cyan , derm , dizz , drow , dysp , hema , hypothermia , incr heart rate , irrit eyes , irrit nose , irrit skin , irrit throat , irrit upper resp sys , kidney changes , liver changes , methemo , restless , spleen changes					
Target Organs	Blood, Skin					
Rexyn	69011-49-0	2.5E+02	5.0E+01	3.0E+01		
Rhenium (VII) oxide	1314-68-7	3.0E+01	6.5E+00	3.9E+00		
Rhenium hexafluoride	10049-17-9	5.0E+02	3.3E+01	2.0E+01		
Rhodamine 6G	989-38-8	2.5E+00	6.0E-01	7.5E-02		
Rhodium	7440-16-6	1.0E+02	5.0E+00	3.0E+00	1.0E+00	3.4E-01
Health Effects	possible resp sens					
Rhodium (III) oxide	12036-35-0	1.2E+02	6.2E+00	3.7E+00		
Rhodium (IV) oxide	12137-27-8	2.6E+00	5.0E-01	7.5E-02		
Rhodium hydroxide	21656-02-0	3.0E+00	6.0E-01	7.5E-02		
Rhodium soluble compounds	RH sol				1.0E-02	3.4E-03
Health Effects	CNS damage , in animals: irrit eyes					
Riboflavine	83-88-5	5.0E+02	1.5E+02	2.5E+01		
Ricin	9009-86-3	4.8E-03				
Ronnel	299-84-3				5.0E+00	1.2E+00
Health Effects	chol inhibition , in animals: irrit eyes , kidney damage , liver damage					
Rotenone	83-79-4	1.3E+02	2.5E+01	1.5E+01	5.0E+00	1.7E+00
Health Effects	abdom pain , clonic convuls , inco , irrit eyes , irrit resp sys , irrit skin , musc tremor , nau , numb muc memb , stupor , vomit					
Target Organs	CNS - unspecified					
Rubber dust	9006-04-6				1.0E-03	2.4E-04
Rubber solvent	64742-89-8	4.0E+03	7.5E+02	4.0E+02		
Rubidium	7440-17-7	5.0E+02	1.0E+02	1.5E+01		
Rubidium bromide	7789-39-1	2.5E+02	5.0E+01	3.0E+01		
Rubidium chloride	7791-11-9	5.0E+02	3.5E-01	5.0E-02		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Rubidium hydroxide	1310-82-3	2.5E+02	5.0E+01	7.5E+00		
Rubidium nitrate	13126-12-0	5.0E+02	4.0E+02	6.0E+01		
Ruthenium	7440-18-8	2.5E+02	5.0E+01	3.0E+01		
Ruthenium (IV) oxide	12036-10-1	1.5E+01	1.5E+01	1.3E+01		
Ruthenium trichloride	10049-08-8	1.5E+02	3.0E+01	4.0E+00		
Safranine	477-73-6	2.5E+01	5.0E+00	7.5E-01		
Safrole	94-59-7	5.0E+02	1.0E+02	1.5E+01		
Salcomine	14167-18-1	4.0E+02	3.9E+01	2.0E+01		
Salicylaldehyde	90-02-8	2.0E+02	1.3E+01	1.5E+00		
Salicylic acid	69-72-7	4.0E+02	6.0E+00	7.5E-01		
Salicylic acid, monoammonium salt	528-94-9	5.0E+02	3.0E+01	4.0E+00		
Salicylic acid, phenyl ester	118-55-8	5.0E+02	7.5E+01	1.3E+01		
Samarium	7440-19-9	2.5E+02	5.0E+01	3.0E+01		
Samarium (III) oxide	12060-58-1	5.0E+02	4.0E+02	6.0E+01		
Samarium nitrate	10361-83-8	5.0E+02	1.5E+02	2.5E+01		
Samarium(ii) iodide solution	32248-43-4	5.0E+02	1.5E+02	2.5E+01		
Samarium(III) chloride hexahydrate	13465-55-9	5.0E+02	2.5E+02	4.0E+01		
Saxitoxin	35523-89-8	3.5E-03	6.0E-04	1.0E-04		
Scandium	7440-20-2	2.5E+02	5.0E+01	3.0E+01		
Scandium oxide	12060-08-1	2.5E+02	5.0E+01	3.0E+01		
sec-Butyl chloroformate	17462-58-7	3.7E+01	1.2E+01	1.5E+00		
Sec-butyllithium	598-30-1	1.0E+02	2.0E+01	3.0E+00		
Selenious acid	7783-00-8	2.5E+02	2.5E+02	9.8E-01		
Selenium	7782-49-2	1.0E+00	1.0E+00	6.0E-01	2.0E-01	6.8E-02
Health Effects	bron , chills , cirr , derm , dysp , eye burns , fever , garlic breath , GI dist , head , in animals: anemia , irrit eyes , irrit nose , irrit skin , irrit throat , kidney damage , liver nec , metallic taste , skin burns , spleen damage , vis dist					
Selenium dioxide	7446-08-4	1.5E+02	1.4E+00	8.4E-01		
Selenium hexafluoride	7783-79-1	2.1E+00	6.9E-01	4.2E-01	1.3E-01	9.7E-02
Health Effects	edema , in animals: pulm irrit					
Selenium oxychloride	7791-23-3	1.0E+01	1.0E+01	1.3E+00		
Selenium sulfide	7488-56-4	6.0E+01	1.8E+00	1.1E+00		
Selenium sulfide	7446-34-6	1.5E+01	1.3E+01	8.4E-01		
Semicarbazide hydrochloride	563-41-7	1.0E+02	1.0E+02	6.0E+01		
Sephacryl s-200, superfine	65546-95-4	2.5E+02	5.0E+01	3.0E+01		
Sephacryl s-300	82785-74-8	2.5E+02	5.0E+01	3.0E+01		
Sepharose CL 4B	61970-08-9	2.5E+02	5.0E+01	3.0E+01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Sesone	136-78-7				1.0E+01	3.4E+00
Health Effects	in animals: CNS effects , in animals: convuls , irrit eyes , irrit skin , kidney damage , liver damage					
Sesquimustard	3563-36-8	6.0E+00	1.3E+00	1.5E-01		
Sethoxydim	74051-80-2	5.0E+02	2.5E+02	4.0E+01		
Silica gel	1343-98-2	5.0E+02	3.0E+01	1.8E+01		
Silica gel dessicant	63231-67-4	5.0E+02	3.0E+01	1.8E+01		
Silica gel, silica precipitated	112926-00-8	5.0E+02	1.0E+02	1.8E+01		
Silica, amorphous	7631-86-9	5.0E+02	1.3E+02	1.8E+01		
Health Effects	irrit eyes , pneumoconiosis					
Silica, amorphous fume	69012-64-2	5.0E+02	1.5E+00	9.0E-01		
Silica, amorphous fumed	112945-52-5	5.0E+02	3.0E+01	1.8E+01		
Silica, crystalline quartz	14808-60-7	5.0E+01	1.3E-01	7.5E-02	2.5E-02	6.1E-03
Health Effects	carc , cough , decr pulm func , dysp , irrit eyes , progressive resp symptoms (silicosis) , wheez					
Silica, crystalline tripoli	1317-95-9				2.5E-02	6.1E-03
Silicic acid	7699-41-4	4.0E+02	7.5E+01	1.0E+01		
Silicic acid, aluminum calcium sodium	1344-01-0	6.0E+01	5.0E+01	3.0E+01		
Silicofluoric acid	16961-83-4	5.0E+01	1.6E+01	9.5E+00		
Silicon	7440-21-3	5.0E+02	7.5E+01	4.5E+01		
Health Effects	cough , irrit eyes , irrit skin , irrit upper resp sys					
Silicon (II) oxide	10097-28-6	2.5E+02	5.0E+01	3.0E+01		
Silicon carbide, fibrous	409-21-2	5.0E+02	2.5E+02	4.5E+01		
Health Effects	cough , irrit eyes , irrit skin , irrit upper resp sys					
Target Organs	Lungs					
Silicon carbide, nonfibrous, inhalable	Sil carb inhal				3.0E+00	7.3E-01
Silicon nitride	12033-89-5	2.5E+02	5.0E+01	3.0E+01		
Silicon tetrafluoride	7783-61-1	4.3E+01	1.4E+01	2.1E-01	2.1E-01	
Silicon tetrahydride	7803-62-5	3.5E+02	1.7E+02	1.3E+02	6.6E+00	2.2E+00
Health Effects	head , irrit eyes , irrit muc memb , irrit skin , nau					
Silicone	63148-62-9	5.0E+02	3.5E+02	5.0E+01		
Silicone oil	63148-58-3	2.5E+02	5.0E+01	7.5E+00		
Siloprene k 1000	63394-02-5	5.0E+02	5.0E+02	1.0E+02		
Siloxanes and Silicones, di-Me, Me	68037-59-2	2.5E+02	5.0E+01	3.0E+01		
Siloxanes and Silicones, di-Me, Me	68083-18-1	2.5E+02	5.0E+01	3.0E+01		
Siloxanes and silicones, di-Me,	67762-90-7	5.0E+02	1.3E+02	1.5E+01		
Siloxanes and Silicones, di-Me, vinyl	68083-19-2	5.0E+02	5.0E+02	2.0E+02		
Silver	7440-22-4	1.0E+01	5.0E-01	3.0E-01	1.0E-01	2.4E-02
Health Effects	blue-gray eyes , blue-gray nasal septum , blue-gray skin , blue-gray throat , GI dist , irrit skin , ulceration skin					
Target Organs	Eyes, Mucosa, Skin					
Silver carbonate	534-16-7	1.3E+01	6.4E-02	3.8E-02		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Silver chloride	7783-90-6	1.3E+01	6.6E-02	4.0E-02		
Silver cyanide	506-64-9	1.3E+02	1.3E+02	7.7E+01		
Silver hydroxide	z-0060	1.2E+01	6.0E-02	3.5E-02		
Silver nitrate	7761-88-8	1.6E+01	3.0E+00	4.0E-01		
Silver nitrite	7783-99-5	1.4E+01	7.5E-02	4.3E-02		
Silver oxide	20667-12-3	3.0E+01	6.0E+00	7.5E-01		
Silver soluble compounds	Ag sol cmpds				1.0E-02	2.4E-03
Silvex	93-72-1	2.5E+02	2.0E+02	3.5E+01		
Soapstone, respirable dust	sil soap resp				3.0E+00	7.3E-01
Soda lime	8006-28-8	2.5E+01	1.0E+01	6.0E+00		
Sodium	7440-23-5	5.0E+01	5.0E+00	5.0E-01		
Sodium acetate	127-09-3	5.0E+02	3.0E+02	4.0E+01		
Sodium acetate trihydrate	6131-90-4	5.0E+02	3.0E+02	4.0E+01		
Sodium aluminate	1302-42-7	1.5E+02	3.0E+01	1.8E+01		
Sodium aluminate	11138-49-1	2.0E+02	4.4E+01	2.6E+01		
Sodium aluminum hydride	13770-96-2	3.0E+02	6.0E+01	7.5E+00		
Sodium aluminum silicate	73987-94-7	5.0E+02	1.5E+01	1.0E+01		
Sodium antimony	11112-10-0	1.0E+02	5.1E+00	3.0E+00		
Sodium arsenate	7631-89-2	1.4E+01	1.4E+01	7.5E+00		
Sodium arsenite	7784-46-5	8.7E+00	8.7E+00	1.3E+00		
Sodium azide	26628-22-8	2.0E+01	2.0E+01	3.0E+00		
Health Effects	blurred vision , bradycardia , dizz , head , irrit eyes , irrit skin , kidney changes , lass , low BP					
Target Organs	CNS - unspecified, CVS - unspecified, Lungs					
Sodium bicarbonate	144-55-8	5.0E+02	2.0E+00	3.5E-01		
Sodium bifluoride	1333-83-1	4.1E+02	7.5E+01	1.0E+01		
Sodium bis(2-methoxyethoxy)	22722-98-1	3.5E+02	7.5E+01	4.5E+01		
Sodium bismuthate	12232-99-4	1.5E+02	3.5E+01	5.0E+00		
Sodium bisulfate	7681-38-1	1.3E+02	2.5E+01	3.5E+00		
Sodium bisulfate monohydrate	10034-88-5	7.5E+01	1.5E+01	2.5E+00		
Sodium bisulfite	7631-90-5	5.0E+02	2.5E+01	1.5E+01	5.0E+00	1.2E+00
Health Effects	irrit eyes , irrit muc memb , irrit skin					
Sodium borohydride	16940-66-2	7.5E+00	1.5E+00	2.0E-01		
Sodium bromate	7789-38-0	6.0E+01	1.3E+01	1.5E+00		
Sodium bromide	7647-15-6	5.0E+02	3.5E+01	5.0E+00		
Sodium cacodylate	124-65-2	5.0E+02	4.0E+01	3.2E+00		
Sodium carbonate	497-19-8	5.0E+02	2.5E-01	4.0E-02		
Sodium carbonate monohydrate	5968-11-6	1.5E+02	3.5E+01	5.0E+00		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Sodium carboxymethyl cellulose	9004-32-4	5.0E+02	7.5E+00	1.3E+00		
Sodium chlorate	7775-09-9	7.5E+01	3.0E+00	4.0E-01		
Sodium chloride	7647-14-5	5.0E+02	3.0E+02	4.0E+01		
Sodium chromate	7775-11-3	4.7E+01	7.5E-01	1.3E-01		
Sodium chromate tetrahydrate	10034-82-9	8.7E+01	1.5E+01	2.5E+00		
Sodium cobaltinitrite	13600-98-1	1.5E+01	3.0E+00	4.0E-01		
Sodium cyanide	143-33-9	3.0E+01	1.4E+01	4.0E+00	2.0E+00	
Health Effects	asphy , blood changes , conf , head , incr resp rate , irrit eyes , irrit skin , lass , nau , slow gasping respiration , thyroid changes , vomit					
Target Organs	CNS - unspecified, Lungs, Thyroid					
Sodium cyclopentadienylide	4984-82-1	2.5E+02	5.0E+01	3.0E+01		
Sodium deuteroxide	14014-06-3	5.0E+01	5.0E+00	5.0E-01		
Sodium dichromate	10588-01-9	3.8E+01	3.8E+01	2.0E+01		
Sodium dichromate dihydrate (VI)	7789-12-0	4.3E+01	7.2E-01	4.3E-01		
Sodium diethydithiocarbamate	148-18-5	5.0E+02	2.5E+02	6.0E+00		
Sodium diethyldithiocarbamate	20624-25-3	5.0E+02	1.0E+01	6.0E+00		
Sodium dihydrogen phosphate	10049-21-5	5.0E+02	5.0E+02	3.0E+02		
Sodium dithionate dihydrate	7631-94-9	2.5E+02	5.0E+01	3.0E+01		
Sodium dodecylbenzenesulfonate	25155-30-0	2.0E+02	7.5E+01	1.3E+01		
Sodium ethoxide	141-52-6	1.5E+02	3.5E+01	5.0E+00		
Sodium ferricyanide	14402-89-2	2.0E+01	1.3E+01	2.0E+00		
Sodium ferrocyanide	13601-19-9	5.0E+02	2.7E+01	1.6E+01		
Sodium fluoroacetate	62-74-8	2.5E+00	5.0E-01	1.5E-01	5.0E-02	1.2E-02
Health Effects	anxi , auditory halu , card arrhy , convuls , ectopic heartbeat , facial pares , kidney damage , liver damage , nystagmus , pulm edema , pulsus altenans , tacar , twitch face musc , vomit					
Target Organs	CNS - unspecified, CVS - unspecified					
Sodium formate	141-53-7	5.0E+02	5.0E+02	1.3E+02		
Sodium gluconate	527-07-1	7.5E+01	1.5E+01	2.0E+00		
Sodium glycinate	6000-44-8	5.0E+02	1.0E+02	1.3E+01		
Sodium glycolate	2836-32-0	3.0E+03	7.5E+02	1.3E+02		
Sodium hexametaphosphate	10124-56-8	5.0E+02	5.0E+02	7.5E+01		
Sodium hexamethyldisilazane	1070-89-9	2.5E+02	5.0E+01	3.0E+01		
Sodium hydride	7646-69-7	4.0E+01	7.5E+00	1.3E+00		
Sodium hydrosulfite	7775-14-6	2.5E+02	5.0E+01	3.0E+01		
Sodium hydroxide	1310-73-2	5.0E+01	5.0E+00	5.0E-01		
Health Effects	eye burns , irrit eyes , irrit muc memb , irrit skin , pneu , skin burns , temporary loss of hair					
Sodium hypobromite	13824-96-9	2.5E+02	5.0E+01	3.0E+01		
Sodium hypochlorite	7681-52-9	5.0E+02	5.0E+01	2.0E+00		
Sodium hypochlorite pentahydrate	10022-70-5	5.0E+02	1.5E+00	2.0E-01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Sodium hypophosphite hydrate	7681-53-0	5.0E+02	1.3E+02	2.0E+01		
Sodium hypophosphite hydrate	123333-67-5	5.0E+02	1.3E+02	2.0E+01		
Sodium iodate	7681-55-2	2.0E+02	4.0E+01	6.0E+00		
Sodium iodide	7681-82-5	5.0E+02	1.5E+01	2.5E+00		
Sodium lactate	72-17-3	5.0E+02	3.0E+02	4.0E+01		
Sodium lauryl sulfate	151-21-3	5.0E+02	6.0E+00	1.0E+00		
Sodium metabisulfite	7681-57-4	1.0E+02	2.5E+01	1.5E+01	5.0E+00	1.7E+00
Health Effects	irrit eyes , irrit muc memb , irrit skin					
Sodium metaborate	7775-19-1	5.0E+02	2.0E+02	3.7E+01		
Sodium metaphosphate	10361-03-2	3.5E+02	7.5E+01	1.0E+01		
Sodium metasilicate	6834-92-0	5.0E+02	5.0E+02	2.0E+02		
Sodium metasilicate pentahydrate	10213-79-3	3.5E+02	7.5E+01	4.5E+01		
Sodium metasilicate, nonahydrate	13517-24-3	5.0E+02	1.0E+02	6.1E+01		
Sodium metavanadate	13718-26-8	3.0E+01	1.2E+00	1.5E-01		
Sodium methylate	124-41-4	5.0E+02	1.5E+02	2.5E+01		
Sodium molybdate	7631-95-0	5.0E+02	1.0E+01	3.2E+00		
Sodium molybdate, dihydrate	10102-40-6	5.0E+02	5.0E+02	1.3E+01		
Sodium monoxide	12401-86-4	5.0E+01	5.0E+00	5.0E-01		
Sodium m-periodate	7790-28-5	2.5E+01	5.0E+00	7.5E-01		
Sodium nitrate	7631-99-4	1.0E+02	7.5E+00	1.0E+00		
Sodium nitrite	7632-00-0	6.0E+01	1.0E+00	1.5E-01		
Sodium o-benzyl-p-chlorophenate	3184-65-4	2.5E+02	5.0E+01	3.0E+01		
Sodium orthovanadate	13721-39-6	1.3E+02	1.8E+00	2.5E-01		
Sodium oxalate	62-76-0	3.0E+01	6.0E+00	7.5E-01		
Sodium oxide	1313-59-3	5.0E+01	5.0E+00	5.0E-01		
Sodium pentachlorophenate	131-52-2	7.5E+01	2.4E+01	3.5E+00		
Sodium perborate	7632-04-4	5.0E+02	1.0E+01	1.5E+00		
Sodium perchlorate	7601-89-0	5.0E+02	1.5E+02	2.5E+01		
Sodium perchlorate monohydrate	7791-07-3	5.0E+02	1.0E+02	1.5E+01		
Sodium permanganate	10101-50-5	5.0E+02	1.3E+01	7.8E+00		
Sodium peroxide	1313-60-6	5.0E+01	5.0E+00	5.0E-01		
Sodium perrhenate	13472-33-8	5.0E+02	1.5E+02	2.5E+01		
Sodium persulfate	7775-27-1	1.0E+02	2.0E+01	2.5E+00		
Sodium phophate dibasic	7558-79-4	5.0E+02	5.0E+02	2.0E+02		
Sodium phosphate decahydrate	13472-36-1	5.0E+02	2.0E+02	3.0E+01		
Sodium phosphate dibasic	10039-32-4	1.5E+02	3.5E+01	5.0E+00		
Sodium phosphate monobasic	7558-80-7	5.0E+02	5.0E+02	1.0E+02		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Sodium phosphate tribasic	10101-89-0	5.0E+02	5.0E+02	7.5E+01		
Sodium phosphate, dibasic	7782-85-6	5.0E+02	5.0E+02	1.5E+02		
Sodium phosphate, tribasic	7601-54-9	5.0E+02	5.0E+02	5.0E+00		
Sodium Phosphide	12058-85-4	1.5E+01	8.2E+00	5.0E+00		
Sodium polyphosphate	68915-31-1	5.0E+02	2.5E+02	4.0E+01		
Sodium polytungstate	12141-67-2	1.5E+02	3.5E+01	1.4E+01		
Sodium potassium alloys	11135-81-2	5.0E+01	5.0E+00	4.8E-01		
Sodium potassium tartrate	304-59-6	5.0E+02	4.0E+02	6.0E+01		
Sodium potassium tartrate, tetrahydrate	6381-59-5	5.0E+02	4.0E+02	6.0E+01		
Sodium p-tert-amylphenate	31366-95-7	2.5E+02	5.0E+01	3.0E+01		
Sodium pyruvate (pyruvic acid, sodium	113-24-6	2.5E+02	5.0E+01	3.0E+01		
Sodium salicylate	54-21-7	5.0E+02	5.0E+02	1.0E+02		
Sodium selenate	13410-01-0	1.6E+00	1.6E+00	1.4E+00		
Sodium selenite	10102-18-8	3.0E+00	2.3E+00	1.3E+00		
Sodium silicate	1344-09-8	5.0E+02	1.5E+02	2.5E+01		
Sodium silicoaluminate	1344-00-9	5.0E+02	1.5E+02	1.0E+01		
Sodium stannate	12058-66-1	1.8E+02	1.8E+01	1.1E+01		
Sodium stearate	822-16-2	1.5E+01	3.5E+00	5.0E-01		
Sodium succinate	150-90-3	4.0E+03	7.5E+02	1.0E+02		
Sodium succinate, hexahydrate	6106-21-4	5.0E+02	5.0E+02	1.0E+02		
Sodium sulfate	7757-82-6	5.0E+02	5.0E+02	2.0E+02		
Sodium sulfhydrate	16721-80-5	6.0E+00	1.3E+00	1.5E-01		
Sodium sulfide	1313-82-2	7.5E+01	1.5E+01	2.5E+00		
Sodium sulfide, nonahydrate	1313-84-4	2.0E+01	4.0E+00	6.0E-01		
Sodium sulfite	7757-83-7	1.0E+02	2.0E+01	3.0E+00		
Sodium tartrate dihydrate	6106-24-7	5.0E+02	1.0E+02	1.5E+01		
Sodium tellurite	10102-20-2	2.5E+01	7.5E+00	5.2E-01		
Sodium tetraborate	1330-43-4	5.0E+02	2.8E+01	2.8E+01	2.0E+00	6.8E-01
Health Effects	cough , derm , dysp , epis , irrit eyes , irrit skin , irrit upper resp sys					
Sodium tetrafluoroborate(1-)	13755-29-8	3.6E+02	1.8E+01	1.1E+01		
Sodium tetraphenyl borate	143-66-8	1.3E+02	2.5E+01	3.5E+00		
Sodium thiocyanate	540-72-7	1.0E+02	6.0E+00	7.5E-01		
Sodium thiosulfate	7772-98-7	5.0E+02	4.0E+02	6.0E+01		
Sodium thiosulfate pentahydrate	10102-17-7	5.0E+02	2.5E+01	3.5E+00		
Sodium titanate	12034-34-3	2.5E+02	5.0E+01	3.0E+01		
Sodium tridecylbenzene sulfonate	26248-24-8	2.0E+02	4.0E+01	6.0E+00		
Sodium triethylborohydride	17979-81-6	1.5E+02	6.8E+01	6.8E+01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Sodium trimetaphosphate	7785-84-4	5.0E+02	3.0E+02	4.0E+01		
Sodium tripolyphosphate	7758-29-4	5.0E+02	2.5E+01	3.5E+00		
Sodium tungstate	13472-45-2	5.0E+02	3.0E+00	3.0E+00		
Sodium tungstate dihydrate	10213-10-2	7.5E+01	1.5E+01	5.4E+00		
Sodium uranate	66018-57-3	1.6E+01	3.0E+00	9.4E-01		
Solvent naphtha, petroleum, heavy	64742-96-7	5.0E+02	3.0E+02	4.0E+01		
Solvent naphtha, petroleum, medium	64742-88-7	5.0E+02	5.0E+02	7.5E+01		
Solvent yellow 3	97-56-3	5.0E+02	4.0E+01	6.0E+00		
Solvent-refined heavy paraffinic	64741-88-4	5.0E+02	2.5E+01	1.5E+01		
Sorbitan monolaurate	5959-89-7	2.5E+02	5.0E+01	3.0E+01		
Sorbitan monostearate polyoxyethylene	9005-67-8	5.0E+02	1.5E+01	2.0E+00		
Sorbitan trioleate	26266-58-0	5.0E+02	3.5E+02	5.0E+01		
Sorbitan, monolaurate	1338-39-2	5.0E+02	5.0E+02	5.0E+02		
Sorbitan, monooleate	1338-43-8	5.0E+02	5.0E+02	5.0E+02		
Sorbitan, monooleate polyoxyethylene	9005-65-6	5.0E+02	1.5E+01	2.5E+00		
Sorbitan, monostearate	1338-41-6	5.0E+02	5.0E+02	5.0E+02		
Sorbitol	50-70-4	5.0E+02	5.0E+02	1.3E+02		
Soybean oil	8001-22-7	5.0E+02	5.0E+02	1.0E+02		
Squalane	111-01-3	7.5E+03	1.5E+03	2.5E+02		
Squalen	111-02-4	5.0E+02	4.0E+02	6.0E+01		
Stannic chloride	7646-78-8	2.2E+02	5.0E+00	4.4E+00		
Stannous chloride	7772-99-8	1.6E+02	5.0E+01	9.6E+00		
Stannous octoate	301-10-0	8.5E+01	1.5E+01	2.5E+00		
Starch	9005-25-8	5.0E+02	5.0E+02	3.0E+01	1.0E+01	2.4E+00
Health Effects	chest pain , cough , derm , irrit eyes , irrit muc memb , irrit skin , rhin					
Target Organs	Lungs, Skin					
Stearates	stearates				1.0E+01	3.4E+00
Stibine	7803-52-3	4.9E+01	7.7E+00	1.0E+00	5.1E-01	1.7E-01
Health Effects	abdom pain , head , hema , hemolytic anemia , jaun , lass , lumbar pain , nau , pulm irrit					
Target Organs	Blood					
Stilbene	588-59-0	5.0E+02	1.0E+02	1.5E+01		
Stoddard solvent	8052-41-3	2.0E+04	1.5E+03	5.7E+02	5.7E+02	2.0E+02
Health Effects	chemical pneu (aspir liquid) , derm , dizz , in animals: kidney damage , irrit eyes , irrit nose , irrit throat					
Target Organs	Kidneys					
Strontium carbonate	1633-05-2	5.0E+02	2.0E+02	3.0E+01		
Strontium chloride heptahydrate	10476-85-4	5.0E+02	1.5E+02	2.0E+01		
Strontium chromate	7789-06-2				5.0E-04	1.2E-04
Strontium hydroxide	18480-07-4	7.5E+01	2.0E+01	7.5E-01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Strontium nitrate	10042-76-9	5.0E+02	2.5E+02	3.5E+01		
Strontium oxalate	814-95-9	7.5E+01	6.0E+01	2.5E+01		
Strontium Phosphide	12504-13-1	2.4E+01	1.3E+01	3.0E+00		
Strontium sulfate	7759-02-6	2.5E+02	5.0E+01	3.0E+01		
Strontium, stable	7440-24-6	5.0E+02	5.0E+02	1.3E+02		
Strychnine	57-24-9	3.0E+00	3.0E-01	3.0E-01	1.5E-01	3.7E-02
Health Effects	anxi , cyan , incr acuity of perception , incr reflex excitability , restless , stiff facial musc , stiff neck , tetanic convuls with opisthotonos					
Target Organs	CNS - unspecified					
Strychnine sulfate (2:1)	60-41-3	3.0E+01	5.0E+00	3.0E+00		
Styrene	100-42-5	4.7E+03	5.5E+02	8.5E+01	8.5E+01	5.8E+00
Health Effects	conf , defatting derm , dizz , drow , head , irrit eyes , irrit nose , irrit resp sys , lass , mal , narco , possible liver inj , repro effects , unsteady gait					
Target Organs	CNS - unspecified, Nervous system - unspecified					
Styrene oxide	96-09-3	2.5E+02	2.5E+02	6.0E+01		
Styrene, polymer	9003-53-6	7.5E+01	1.5E+01	2.0E+00		
Styrene-allyl alcohol copolymer	25119-62-4	2.5E+02	5.0E+01	3.0E+01		
Succinic acid	110-15-6	5.0E+02	2.0E+02	2.5E+01		
Succinic anhydride	108-30-5	5.0E+02	1.5E+01	2.0E+00		
Succinimidyl-6-(beta-maleimido	0-582*	2.5E+02	5.0E+01	3.0E+01		
Sucrose	57-50-1	5.0E+02	5.0E+01	3.0E+01	1.0E+01	2.4E+00
Health Effects	cough , irrit eyes , irrit skin , irrit upper resp sys					
Target Organs	Lungs					
Sucrose, diacetate hexaisobutyrate	126-13-6	5.0E+02	3.0E+02	4.0E+01		
Sulfamic acid	5329-14-6	5.0E+02	2.5E+02	4.0E+01		
Sulfamic acid, sodium salt (1:1)	13845-18-6	5.0E+02	1.5E+02	2.5E+01		
Sulfanilamide	63-74-1	5.0E+02	2.0E+01	3.0E+00		
Sulfanilic acid	121-57-3	5.0E+02	5.0E+02	1.5E+02		
Sulfometuron methyl	74222-97-2				5.0E+00	1.7E+00
Sulfosalicylic acid	97-05-2	5.0E+02	2.0E+02	3.0E+01		
Sulfosalicylic acid, dihydrate, crystal	5965-83-3	5.0E+02	1.5E+02	2.0E+01		
Sulfur (precipitated)	7704-34-9	1.3E+01	2.5E+00	4.0E-01		
Sulfur dioxide	7446-09-5	7.9E+01	2.0E+00	5.2E-01	5.2E-01	5.2E-01
Health Effects	choking , cough , irrit eyes , irrit nose , irrit throat , liquid: frostbite , reflex bronchoconstriction , rhin					
Target Organs	Respiration - unspecified					
Sulfur hexafluoride	2551-62-4	3.0E+04	3.0E+04	1.5E+04	6.0E+03	1.5E+03
Health Effects	asphy: incr breath rate , asphy: pulse rate , convuls , emotional upset , lass , liquid: frostbite , nau , slight musc inco , vomit					
Sulfur pentafluoride	5714-22-7	1.0E+01	1.0E-01	1.0E-01		
Health Effects	in animals: hemorr , in animals: pulm edema , irrit eyes , irrit resp sys , irrit skin					

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Sulfur tetrafluoride	7783-60-0	7.5E+00	7.5E+00	1.0E+00		
Health Effects	eye burns (from SF4 releasing hydrofluoric acid on exposure to moisture) , in animals: dysp , in animals: lass , in animals: rhin , irrit eyes , irrit muc memb , irrit skin , liquid: frostbite , skin burns (from SF4 releasing hydrofluoric acid on exposure					
Sulfur trioxide	7446-11-9	1.6E+02	8.7E+00	2.0E-01	2.0E-01	
Sulfuric acid	7664-93-9	1.6E+02	8.7E+00	2.0E-01	2.0E-01	4.9E-02
Health Effects	bron , conj , dental erosion , derm , emphy , eye burns , irrit eyes , irrit nose , irrit skin , irrit throat , pulm edema , skin burns , stomatis					
Target Organs	Lungs					
Sulfuric Acid D2	13813-19-9	1.6E+02	8.7E+00	2.0E-01		
Sulfuric acid, thallium salt	10031-59-1	1.6E+01	2.0E+00	3.2E-01		
Sulfuric acid, zirconium(4+) salt (2:1),	7446-31-3	2.0E+02	3.9E+01	3.9E+01		
Sulfurous acid	7782-99-2	1.5E+00	3.0E-01	4.0E-02		
Sulfuryl chloride	7791-25-5	6.1E+01	2.0E+01	1.7E+00		
Sulfuryl fluoride	2699-79-8	2.7E+02	8.8E+01	4.0E+01	2.1E+01	7.1E+00
Health Effects	conj , in animals: convuls , in animals: kidney inj , in animals: narco , in animals: pulm edema , in animals: tremor , liquid: frostbite , pares , pharyngitis , rhinitis					
Target Organs	CNS - unspecified					
Sulprofos	35400-43-2				1.0E-01	2.4E-02
Health Effects	abdom cramps , blurred vision , card irreg , chest tight , diarr , dizz , dysp , head , lass , miosis , musc fasc , nau , rhin , salv , vomit					
Talc	14807-96-6	5.0E+02	1.0E+01	2.0E+00	2.0E+00	4.9E-01
Health Effects	fibrotic pneumoconiosis , irrit eyes					
Target Organs	Lungs					
Tall oil (alkyd resin)	68333-62-0	2.5E+02	5.0E+01	3.0E+01		
Tantalum	7440-25-7	5.0E+02	2.0E+02	1.0E+01		
Health Effects	in animals: pulm irrit , irrit eyes , irrit skin					
Target Organs	Lungs					
Tantalum (V) fluoride	7783-71-3	5.0E+02	3.6E+01	2.2E+01		
Tantalum carbide	12070-06-3	5.0E+02	5.0E+02	1.1E+01		
Tantalum oxide	1314-61-0	5.0E+02	6.0E+01	1.2E+01		
Tantalum(V) ethoxide	6074-84-6	2.5E+02	5.0E+01	3.0E+01		
Tartaric acid	87-69-4	4.0E+02	7.5E+01	1.3E+01		
Tartaric acid, monopotassium salt	868-14-4	5.0E+02	5.0E+02	5.0E+02		
Tartaric acid, monosodium salt	526-94-3	5.0E+02	4.0E+02	5.0E+01		
TCDD, 2,3,7,8-	1746-01-6	7.5E-03	7.5E-03	1.5E-03		
Health Effects	allergic derm , chloracne , GI dist , in animals: carc , in animals: hemorr , in animals: kidney damage , in animals: liver damage , irrit eyes , porphyria , possible repro effects , possible terato effects					
Target Organs	Liver, Respiration - unspecified					
Tellurium and compounds	13494-80-9	2.5E+01	2.0E+01	3.0E-01	1.0E-01	2.4E-02
Health Effects	anor , derm , drow , dry mouth , garlic breath , in animals: CNS changes , in animals: RBC changes , metallic taste , nau , no sweat , sweat					
Target Organs	CNS - unspecified, Liver					

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Tellurium hexafluoride	7783-80-4	5.2E-01	1.8E-01	1.8E-01	1.8E-01	6.8E-02
Health Effects	dysp , garlic breath , head , in animals: pulm edema					
Tellurium oxide	7446-07-3	3.1E+01	5.0E+00	3.8E-01		
Tellurium tetrachloride	10026-07-0	5.3E+01	1.5E+01	6.3E-01		
Temephos	3383-96-8				1.0E+00	2.4E-01
Health Effects	abdom cramps , blurred vision , diarr , dizz , dysp , irrit eyes , nau , salv , vomit					
Terbium	7440-27-9	1.5E+02	3.5E+01	5.0E+00		
Terbium oxide (Tb2O3)	12036-41-8	2.5E+02	5.0E+01	3.0E+01		
Terbium(III,IV) oxide	12037-01-3	2.5E+02	5.0E+01	3.0E+01		
Terbufos	13071-79-9	1.0E+00	1.0E+00	3.0E-02	1.0E-02	2.4E-03
Terephthaloyl chloride	100-20-9	5.0E+02	2.0E+01	2.5E+00		
Terphenyl, p-	92-94-4	5.0E+02	9.0E+00	1.3E+00		
Health Effects	head , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit muc memb , irrit skin , sore throat , thermal skin burns					
Terphenyls	26140-60-3	5.0E+02	9.0E+00	1.3E+00		
Tert butyllithium	594-19-4	1.5E+02	3.5E+01	5.0E+00		
Tert-amyl methyl ether	994-05-8	6.0E+02	6.0E+02	6.0E+02	8.4E+01	2.0E+01
Tert-butyl alcohol	75-65-0	5.0E+03	5.0E+03	4.0E+02	3.0E+02	1.0E+02
Health Effects	drow , irrit eyes , irrit nose , irrit skin , irrit throat , narco					
Tert-Butyl isocyanate	1609-86-5	2.5E+01	5.0E+00	7.5E-01		
tert-Butyl Methyl-d3 Ether	29366-08-3	2.0E+04	2.0E+03	1.5E+02		
Tert-pentane	463-82-1	4.0E+03	1.8E+03	1.8E+03	1.8E+03	6.1E+02
tert-Pentyl alcohol	75-85-4	4.0E+02	4.0E+02	4.0E+02		
Tetraammine palladium (II) nitrate	13601-08-6	1.5E+02	3.5E+01	5.0E+00		
Tetrabutylammonium bromide	1643-19-2	2.5E+02	5.0E+01	3.0E+01		
Tetrabutylammonium dihydrogen	5574-97-0	2.5E+02	5.0E+01	3.0E+01		
Tetrabutylammonium fluoride	429-41-4	5.0E+02	1.7E+02	1.0E+02		
Tetrabutylammonium hydroxide	2052-49-5	6.0E+00	1.3E+00	1.5E-01		
Tetrabutylammonium nitrate	1941-27-1	7.5E+00	1.5E+00	2.5E-01		
Tetrachlorobenzene, 1,2,3,4-	634-66-2	5.0E+02	2.5E+02	3.5E+01		
Tetrachlorobenzene, 1,2,4,5-	95-94-3	5.0E+02	1.3E+02	1.5E+01		
Tetrachloroethane	25322-20-7	3.0E+03	2.0E+02	3.5E+01		
Tetrachloroethane, 1,1,1,2-	630-20-6	1.5E+03	4.0E+02	6.0E+01		
Health Effects	in animals: liver changes , irreg respiration , irrit eyes , irrit skin , lass , musc inco , restless					
Target Organs	Liver					
Tetrachloroethane, 1,1,2,2-	79-34-5	6.0E+02	2.0E+02	2.0E+01	6.9E+00	1.7E+00
Health Effects	abdom pain , carc , derm , hepatitis , jaun , kidney damage , leucyt , liver tend , nau , tremor fingers , vomit					
Target Organs	CNS - unspecified, GI tract - unspecified, Kidneys, Liver					
Tetrachlorohexafluorobutane, 2,2,3,3-	375-34-8	2.5E+02	5.0E+01	7.5E+00		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Tetrachloronaphthalene	1335-88-2				2.0E+00	4.9E-01
Health Effects	acne-form derm , anor , dizz , head , jaun , lass , liver inj					
Target Organs	Liver					
Tetrachlorosilane	10026-04-7	1.7E+02	3.8E+01	3.1E+00		
Tetracyanoquinodimethane, 7,7,8,8,-	1518-16-7	5.0E+01	1.0E+01	1.3E+00		
Tetracycline hydrochloride	64-75-5	5.0E+02	1.5E+01	2.5E+00		
Tetradecafluorohexane	355-42-0	3.5E+05	6.0E+04	7.5E+03		
Tetradecane	629-59-4	1.0E+04	2.5E+00	4.0E-01		
Tetradecanoic acid	544-63-8	3.5E+01	7.5E+00	1.0E+00		
Tetradecyltrimethylammonium bromide	1119-97-7	5.0E+02	3.5E+02	5.0E+01		
Tetraethoxysilane	78-10-4	2.6E+03	8.5E+02	2.1E+02	8.5E+01	2.9E+01
Health Effects	in animals: anemia , in animals: dysp , in animals: kidney damage , in animals: lac , in animals: liver damage , in animals: narco , in animals: pulm edema , in animals: tremor , irrit eyes , irrit nose					
Target Organs	Kidneys					
Tetraethyl ammonium bromide	71-91-0	4.0E+01	3.0E+01	4.0E+00		
Tetraethyl dithiopyrophosphate	3689-24-5	1.0E+01	3.5E+00	5.0E-01	1.0E-01	2.4E-02
Health Effects	anor , blurred vision , card irreg , Cheyne-Stokes respiration , convuls , cyan , diarr , eye pain , head , irrit eyes , irrit skin , lac , lass , local sweat , low BP , nau , para , rhin , twitch , vomit					
Tetraethyl lead	78-00-2	6.2E+01	4.0E+00	4.7E-01	1.0E-01	2.4E-02
Health Effects	anor , anxi , bradycardia , coma , conf , convuls , halu , hyper-reflexia , hypotension , hypothermia , insom , irrit eyes , lass , low weight , mania , nau , pallor , psychosis , spasticity , tremor					
Target Organs	CNS - unspecified					
Tetraethyl pyrophosphate	107-49-3	5.0E+00	1.0E+00	1.5E-01	1.0E-02	2.4E-03
Health Effects	anor , blurred vision , card irreg , chest tight , Cheyne-Stokes respiration , convuls , cyan , diarr , eye pain , head , lac , lass , low BP , nau , para , rhin , sweat , twitch , vomit					
Tetraethyl tin	597-64-8	5.0E+01	7.0E+00	4.0E-01		
Tetraethylammonium chloride	56-34-8	5.0E+02	6.0E+00	7.5E-01		
Tetraethylammonium hydroxide	77-98-5	3.5E+01	7.5E+00	1.0E+00		
Tetraethylammoniumiodide	68-05-3	4.3E+01	2.0E+00	2.0E+00		
Tetraethylene glycol	112-60-7	5.0E+02	5.0E+02	3.5E+02		
Tetraethylene glycol diacrylate	17831-71-9	3.5E+02	2.5E+01	3.5E+00		
Tetraethylenepentamine	112-57-2	5.0E+02	3.5E+02	5.0E+01		
Tetrafluoroethylene	116-14-3	1.3E+04	2.2E+03	9.0E+02	3.7E+02	2.0E+00
Tetrafluoroethylene	116-14-3	1.4E+04	2.3E+03	9.0E+02	3.7E+02	2.0E+00
Tetrafluorohydrazine	10036-47-2	4.0E+02	7.5E+01	1.0E+01		
Tetrahydrofuran	109-99-9	1.5E+04	1.5E+03	2.9E+02	1.5E+02	5.0E+01
Health Effects	CNS depres , dizz , head , irrit eyes , irrit upper resp sys , nau					
Target Organs	CNS, Kidneys, Liver					
Tetrahydrofuran-d8	1693-74-9	1.5E+04	1.5E+03	3.0E+02		
Tetrahydrophthalic anhydride	85-43-8	5.0E+02	1.0E+00	1.5E-01		
Tetrahydrothiophene-1,1-dioxide	126-33-0	2.0E+02	2.0E+02	2.0E+02		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Tetrakis (hydroxymethyl) phosphonium	124-64-1				2.0E+00	4.9E-01
Tetrakis (hydroxymethyl) phosphonium	55566-30-8				2.0E+00	4.9E-01
Tetralin	119-64-2	1.0E+02	2.5E+01	3.5E+00		
Tetramethoxysilane	681-84-5	8.7E+00	5.7E+00	5.7E+00	5.7E+00	1.5E+00
Health Effects	corn damage (following even short-term exposure to the vapor) , irrit eyes , kidney inj , lung inj , pulm edema					
Target Organs	Eyes, Lungs					
Tetramethyl ammonium hydroxide	75-59-2	2.0E+00	2.0E+00	7.5E-01		
Tetramethyl ammonium,	16883-45-7	3.5E+01	6.0E+00	1.0E+00		
Tetramethyl butanediamine	97-84-7	2.0E+02	4.0E+01	6.0E+00		
Tetramethyl ethylene diamine	110-18-9	6.0E+02	6.0E+02	1.5E+02		
Tetramethyl lead	75-74-1	5.2E+01	4.0E+00	5.8E-01	1.5E-01	3.7E-02
Health Effects	anor , anxi , bad dreams , coma , convuls , delirium , hypotension , insom , mania , nau , restless					
Target Organs	CNS - unspecified					
Tetramethyl silane	75-76-3	3.5E+02	7.5E+01	5.0E+01		
Tetramethyl succinonitrile	3333-52-6				2.8E+00	6.8E-01
Health Effects	coma , convuls , GI effects , head , kidney effects , liver effects , nau					
Target Organs	CNS - unspecified					
Tetramethyl-5-decyne-4,7-diol, 2,4,7,9-	126-86-3	2.5E+02	5.0E+01	3.0E+01		
Tetramethylammonium bromide	64-20-0	2.0E+01	4.0E+00	6.0E-01		
Tetramethylammonium hydroxide	10424-65-4	4.0E+00	4.0E+00	1.5E+00		
Tetramethylammonium silicate	53116-81-7	2.5E+02	5.0E+01	3.0E+01		
Tetranitromethane	509-14-8	1.4E+01	4.2E+00	4.2E+00	4.0E-02	1.4E-02
Health Effects	chest pain , cyan , dizz , dysp , head , irrit eyes , irrit nose , irrit skin , irrit throat , methemo , skin burns					
Target Organs	Lungs					
Tetraphenylarsonium chloride	507-28-8	2.5E+01	1.4E+01	8.4E+00		
Tetrapotassium	5964-35-2	4.0E+02	7.5E+01	1.5E+01		
Tetrapropoxysilane	682-01-9	5.0E+02	1.5E+02	2.5E+01		
Tetrapropylammonium hydroxide	4499-86-9	1.5E+01	3.5E+00	5.0E-01		
Tetrapropylorthotitanate	3087-37-4	2.5E+02	5.0E+01	3.0E+01		
Tetrasodium	64-02-8	5.0E+02	5.0E+02	1.3E+02		
Tetrasodium pyrophosphate	7722-88-5	5.0E+02	2.5E+01	1.5E+01		
Health Effects	derm , irrit eyes , irrit nose , irrit skin , irrit throat					
Thallic oxide	1314-32-5	2.0E+01	2.0E+00	1.3E+00		
Thallium	7440-28-0	3.0E+00	3.0E+00	5.0E-01		
Health Effects	abdom pain , alopecia , chest pain , chorea , convuls , diarr , kidney damage , liver damage , nau , pares legs , peri neuritis , psychosis , ptosis , pulm edema , retster tight , strabismus , tremor , vomit					
Target Organs	CNS - unspecified, CVS - unspecified					
Thallium (I) acetate	563-68-8	1.9E+01	2.5E+00	3.9E-01		
Thallium (I) carbonate	6533-73-9	1.7E+01	2.0E+00	3.4E-01		
Thallium (I) chloride	7791-12-0	1.8E+01	2.0E+00	3.5E-01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Thallium (I) nitrate	10102-45-1	2.0E+01	2.0E+01	3.9E-01		
Thallium (I) sulfate	7446-18-6	1.9E+01	2.0E+00	3.7E-01		
Thallium (III) perchlorate hexahydrate	15596-83-5	4.5E+01	7.5E+00	1.3E+00		
Thallium oxide	1314-12-1	1.5E+01	5.2E-01	3.1E-01		
Thallous malonate	2757-18-8	7.5E+00	2.0E+00	1.3E+00		
Thenoyltrifluoroacetone	326-91-0	1.3E+02	2.5E+01	3.5E+00		
Thioacetamide	62-55-5	1.3E+02	1.3E+02	1.5E+01		
Thioacetic acid	507-09-5	3.0E+01	4.0E-01	6.0E-02		
Thiobis(4-chloro-6-methylphenol), 2,2'-	4418-66-0	1.3E+00	1.3E+00	7.5E-01		
Thiocarbazide	2231-57-4	1.0E+02	1.0E+02	6.0E+01		
Thiodiglycol	111-48-8	5.0E+02	5.0E+02	7.5E+01		
Thiofanox	39196-18-4	3.0E+01	8.5E+00	5.0E+00		
Thioglycolic acid	68-11-1	2.0E+01	4.0E+00	3.8E+00	3.8E+00	1.3E+00
Health Effects	blisters , corn damage , in animals: convuls , in animals: gasping respirations , in animals: lass , irrit eyes , irrit nose , irrit skin , irrit throat , lac , skin burns					
Thionazin	297-97-2	3.5E+00	3.5E+00	2.0E+00		
Thionyl chloride	7719-09-7	6.8E+01	1.2E+01	9.7E-01		
Health Effects	eye burns , irrit eyes , irrit muc memb , irrit skin , skin burns					
Thiophosphoryl chloride	3982-91-0	6.0E+01	2.5E+01	4.0E+00		
Thiosemicarbazide	79-19-6	9.2E+00	9.2E+00	5.0E+00		
Thiourea	62-56-6	1.3E+02	2.5E+01	4.0E+00		
Thiram	137-26-8	1.0E+02	7.5E+01	1.0E+01	5.0E-02	1.7E-02
Health Effects	antabuse-like effects , derm , irrit eyes , irrit muc memb , irrit skin					
Thorium	7440-29-1	3.5E+01	6.0E+00	1.0E+00		
Thorium (IV) nitrate	13823-29-5	2.5E+01	1.5E+01	2.0E+00		
Thorium oxalate	2040-52-0	5.0E+02	2.1E+02	1.3E+02		
Thorium oxide	1314-20-1	5.0E+02	5.0E+02	7.5E+01		
Thorium perchlorate	16045-17-3	5.0E+02	1.6E+02	9.4E+01		
Thulium	7440-30-4	2.5E+02	5.0E+01	3.0E+01		
Thulium oxide	12036-44-1	3.0E+02	6.0E+01	3.4E+01		
Thulium trichloride	13537-18-3	5.0E+02	3.5E+02	5.0E+01		
Thymol blue	76-61-9	2.5E+02	5.0E+01	3.0E+01		
Thyodene	9005-84-9	2.5E+02	5.0E+01	3.0E+01		
Tin (II) chloride dihydrate	10025-69-1	1.9E+02	2.0E+01	1.1E+01		
Tin (II) sulfate	7488-55-3	1.8E+02	1.8E+01	1.1E+01		
Tin fluoroborate	13814-97-6	2.5E+02	2.5E+01	1.5E+01		
Tin organic compounds	Sn organ cmpd				1.0E-01	3.4E-02
Health Effects	abdom pain , cough , dizz , focal anes , head , in animals: hemolysis , in animals: hepatic nec , irrit eyes , irrit					

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
	resp sys , irrit skin , kidney damage , paresis , pruritus , psycho-neurologic dist , skin burns , sore throat , urine retention , vomit					
Target Organs	CNS - unspecified, IMM system - unspecified					
Tin oxide	18282-10-5	5.0E+02	1.3E+01	7.6E+00	2.0E+00	4.9E-01
Health Effects	decr pulm func , Stannosis (benign pneumoconiosis): dysp					
Tin(II) oxide	1332-29-2	6.0E+01	1.3E+01	7.6E+00		
Tin(IV) isopropoxide	1184-61-8	8.7E+01	1.5E+01	7.0E-01		
Tin, inorganic	7440-31-5	1.0E+02	1.0E+02	6.0E+00	2.0E+00	4.9E-01
Health Effects	in animals: diarr , in animals: para with musc twitch , in animals: vomit , irrit eyes , irrit resp sys , irrit skin					
Tirpate	26419-73-8	1.0E+00	1.0E+00	6.0E-01		
Titanium	7440-32-6	6.0E+01	1.3E+01	2.0E+00		
Titanium (II) oxide	12137-20-1	2.5E+02	5.0E+01	3.0E+01		
Titanium (III) fluoride	7783-63-3	4.6E+02	7.5E+01	1.3E+01		
Titanium boride	12045-63-5	1.5E+02	3.2E+01	1.9E+01		
Titanium carbide	12070-08-5	2.5E+02	5.0E+01	3.0E+01		
Titanium dioxide	13463-67-7	5.0E+02	5.0E+01	3.0E+01	1.0E+01	2.4E+00
Health Effects	carc , lung fib					
Target Organs	Lungs					
Titanium hydride	7704-98-5	1.5E+02	3.5E+01	5.0E+00		
Titanium isopropoxide	546-68-9	5.0E+02	5.0E+02	7.5E+01		
Titanium tetrachloride	7550-45-0	4.4E+01	7.8E+00	5.0E+00		
Titanium trichloride	7705-07-9	5.0E+01	1.0E+01	1.5E+00		
t-Octyl mercaptan	141-59-3	1.1E+01	3.6E+00			
Toluene	108-88-3	1.7E+04	4.5E+03	7.5E+02	7.5E+02	7.5E+01
Health Effects	anxi , conf , derm , dilated pupils , dizz , euph , head , insom , irrit eyes , irrit nose , kidney damage , lac , lass , liver damage , musc ftg , pares					
Target Organs	CNS - unspecified, Nervous system - unspecified					
Toluene 2,4-diisocyanate	584-84-9	3.6E+00	5.9E-01	1.4E-01	7.1E-02	
Health Effects	abdom pain , asthma , bron , bronchospasm wheez , carc , chest pain , choking , conj , conj Eyes, derm , dysp , irrit Throat, irrit Nose, irrit Eyes, irrit eyes , irrit nose , irrit skin , irrit throat , lac , lac Eyes, nau , paroxysmal cough , pulm edema					
Target Organs	Eyes, Lungs, Throat, Whole body					
Toluene diisocyanate mixture, 2,4-/2,6-	26471-62-5	1.3E+01	1.3E+01	5.0E+00		
Toluene-2,4-diamine	95-80-7	2.5E+02	6.0E+01	7.5E+00		
Health Effects	ataxia , bluish skin , carc , convuls , cyan , derm , dizz , head , irrit eyes , irrit nose , irrit skin , irrit throat , lass , liver inj , methemo , nau , resp depres , tacar , vomit					
Toluene-2,6-diamine	823-40-5	1.5E+02	3.0E+01	4.0E+00		
Toluene-d8	2037-26-5	1.5E+04	5.0E+03	7.5E+02		
Toluenediisocyanate, 2,6-	91-08-7	3.6E+00	5.9E-01	1.4E-01	7.1E-02	
Health Effects	irrit Throat, irrit Nose, irrit Eyes, lac Eyes					
Target Organs	Eyes, Lungs, Throat, Whole body					
Toluenesulfonyl chloride, p-	98-59-9	2.5E+02	5.0E+01	7.5E+00		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Toluenesulphonic acid monohydrate, p-	6192-52-5	5.0E+02	2.0E+02	3.0E+01		
Toluenethiol, m-	108-40-7	2.0E+01	4.0E+00	6.0E-01		
Toluidine, m-	108-44-1	2.0E+02	2.0E+02	3.5E+01	8.8E+00	2.1E+00
Health Effects	anemia , convuls , cyan , derm , hema , irrit eyes , irrit skin , lass , low BP , methemo , nau , vomit					
Target Organs	Kidneys					
Toluidine, p-	106-49-0	1.5E+02	1.3E+02	1.5E+01	8.8E+00	2.1E+00
Health Effects	anemia , carc , convuls , cyan , derm , hema , irrit eyes , irrit skin , lass , low BP , methemo , nau , vomit					
Target Organs	Kidneys					
Tolyltriazole, sodium salt	64665-57-2	2.5E+02	5.0E+01	7.5E+00		
Toxaphene	8001-35-2	2.0E+02	2.0E+01	1.0E+00	5.0E-01	1.2E-01
Health Effects	agitation , carc , conf , convuls , dry skin , nau , reddening skin , tremor , uncon					
Target Organs	Liver					
Tranid	15271-41-7	1.9E+01	1.9E+01	1.0E+01		
Tri(2-butoxyethyl) phosphate	78-51-3	5.0E+02	1.5E+02	2.0E+01		
Triacetin	102-76-1	5.0E+02	2.5E+02	3.5E+01		
Triamiphos	1031-47-6	1.0E+01	1.0E+01	6.0E+00		
Triazofos	24017-47-8	1.3E+02	2.8E+00	1.5E+00		
Tribenzylamine	620-40-6	2.5E+02	5.0E+01	3.0E+01		
Tributyl (2,4-dichlorobenzyl)	115-78-6	7.5E+01	1.5E+01	2.0E+00		
Tributyl citrate	77-94-1	1.3E+03	3.5E+02	5.0E+01		
Tributyl phosphate	126-73-8	3.0E+02	1.5E+02	2.5E+01	2.2E+00	7.5E-01
Health Effects	head , irrit eyes , irrit resp sys , irrit skin , nau					
Tributyl tetradecyl phosphonium	81741-28-8	2.5E+02	5.0E+01	3.0E+01		
Tributylamine	102-82-9	6.0E+01	3.5E+00	5.0E-01		
Tributylphosphine	998-40-3	3.0E+02	6.0E+01	7.5E+00		
Trichloro(dichlorophenyl) silane	27137-85-5	3.8E+02	8.4E+01	6.9E+00	6.9E+00	
Trichloro-1,2,2-trifluoroethane, 1,1,2-	76-13-1	1.5E+04	1.0E+04	1.0E+04	7.7E+03	7.7E+02
Health Effects	CNS depres , derm , drow , in animals: card arrhy , in animals: narco , irrit skin , irrit throat					
Target Organs	CVS - unspecified, Whole body					
Trichloro-2,2,2-trifluoroethane, 1,1,1-	354-58-5	5.0E+02	5.0E+02	5.0E+02		
Trichloroacetic acid	76-03-9	1.5E+02	1.5E+01	6.7E+00	6.7E+00	2.3E+00
Health Effects	cough , delayed pulm edema , derm , diarr , dysp , eye burns , irrit eyes , irrit nose , irrit resp sys , irrit skin , irrit throat , salv , skin burns , vomit					
Trichloroacetyl chloride	76-02-8	5.0E+01	4.0E+00	6.0E-01		
Trichlorobenzene, 1,2,3-	87-61-6	5.0E+02	2.5E+01	1.5E+01		
Trichlorobenzene, 1,2,4-	120-82-1	3.0E+02	3.5E+01	5.0E+00		
Health Effects	in animals: kidney damage , in animals: liver damage , in animals: possible terato effects , irrit eyes , irrit muc memb , irrit skin					
Target Organs	Liver, Ureters/urethra					
Trichloroethane, 1,1,1-	71-55-6	2.3E+04	3.3E+03	1.3E+03	1.3E+03	7.5E+00
Health Effects	card arrhy , CNS depres , derm , head , irrit eyes , irrit skin , lass , liver damage , poor equi					
Target Organs	Brain, CNS - unspecified, Liver, Nervous system - unspecified					

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Trichloroethane, 1,1,2-	79-00-5	5.0E+02	7.5E+01	5.5E+01	5.5E+01	1.3E+01
Health Effects	carc , CNS depres , derm , irrit eyes , irrit nose , kidney damage , liver damage					
Target Organs	CNS - unspecified, Liver					
Trichloroethylene	79-01-6	2.0E+04	2.4E+03	7.0E+02	4.1E+02	7.4E+00
Health Effects	carc , card arrhy , derm , dizz , drow , head , irrit eyes , irrit skin , lass , liver inj , nau , pares , tremor , vis dist , vomit					
Target Organs	Nervous system - unspecified					
Trichloroethylsilane	115-21-9	2.2E+02	4.9E+01	4.0E+00	4.0E+00	
Trichlorofluoromethane	75-69-4	1.0E+04	7.5E+03	5.0E+03		5.6E+02
Health Effects	asphy , card arrest , card arrhy , derm , inco , liquid: frostbite , tremor					
Target Organs	CNS - unspecified, CVS - unspecified					
Trichlorofon	52-68-6	5.0E+02	1.3E+01	3.0E+00	1.0E+00	2.4E-01
Trichloroisocyanuric acid	87-90-1	5.0E+02	5.0E+02	7.5E+01		
Trichloronaphthalene	1321-65-9	5.0E+01	2.5E+01	1.5E+01	5.0E+00	1.2E+00
Health Effects	anor , dizz , jaun , liver inj , nau					
Target Organs	Liver					
Trichloronate	327-98-0F	3.0E+02	1.0E+01	6.0E+00		
Trichlorophenol, 2,3,6-	933-75-5	1.3E+02	2.5E+01	4.0E+00		
Trichlorophenol, 2,4,5-	95-95-4	3.5E+02	3.5E+02	3.0E+01		
Trichlorophenol, 2,4,6-	88-06-2	3.5E+02	3.5E+02	1.0E+02		
Trichlorophenoxyacetic acid	93-76-5	2.5E+02	5.0E+01	3.0E+01	1.0E+01	3.4E+00
Health Effects	acne-like rash , in animals: ataxia , irrit skin , liver damage					
Trichlorophenylsilane	98-13-5	2.9E+02	6.3E+01	5.2E+00	5.2E+00	
Trichloropropane, 1,2,3-	96-18-4	6.0E+02	3.0E+02	1.5E+02	6.0E+01	1.2E-03
Health Effects	carc , CNS depres , in animals: kidney inj , in animals: liver inj , irrit eyes , irrit nose , irrit throat					
Target Organs	Kidneys, Liver, Respiration - unspecified					
Trichlorosilane	10025-78-2	1.8E+02	4.0E+01	3.3E+00		
Tricresol	1319-77-3	1.0E+03	1.0E+02	6.0E+01	2.0E+01	6.8E+00
Tridecane	629-50-5	5.0E+01	2.5E+00	3.5E-01		
Tridodecylamine	102-87-4	5.0E+02	1.5E+02	2.5E+01		
Triethanolamine	102-71-6	5.0E+02	2.0E+01	5.0E+00	5.0E+00	1.7E+00
Triethoxysilane	998-30-1	6.7E+01	2.7E+01	3.4E+00		
Triethoxyvinylsilane	78-08-0	1.3E+04	2.5E+03	4.0E+02		
Triethyl phosphate	78-40-0	5.0E+02	5.0E+02	2.0E+02		
Triethyl phosphite	122-52-1	1.5E+03	3.0E+02	4.0E+01		
Triethylaluminum	97-93-8	2.5E+02	5.0E+01	8.5E+00		
Triethylamine	121-44-8	7.5E+02	1.3E+01	1.3E+01	4.1E+00	1.4E+00
Health Effects	in animals: kidney damage , in animals: liver damage , in animals: myocardial damage , irrit eyes , irrit resp sys , irrit skin					
Target Organs	Eyes, Nasal-pharynx, None					
Triethylammonium bicarbonate	15715-58-9	2.5E+02	5.0E+01	3.0E+01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Triethylbenzenes	25340-18-5	4.0E+03	7.5E+02	1.3E+02		
Triethylene glycol	112-27-6	5.0E+02	5.0E+02	5.0E+02		
Triethylene glycol dimethacrylate	109-16-0	5.0E+02	3.5E+01	5.0E+00		
Triethylene glycol monomethyl ether	112-35-6	5.0E+02	5.0E+02	1.3E+02		
Triethylenetetramine	112-24-3	1.0E+03	3.5E+02	5.0E+01		
Triethyloxonium tetrafluoroborate	368-39-8	5.0E+02	3.1E+01	1.9E+01		
Triethylphosphorothionate	126-68-1	1.3E+02	2.5E+01	4.0E+00		
Trifluoroacetaldehyde hydrate	421-53-4	2.5E+02	5.0E+01	7.5E+00		
Trifluoroacetic acid	76-05-1	7.5E+01	7.5E+01	7.5E+01		
Trifluoroacetic acid anhydride	407-25-0	4.6E+02	2.3E+01	1.4E+01		
Trifluoroacetyl chloride	354-32-5	1.3E+03	2.5E+02	3.5E+01		
Trifluorobromomethane	75-63-8	2.5E+05	1.5E+05	2.0E+04	6.1E+03	6.1E+02
Health Effects	card arrhy , dizz , liquid: frostbite					
Target Organs	CNS - unspecified, CVS - unspecified					
Trifluoroethanol, 2,2,2-	75-89-8	2.5E+02	2.5E+02	3.5E+01		
Trifluoromethanesulfonic acid	1493-13-6	6.0E+01	1.3E+01	1.5E+00		
Trifluoromethanesulfonic anhydride	358-23-6	1.5E+02	3.5E+01	5.0E+00		
Trifluoromethyl iodide	2314-97-8	3.5E+04	3.5E+04	3.5E+04		
Trifluoromethylaniline, 3-	98-16-8	1.5E+02	4.4E+00	2.5E+00		
Trifluralin	1582-09-8	3.0E+02	6.0E-01	7.5E-02		
Triglycidyl isocyanurate	2451-62-9				5.0E-02	1.2E-02
Triisobutyl aluminum	100-99-2	5.0E+02	5.0E+02	1.0E+02		
Trilauryl phosphite	3076-63-9	5.0E+02	2.5E+02	4.0E+01		
Trimellitic anhydride	552-30-7				5.0E-04	1.2E-04
Health Effects	asthma , cough , dysp , fever , irrit eyes , irrit nose , irrit resp sys , irrit skin , mal , musc ache , pulm edema , resp sens , rhinitis , sneez , wheez					
Target Organs	IMM system - unspecified, Lungs					
Trimethoxy(3,3,3-fluoropropyl) silane	429-60-7	5.0E+02	5.0E+01	2.9E+01		
Trimethoxyboroxine	102-24-9	5.0E+02	4.0E+02	6.0E+01		
Trimethoxysilane	2487-90-3	1.2E+01	4.1E+00	2.5E+00		
Trimethyl benzene	25551-13-7				1.2E+02	4.2E+01
Trimethyl borate	121-43-7	2.5E+03	5.0E+02	7.5E+01		
Trimethyl N', 2-hydroxyethyl-	82136-26-3	2.5E+02	5.0E+01	3.0E+01		
Trimethyl octane	98060-52-7	6.0E+03	1.5E+03	3.5E+02		
Trimethyl phosphate	512-56-1	3.5E+02	3.5E+02	7.5E+01		
Trimethyl phosphite	121-45-9	1.6E+03	3.1E+02	3.1E+01	1.3E+01	3.5E+00
Health Effects	derm , in animals: terato effects , irrit eyes , irrit skin , irrit upper resp sys					
Trimethyl-1,3-pentanediol	25265-77-4	5.0E+02	5.0E+02	7.5E+01		
Trimethylacetic acid	75-98-9	4.0E+02	7.5E+01	1.0E+01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Trimethylacetyl chloride	3282-30-2	7.9E+00	2.6E+00	1.5E+00		
Trimethylaluminum	75-24-1	1.3E+02	2.7E+01	1.6E+01		
Trimethylamine	75-50-3	9.2E+02	2.9E+02	1.9E+01	1.9E+01	4.1E+00
Health Effects	blurred vision , corn nec , cough , delayed pulm edema , dysp , irrit eyes , irrit nose , irrit resp sys , irrit skin , irrit throat , liquid: frostbite , skin burns					
Trimethylammonium chloride	75-57-0	2.0E+01	4.0E+00	6.0E-01		
Trimethylaniline, 2,4,6-	88-05-1	4.0E+01	2.9E+00	4.0E-01		
Trimethylbenzene, 1,2,3-	526-73-8	7.5E+03	1.8E+03	6.9E+02	2.2E+02	
Health Effects	bron , chemical pneu (aspir liquid) , conf , dizz , drow , head , hypochromic anemia , inco , irrit eyes , irrit nose , irrit resp sys , irrit skin , irrit throat , lass , nau , vomit					
Trimethylbenzene, 1,2,4-	95-63-6	7.5E+03	1.8E+03	6.9E+02	2.2E+02	
Health Effects	bron , chemical pneu (aspir liquid) , conf , dizz , drow , head , hypochromic anemia , inco , irrit eyes , irrit nose , irrit resp sys , irrit skin , irrit throat , lass , nau , vomit					
Target Organs	Blood, Lungs					
Trimethylbenzene, 1,3,5-	108-67-8	2.5E+03	1.8E+03	6.9E+02	2.2E+02	
Health Effects	bron , chemical pneu (aspir liquid) , conf , dizz , drow , head , hypochromic anemia , inco , irrit eyes , irrit nose , irrit resp sys , irrit skin , irrit throat , lass , nau , vomit					
Target Organs	Blood, Nervous system - unspecified, Respiration - generic					
Trimethylbenzene, 1,3,5-	108-67-8	2.5E+03	1.8E+03	6.9E+02	2.2E+02	
Trimethylchlorosilane	75-77-4	4.4E+02	9.8E+01	8.0E+00	8.0E+00	
Trimethylene oxide	503-30-0	7.5E+01	2.0E+00	3.0E-01		
Trimethylgallium	1445-79-0	1.5E+02	3.5E+01	5.0E+00		
Trimethylhexane, 2,2,5-	3522-94-9	7.5E+03	1.5E+03	3.5E+02		
Trimethylolpropane ethoxylate	50586-59-9	2.5E+02	5.0E+01	3.0E+01		
Trimethylolpropane phosphite	824-11-3	6.0E+00	2.5E+00	3.5E-01		
Trimethylopropane methylated	71342-93-3	2.5E+02	5.0E+01	3.0E+01		
Trimethylpentane, 2,2,4-	540-84-1	4.0E+03	1.5E+03	1.5E+03		
Trimethylphosphine	594-09-2	3.5E+01	6.0E+00	1.0E+00		
Trimethylpyridine, 2,4,6-	108-75-8	7.5E+02	1.5E+02	2.5E+01		
Trimethylsilanol	1066-40-6	1.5E+01	7.5E+00	1.5E+00		
Trimethylsilylmethyllithium	1822-00-0	1.5E+02	3.5E+01	5.0E+00		
Trimethyltin chloride	1066-45-1	4.2E+01	2.0E+01	3.4E-01		
Trinitrobenzene, 1,3,5-	99-35-4	1.3E+02	2.5E+01	3.5E+00		
Trinitrochlorobenzene	28260-61-9	2.5E+02	5.0E+01	3.0E+01		
Trinitrophenylmethylnitramine	479-45-8	5.0E+02	5.0E+01	7.5E+00	1.5E+00	3.7E-01
Health Effects	anemia , coryza , cough , edema on cheeks , edema on nasal folds , edema on neck , eryt , head , insom , irrity , itch , kera , kidney damage , lass , liver damage , mal , nau , sens derm , sneez , vomit					
Target Organs	Liver, Skin					
Trinitrotoluene, 2,4,6-	118-96-7	5.0E+02	7.5E+00	1.3E+00	1.0E-01	3.4E-02
Health Effects	anemia , card irreg , cataract , cough , cyan , irrit muc memb , irrit skin , jaun , kidney damage , leucyt , liver damage , musc pain , peri neur , sens derm , sneez , sore throat					
Target Organs	Blood, Eyes, Liver					

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Trioctylamine	1116-76-3	4.0E+02	7.5E+01	1.3E+01		
Trioctylphosphine	4731-53-7	5.0E+01	1.0E+01	1.5E+00		
Trioctylphosphine oxide	78-50-2	2.5E+02	5.0E+01	3.0E+01		
Triorthocresyl phosphate	78-30-8	6.0E+02	7.5E+00	4.0E+00	1.0E-01	2.4E-02
Health Effects	cramps in calves , GI dist , para , pares in feet or hands , peri neur , weak feet , wrist drop					
Target Organs	CNS - unspecified					
Tripentaerythritol	78-24-0	2.5E+02	5.0E+01	3.0E+01		
Triphenyl phosphate	115-86-6	5.0E+02	5.0E+02	9.0E+00	3.0E+00	1.0E+00
Health Effects	in animals: musc weak , in animals: para , minor changes in blood enzymes					
Target Organs	Skin					
Triphenyl phosphine	603-35-0	5.0E+02	4.0E+01	5.0E+00		
Triphenyl phosphite	101-02-0	2.0E+02	1.5E+02	2.5E+01		
Triphenylborane	960-71-4	5.0E+02	1.5E+02	2.5E+01		
Triphenylethoxysilane	1516-80-9	2.5E+02	5.0E+01	3.0E+01		
Triphenylolmethane triglycidyl ether	66072-38-6	2.5E+02	5.0E+01	3.0E+01		
Triphenyltin acetate	900-95-8	8.6E+01	2.0E+01	6.9E-01		
Triphenyltin chloride	639-58-7	8.1E+01	2.0E+01	6.5E-01		
Tripropyl phosphate	513-08-6	5.0E+02	1.3E+02	1.5E+01		
Tripropylamine	102-69-2	2.0E+03	4.0E+02	6.0E+01		
Tripropylene glycol	1638-16-0	1.5E+03	7.5E-01	1.3E-01		
Tripropylene glycol monomethyl ether	25498-49-1	5.0E+02	2.5E+02	4.0E+01		
Tris(2-aminoethyl)amine	4097-89-6	1.0E+02	4.0E+01	6.0E+00		
Tris(2-chloroethyl)amine	555-77-1	3.7E-01	2.2E-02	3.0E-03		
Tris(2-chloroethyl)phosphate	115-96-8	5.0E+02	1.5E+02	2.0E+01		
Tris(2-ethylhexyl)phosphate	78-42-2	1.3E+01	1.3E+01	1.3E+01		
Tris(dimethylaminomethyl)phenol,	90-72-2	5.0E+02	1.0E+02	1.5E+01		
Tris(hydroxymethyl) aminomethane	1185-53-1	5.0E+02	1.5E+02	2.5E+01		
Tris(hydroxymethyl)aminomethane	77-86-1	5.0E+02	5.0E+02	7.5E+01		
Trisodium arsenate	13464-38-5	1.4E+01	1.4E-01	8.3E-02		
Trisodium citrate	68-04-2	6.0E+02	1.3E+02	2.0E+01		
Trisodium ethylenediaminetriacetate	139-89-9	4.0E+02	7.5E+01	1.3E+01		
Triton X-100	9002-93-1	5.0E+02	3.0E+02	4.0E+01		
Triuranium octaoxide	1344-59-8	5.0E+01	1.0E+01	7.1E-01		
Trizma acetate	6850-28-8	5.0E+02	5.0E+02	7.5E+01		
Trypan blue	72-57-1	5.0E+02	5.0E-01	7.5E-02		
Trypsin	9002-07-7	3.0E+01	6.0E-01	7.5E-02		
Trypsinogen	9002-08-8	5.0E+02	1.5E+02	2.5E+01		
Tungslosilicic acid	11130-20-4	1.5E+02	3.3E+01	1.3E+01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Tungsten	7440-33-7	5.0E+02	1.0E+01	1.0E+01	5.0E+00	1.7E+00
Health Effects	blood changes , cough , diffuse pulm fib , irrit eyes , irrit resp sys , irrit skin , loss of appetite , nau					
Tungsten (IV) oxide	12036-22-5	1.5E+02	3.0E+01	1.2E+01		
Tungsten boride	12007-09-9	1.3E+02	2.7E+01	1.1E+01		
Tungsten carbide	12070-12-1	1.3E+02	2.7E+01	1.1E+01		
Health Effects	blood changes , cough , diffuse pulm fib , irrit eyes , irrit resp sys , irrit skin , loss of appetite , nau , possible skin sens to cobalt , possible skin sens to nickel					
Tungsten hexafluoride	7783-82-6	4.0E+01	8.1E+00	4.9E+00		
Tungsten trioxide	1314-35-8	4.0E+02	4.0E+02	1.3E+01		
Tungsten(iv) chloride	13470-13-8	4.0E+01	8.9E+00	5.3E+00		
Tungsten, soluble compounds	W sol				1.0E+00	3.4E-01
Health Effects	in animals: body weight changes , in animals: behavioral changes , in animals: blood changes , in animals: CNS dist , in animals: diarr , in animals: resp failure , irrit eyes , irrit resp sys , irrit skin					
Target Organs	CNS - unspecified					
Tungstic acid	7783-03-1	1.5E+02	3.5E+01	1.4E+01		
Turpentine	8006-64-2	4.0E+03	1.1E+02	1.1E+02	1.1E+02	3.8E+01
Health Effects	abdom pain , chemical pneu (aspir liquid) , convuls , diarr , dizz , head , hema , irrit eyes , irrit nose , irrit skin , irrit throat , kidney damage , nau , prot , skin sens , vomit					
Target Organs	Lungs					
Undecane	1120-21-4	2.0E+02	4.0E+01	6.0E+00		
Undecanone, 2-	112-12-9	2.0E+03	3.0E+01	4.0E+00		
Uranine	518-47-8	5.0E+02	2.5E+02	4.0E+01		
Uranium	7440-61-1	1.0E+01	2.0E+00	6.0E-01		
Health Effects	blood changes , carc. Potential for cancer is a result of alpha-emitting properties & radioactive decay products (e.g. radon) , derm , in animals: lung damage , in animals: lymph node damage , kidney damage					
Target Organs	Blood, Kidneys					
Uranium compounds	0-287*				2.0E-01	4.9E-02
Uranium dioxide	1344-57-6	3.0E+01	1.0E+01	6.8E-01		
Uranium hexafluoride	7783-81-5	3.6E+01	9.6E+00	3.6E+00		
Health Effects	inj Kidneys					
Target Organs	Kidneys, None, Whole body					
Uranium oxide	1344-58-7	3.0E+00	5.0E-01	5.0E-01		
Uranium telluride A	0-317*	1.7E+01	3.5E+00	1.0E+00		
Uranium, highly soluble salts	HZ1800-90-T	1.0E+01	2.0E+00	6.0E-01		
Health Effects	carc. Potential for cancer is a result of alpha-emitting properties & radioactive decay products (e.g. radon) , casts in urine , chest rales , conj , cough , high BUN , lac , nau , prot , RBC in urine , short breath , skin burns , vomit					
Target Organs	Kidneys					
Uranium, insoluble compounds	0-149*	1.0E+01	2.0E+00	6.0E-01		
Uranyl acetate	541-09-3	1.8E+01	3.5E+00	1.1E+00		
Uranyl fluoride	13536-84-0	1.3E+01	2.5E+00	7.8E-01		
Uranyl nitrate	10102-06-4	1.7E+01	3.0E+00	9.9E-01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Uranyl nitrate hexahydrate	13520-83-7	2.1E+01	1.3E+00	1.3E+00		
Urea	57-13-6	5.0E+02	1.5E+01	1.0E+01		
Urea peroxide	124-43-6	1.5E+02	3.5E+01	5.0E+00		
Urea, substituted	17526-94-2	1.5E+02	3.5E+01	5.0E+00		
Valeraldehyde, n-	110-62-3				1.8E+02	6.0E+01
Health Effects	irrit eyes , irrit nose , irrit skin , irrit throat					
Valeric acid	109-52-4	5.0E+02	5.0E+02	7.5E+01		
Valinomycin	2001-95-8	2.5E+00	2.5E+00	1.5E+00		
Vanadium	7440-62-2	3.5E+01	5.0E-01	7.5E-02		5.5E-04
Vanadium (III) sulfate	13701-70-7	1.3E+02	1.9E-01	2.5E-02		
Vanadium pentoxide	1314-62-1	3.5E+01	7.0E+00	1.0E+00	5.0E-02	1.4E-04
Health Effects	bron , cough , drow , dysp , eczema , fine rales , green tongue , irrit eyes , irrit skin , irrit throat , metallic taste , wheez					
Vanadium sulfate	16785-81-2	3.1E+02	4.5E+00	6.0E-01		
Vanadium tetrachloride	7632-51-1	1.3E+02	1.9E-01	2.5E-02		
Vanadium trioxide	1314-34-7	5.2E+01	7.4E+00	1.0E+00		
Vanadium, trichlorooxo	7727-18-6	7.5E+02	1.3E+00	1.5E-01		
Vanadyl sulfate	27774-13-6	1.1E+02	1.6E+00	2.0E-01		
Vegetable oil mist	68956-68-3	5.0E+02	7.5E+01	4.5E+01		
Health Effects	irrit eyes , irrit resp sys , irrit skin , lac					
Veratraldehyde	120-14-9	5.0E+02	1.5E+02	2.5E+01		
Vermiculite, exfoliated	1318-00-9	2.5E+01	5.0E+00	5.0E+00		
Vinyl acetate	108-05-4	2.1E+03	6.3E+02	2.4E+01	2.4E+01	1.2E+01
Health Effects	cough , eye burns , hoarseness , irrit eyes , irrit nose , irrit skin , irrit throat , loss of smell , skin blisters					
Target Organs	Nasal - pharynx, Nasal-pharynx, Respiration - unspecified					
Vinyl acetate-vinyl chloride copolymers	9003-22-9	5.0E+02	5.0E+02	1.0E+02		
Vinyl chloride	75-01-4	1.2E+04	3.1E+03	6.4E+02	1.8E+02	8.8E-01
Health Effects	abdom pain , carc , enlarged liver , GI bleeding , lass , liquid: frostbite , pallor or cyan of extremities					
Target Organs	Developmental - generic, Liver					
Vinyl cyclohexene dioxide	106-87-6	5.0E+02	1.3E+01	2.0E+00	5.7E-01	2.0E-01
Health Effects	in animals: carc , in animals: irrit eyes , in animals: irrit resp sys , in animals: irrit skin , in animals: leupen , in animals: nec thymus , in animals: skin sens , in animals: testicular atrophy					
Target Organs	Reproductive - unspecified by gender, Skin					
Vinyl ethyl ether	109-92-2	5.0E+03	1.0E+03	1.5E+02		
Vinyl fluoride	75-02-5	1.5E+05	7.5E+01	1.0E+01	1.9E+00	4.6E-01
Health Effects	conf , dizz , head , inco , liquid: frostbite , narco , nau , vomit					
Target Organs	Liver					
Vinyl sulfoxide	1115-15-7	7.5E+01	1.5E+01	2.5E+00		
Vinyl Terminated Dimethyl-	68951-96-2	5.0E+02	5.0E+02	2.5E+02		
Vinyl toluene	25013-15-4				2.4E+02	8.3E+01
Health Effects	drow , in animals: narco , irrit eyes , irrit skin , irrit upper resp sys					

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Vinyl trichlorosilane	75-94-5	2.2E+02	4.8E+01	4.0E+00	4.0E+00	
Vinyl-2-pyrrolidone, N-	88-12-0	3.5E+02	1.5E+02	2.5E+01	2.3E-01	5.6E-02
Vinylbenzylchloride	1592-20-7	1.5E+02	3.5E+01	5.0E+00		
Vinylcyclohexene, 4-	100-40-3	1.5E+04	2.0E+02	1.3E+00	4.4E-01	1.5E-01
Vinylidene fluoride	75-38-7	1.5E+05	6.0E+03	4.0E+03	1.3E+03	3.2E+02
Health Effects	dizz , head , liquid: frostbite , nau					
Target Organs	Liver					
Vinylmagnesium bromide	1826-67-1	1.5E+02	3.5E+01	5.0E+00		
Vinylpyrrolidone/vinyl acetate	25086-89-9	2.5E+02	2.5E+02	2.5E+02		
Vinyltrimethoxysilane	2768-02-7	7.5E+03	7.5E+03	2.5E+03		
Virginia refrigeration oil 150 and 300	64742-52-5	5.0E+02	3.0E+02	4.0E+01		
Warfarin	81-81-2	1.0E+02	2.0E+01	3.0E-01	1.0E-01	2.4E-02
Health Effects	abdom pain , abnor hematologic indices , back pain , bleeding lips , epis , fecal blood , hema , hematoma arms , hematoma legs , muc memb hemorr , petechial rash , vomit					
Target Organs	Blood					
Warfarin sodium	129-06-6	9.0E+00	9.0E+00	5.0E+00		
Wax	71808-29-2	2.5E+02	5.0E+01	3.0E+01		
Wood dust	wood dust				1.0E+00	2.4E-01
Wood dust, western red cedar	wood dust cedar				5.0E-01	1.2E-01
Health Effects	asthma , carc , cough , derm , epis , granulomatous pneuitis , irrit eyes , prolonged colds , resp hypersensitivity , sinusitis , wheez					
Wood dusts (birch, mahogany, teak,	Wood dust (others)				1.0E+00	2.4E-01
Xenon	7440-63-3	2.0E+06	1.3E+06	3.5E+05		
Xylene, m-	108-38-3	4.0E+03	7.5E+02	6.0E+02	4.3E+02	1.5E+02
Health Effects	abdom pain , anor , corn vacuolization , derm , dizz , drow , excitement , inco , irrit eyes , irrit nose , irrit skin , irrit throat , nau , staggering gait , vomit					
Xylene, o-	95-47-6	4.0E+03	7.5E+02	6.0E+02	4.3E+02	1.5E+02
Health Effects	abdom pain , anor , corn vacuolization , derm , dizz , drow , excitement , inco , irrit eyes , irrit nose , irrit skin , irrit throat , nau , staggering gait , vomit					
Xylene, p-	106-42-3	4.0E+03	7.5E+02	6.0E+02	4.3E+02	1.5E+02
Health Effects	abdom pain , anor , corn vacuolization , derm , dizz , drow , excitement , inco , irrit eyes , irrit nose , irrit skin , irrit throat , nau , staggering gait , vomit					
Xylenes, total	1330-20-7	1.1E+04	4.0E+03	5.6E+02	5.6E+02	2.2E+02
Xylenol orange tetrasodium salt	3618-43-7	2.5E+02	5.0E+01	3.0E+01		
Xylidine	1300-73-8	2.5E+02	1.3E+01	7.5E+00	2.5E+00	6.1E-01
Health Effects	anoxia , cyan , kidney damage , liver damage , lung damage , methemo					
Xylidine, 2,3-	87-59-2	4.0E+02	7.5E+01	1.0E+01		
Xylidine, 2,6-	87-62-7	3.5E+02	1.3E+02	2.0E+01		
Xylylene dichloride	28347-13-9	7.5E+01	2.0E+00	1.3E+00		
Yeast extract	8013-01-2	5.0E+02	4.0E+02	5.0E+01		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Ytterbium fluoride	13760-80-0	5.0E+02	1.0E+01	1.0E+01		
Ytterbium oxide	1314-37-0	2.5E+02	5.0E+01	3.0E+01		
Yttrium	7440-65-5	5.0E+02	5.0E+00	3.0E+00	1.0E+00	2.4E-01
Health Effects	in animals: eye inj , in animals: possible liver damage , in animals: pulm irrit , irrit eyes					
Yttrium chloride, hexahydrate	10025-94-2	5.0E+02	5.0E+02	1.0E+01		
Yttrium trioxide	1314-36-9	5.0E+02	4.0E+01	3.8E+00		
Zeolites, CaA	68989-20-8	5.0E+02	1.5E+02	2.5E+01		
Zeolites, NaA	68989-22-0	5.0E+02	1.3E+02	1.5E+01		
Zinc acetate	557-34-6	5.0E+02	6.0E+00	7.5E-01		
Zinc acetate dihydrate	5970-45-6	3.5E+02	3.5E+02	7.5E+01		
Zinc bromide	7699-45-8	2.0E+02	4.0E+01	6.0E+00		
Zinc carbonate	3486-35-9	5.0E+02	1.0E+02	1.5E+01		
Zinc carbonate hydroxide	5263-02-5	2.5E+02	5.0E+01	3.0E+01		
Zinc chloride fume	7646-85-7	5.0E+01	5.0E+01	2.0E+00	1.0E+00	3.4E-01
Health Effects	chest pain , conj , copious sputum , cor pulmonale , cough , cyan , dysp , fever , irrit eyes , irrit nose , irrit skin , irrit throat , pneu , pulm edema , pulm fib , skin burns , tachypnea					
Target Organs	Lungs					
Zinc chromate	11103-86-9				1.0E-02	2.4E-03
Zinc chromate	13530-65-9	1.5E+01	1.0E+00	1.5E-01	1.0E-02	2.4E-03
Zinc cyanide	557-21-1	1.1E+02	2.3E+01	2.3E+01		
Zinc fluoride	7783-49-5	5.0E+02	1.3E+02	2.0E+01		
Zinc hydroxide	20427-58-1	6.0E+01	1.5E+00	6.0E-01		
Zinc nitrate	7779-88-6	5.0E+02	1.3E+02	1.5E+01		
Zinc nitrate hexahydrate	10196-18-6	5.0E+02	1.0E+02	1.5E+01		
Zinc oxide	1314-13-2	5.0E+02	1.5E+01	1.0E+01	2.0E+00	4.9E-01
Health Effects	blurred vision , chest tight , decr pulm func , dysp , head , lass , low back pain , mal , metal fume fever: chills , metal fume fever: cough , metal fume fever: dry throat , metal fume fever: fever , metal fume fever: musc ache , metal fume fever: nau ,					
Target Organs	Lungs					
Zinc perchlorate	13637-61-1	2.5E+02	5.0E+01	3.0E+01		
Zinc perchlorate hexahydrate	10025-64-6	6.0E+01	1.3E+01	1.5E+00		
Zinc phenolsulfonate	127-82-2	5.0E+02	1.5E+01	2.0E+00		
Zinc phosphate	7779-90-0	2.5E+02	5.0E+01	6.0E+00		
Zinc phosphide	1314-84-7	1.9E+01	1.1E+01	1.5E+00		
Zinc stearate	557-05-1	1.5E+02	5.0E+01	3.0E+01		
Health Effects	cough , irrit eyes , irrit skin , irrit upper resp sys					
Zinc sulfate	7733-02-0	5.0E+02	3.5E+00	5.0E-01		
Zinc sulfate heptahydrate	7446-20-0	2.0E+02	2.0E+02	2.0E+02		
Zinc, metallic	7440-66-6	5.0E+02	4.0E+01	6.0E+00		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible
Zirconium	7440-67-7	5.0E+01	1.0E+01	1.0E+01	5.0E+00	1.2E+00
Health Effects	in animals: irrit muc memb , in animals: irrit skin , lung granulomas , skin granulomas , X-ray evidence of retention in lungs					
Target Organs	Lungs					
Zirconium boride	12045-64-6	6.2E+01	6.2E+01	1.2E+01		
Zirconium carbide	12070-14-3	6.3E+01	1.3E+01	1.3E+01		
Zirconium chloride	10026-11-6	1.3E+02	2.6E+01	2.6E+01		
Zirconium dinitrate oxide hydrate	14985-18-3	1.4E+02	2.7E+01	2.7E+01		
Zirconium fluoride	7783-64-4	5.0E+02	1.1E+02	6.6E+01		
Zirconium hydride	7704-99-6	5.1E+01	5.1E+01	1.0E+01		
Zirconium hydroxide	14475-63-9	8.7E+01	1.8E+01	1.8E+01		
Zirconium nitrate	13746-89-9	1.9E+02	3.7E+01	3.7E+01		
Zirconium nitride	25658-42-8	5.8E+01	1.2E+01	1.2E+01		
Zirconium oxide	1314-23-4	6.8E+01	1.4E+01	1.4E+01		
Zirconium oxychloride octahydrate	13520-92-8	1.8E+02	3.5E+01	3.5E+01		
Zirconium potassium fluoride	16923-95-8	5.0E+02	1.9E+02	1.1E+02		
Zirconium silicate	10101-52-7	1.0E+02	5.1E+01	2.1E+01		
Zirconyl chloride	7699-43-6	9.8E+01	9.8E+01	2.0E+01		
Zirconyl nitrate	13826-66-9	1.3E+02	2.5E+01	2.5E+01		
Zonyl FSN	65545-80-4	5.0E+02	5.0E+02	1.5E+02		

Table C-3. Short-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³

Chemical Name	CASRN	1-hour Critical	1-hour Marginal	1-hour Negligible	8-hour Negligible	14-day Negligible

CASRN = Chemical Abstract Service Registry Number
MEG = Military Exposure Guideline
mg/m³ = milligrams per cubic meter

Potential Health Effects: please see Appendix B for acronyms and definitions. Health effects information was obtained from the following sources:

1) CDC 2004. Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health (NIOSH) Pocket Guide to Chemical Hazards, 97-140, Feb 2004.

2) NRC/COT 2003. National Research Council, Committee on Toxicology. Acute Exposure Guideline Levels for Selected Airborne Chemicals, Volume 3. Committee on Toxicology, Subcommittee on Acute Exposure Guideline Levels. National Academy Press, Washington, DC.

Target organs were identified using the sources providing the inhalation value used to develop the Air-MEGs. Sources included: 1) EPA/NRC 2007, 2) EPA 2005c, 3) EPA 2005a, 4) ATSDR 2006, 5) EPA 2005d, and 6) ACGIH 2005.

Odor threshold data were obtained from the following sources:

1) AIHA 1989. American Industrial Hygiene Association. Odor Thresholds for Chemicals with Established Occupational Health Standards. Akron, OH.

2) NLM 2006. National Library of Medicine's Hazardous Substances Data Base (HSDB), http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB, accessed August 2006.

3) Ruth, J.H. 1986. Odor Thresholds and Irritation Levels of Several Chemical Substances: A Review. American Industrial Hygiene Association Journal (47), p. A-142-151.

Table C-4. 10-minute Air Military Exposure Guidelines for Key Toxic Industrial Che

All concentrations in mg/m³

Chemical Name	CASRN	10-minute Critical	10-minute Marginal	10-minute Negligible
Acrolein	107-02-8	1.4E+01	1.0E+00	7.0E-02
Health Effects	chronic resp disease , decr pulm func , delayed pulm edema , irrit eyes , irrit muc memb , irrit skin			
Target Organs	Lungs, Nose, Respiration - unspecified			
Acrylonitrile	107-13-1	1.0E+03	6.3E+02	1.0E+01
Health Effects	asphy , carc , dizz , head , irrit eyes , irrit skin , lass , nau , scaling derm , skin vesic , sneez , vomit			
Target Organs	Lungs, Nervous system - unspecified, Nose, Respiration - unspecified			
Allyl alcohol	107-18-6	8.6E+01	1.0E+01	5.0E+00
Health Effects	irrit eyes , irrit skin , irrit upper resp sys , pulm edema , tissue damage			
Ammonia	7664-41-7	1.9E+03	1.5E+02	2.1E+01
Health Effects	chest pain , cough Respiration - unspecified, discomfort Eyes, dizz Whole body, dysp , head None, hyperpnea Respiration - unspecified, incr Nasal-pharynx, inebri Whole body, irrit Throat, irrit Eyes, irrit Nose, irrit Respiration - unspecified, irrit eyes			
Target Organs	Eyes, Lungs, Respiration - unspecified, Whole body			
Arsine	7784-42-1	2.9E+00	9.6E-01	9.6E-01
Health Effects	abdom pain , back pain , bronze skin , carc , dizz , dysp , head , hema , jaun , lass , liquid: frostbite , mal , nau , peri neur , vomit			
Target Organs	Blood, Kidneys, Spleen			
Boron trifluoride	7637-07-2	1.4E+02	4.7E+01	2.5E+00
Health Effects	epis , eye burns , in animals: kidney damage , in animals: pneu , irrit eyes , irrit nose , irrit resp sys , irrit skin , skin burns			
Target Organs	Kidneys			
Carbon monoxide	630-08-0	1.9E+03	4.8E+02	9.5E+01
Health Effects	angina , conf , cyan , depres S_T segment of electrocardiogram , dizz , halu , head , lass , nau , syncope , tachypnea			
Target Organs	CNS - unspecified, CVS - unspecified, Reproductive - unspecified by gender			
Chlorine	7782-50-5	1.5E+02	8.1E+00	1.5E+00
Health Effects	burning mouth , burning nose , burning of eyes , choking , cough , derm , dizz , head , hypox , irrit Throat, irrit Nose, irrit Eyes, lac , liquid: frostbite , nau , pneu , pulm edema , rhin , subs pain , syncope , vomit			
Target Organs	Lungs, Whole body			
Cyanogen chloride	506-77-4	1.0E+01	1.0E+00	7.5E-01
Health Effects	conf , cough , delayed pulm edema , dizz , head , irreg heartbeat , irrit eyes , irrit skin (liquid) , irrit upper resp sys , lass , nau , vomit			
Target Organs	Lungs			
Diborane	19287-45-7	8.0E+00	2.2E+00	1.5E-01
Health Effects	chest tight , chills , dizz , fever , head , hemorr , in animals: kidney damage , in animals: liver damage , lass , musc fasc , nau , nonproductive cough , precordial pain , pulm edema , short breath , tremor			
Target Organs	CNS - unspecified, Lungs			
Dimethylamine	124-40-3	8.9E+02	2.4E+02	1.8E+01
Health Effects	conj , cough , derm , dysp , irrit nose , irrit throat , liquid: frostbite , pulm edema , sneez			
Ethylene oxide	75-21-8	6.5E+02	1.4E+02	9.0E+00
Health Effects	cyan , diarr , drow , dysp , EKG abnor , eye burns (liq or high vap conc) , head , in animals: carc , in animals: convuls , in animals: kidney damage , in animals: liver damage , inco , irrit eyes , irrit nose , irrit skin , irrit throat , lass , liquid:			
Target Organs	Blood, Brain, Kidneys, Reproductive - unspecified by gender			

Table C-4. 10-minute Air Military Exposure Guidelines for Key Toxic Industrial Che

All concentrations in mg/m³

Chemical Name	CASRN	10-minute Critical	10-minute Marginal	10-minute Negligible
Fluorine	7782-41-4	5.6E+01	3.1E+01	2.6E+00
Health Effects	eye burns , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit nose , irrit resp sys , lar spasm , pulm edema , skin burns , wheez			
Target Organs	Respiration - unspecified			
Formaldehyde	50-00-0	1.2E+02	1.7E+01	1.1E+00
Health Effects	carc , cough , derm , irrit eyes , irrit nose , irrit resp sys , irrit throat , lac , wheez			
Target Organs	Nasal - pharynx, Respiration - unspecified, Skin			
Hydrazine	302-01-2	8.4E+01	3.0E+01	1.3E-01
Health Effects	carc , convuls , derm , dizz , eye burns , in animals: bron , in animals: pulm edema , irrit eyes , irrit nose , irrit skin , irrit throat , kidney damage , liver damage , nau , skin burns , temporary blindness			
Target Organs	Liver, Nasal - pharynx, Nose			
Hydrogen chloride	7647-01-0	9.4E+02	1.5E+02	2.7E+00
Health Effects	choking , cough , derm , in animals: lar spasm , irrit Throat, irrit larynx , irrit nose , irrit throat , liquid: frostbite , pulm edema , solution: eye burns , solution: skin burns			
Target Organs	Larynx, Lungs, Nasal-pharynx, None, Nose, Trachea, Whole body			
Hydrogen cyanide	74-90-8	3.0E+01	1.9E+01	2.8E+00
Health Effects	anor , asphy , blood changes , conf , dizz , ftg , head , head , incr rate and depth of respiration or respiration slow and gasping , irrit Eyes, lass , nau , nau , numb , thyroid changes , tremors , vertigo , vomit , vomit , weak			
Target Organs	CNS - unspecified, Lungs, Thyroid, Whole body			
Hydrogen fluoride	7664-39-3	1.4E+02	7.8E+01	8.2E-01
Health Effects	bone changes , bron , cough Lungs, eye burns , irrit Throat, irrit Eyes, irrit Nose, irrit Respiration - unspecified, irrit Skin, irrit eyes , irrit nose , irrit skin , irrit throat , pulm edema , rhinitis , skin burns , tight Lungs, wheez Lungs			
Target Organs	Eyes, Lungs, Nasal-pharynx, Respiration - unspecified, Whole body			
Hydrogen selenide	7783-07-5	1.8E+01	6.0E+00	3.5E-01
Health Effects	diarr , dizz , garlic breath , in animals: pneu , irrit eyes , irrit nose , irrit throat , lass , liquid: frostbite , liver damage , metallic taste , nau , vomit			
Target Organs	GI tract - unspecified			
Hydrogen sulfide	7783-06-4	1.1E+02	5.7E+01	1.1E+00
Health Effects	apnea , coma , conj , convuls , corn vesic , dizz , eye pain , GI dist , head , insom , irrit eyes , irrit resp sys , irrity , lac , lass , liquid: frostbite , photo			
Target Organs	Nasal - pharynx, Nose, Respiration - unspecified			
Lewisite	541-25-3	2.5E+00	6.5E-01	3.0E-03
Methyl bromide	74-83-9	1.3E+04	3.7E+03	7.5E+01
Health Effects	carc , convuls , dizz , dysp , hand tremor , head , inco , irrit eyes , irrit resp sys , irrit skin , liquid: frostbite , mal , musc weak , nau , skin vesic , vis dist , vomit			
Target Organs	Nervous system - unspecified, Nose			
Methyl hydrazine	60-34-4	3.0E+01	1.0E+01	3.5E-01
Health Effects	anoxia , ataxia , carc , convuls , cyan , diarr , irrit eyes , irrit resp sys , irrit skin , tremor , vomit			
Target Organs	Liver			
Methyl isocyanate	624-83-9	2.8E+00	9.3E-01	5.8E-02
Health Effects	asthma , chest pain , cough , dysp , eye damage , in animals: pulm edema , irrit upper respiratory tract, irrit Eyes, irrit Nasal-pharynx, irrit eyes , irrit nose , irrit skin , irrit throat , lac , pulm secretions , resp sens , skin damage			

Table C-4. 10-minute Air Military Exposure Guidelines for Key Toxic Industrial Che

All concentrations in mg/m³

Chemical Name	CASRN	10-minute Critical	10-minute Marginal	10-minute Negligible
Target Organs	Developmental - generic, Heart, Lungs			
Monomethylamine	74-89-5	1.2E+03	2.0E+02	1.9E+01
Health Effects	conj , cough , derm , irrit eyes , irrit resp sys , irrit skin , liquid: frostbite , muc memb burns , skin burns			
Nitric acid	7697-37-2	4.4E+02	1.1E+02	1.4E+00
Health Effects	bron , delayed pulm edema , dental erosion , irrit eyes , irrit muc memb , irrit skin , pneu			
Target Organs	Lungs			
Nitrogen dioxide	10102-44-0	6.4E+01	3.8E+01	9.4E-01
Health Effects	chest pain , chronic bron , cough , cyan , decr pulm func , dysp , irrit eyes , irrit nose , irrit throat , mucoid frothy sputum , pulm edema , tacar , tachypnea			
Target Organs	Lungs			
Parathion	56-38-2	3.6E+00	2.8E+00	3.0E-01
Health Effects	abdom cramps , anor , ataxia , card irreg , chest tight , coma , conf , convuls , cyan , diarr , dizz , head , irrit eyes , irrit resp sys , irrit skin , lar spasm , lass , low BP , miosis , musc fasc , nau , para , rhin , salv , sweat , vomit , wheez			
Phosgene	75-44-5	1.5E+01	2.5E+00	4.0E-01
Health Effects	chest pain , cough Lungs, cough , cyan , dry burning throat , dysp , foamy sputum , inj Lungs, irrit Throat, irrit Respiration - unspecified, irrit Eyes, irrit eyes , liquid: frostbite , pulmonary edema Lungs, vomit			
Target Organs	Lungs, None			
Phosphorus oxychloride	10025-87-3	6.9E+00	3.0E+00	3.0E+00
Health Effects	abdom pain , cough , dizz , dysp , eye burns , head , irrit eyes , irrit resp sys , irrit skin , lass , nau , neph , pulm edema , skin burns , vomit			
Target Organs	Kidneys			
Phosphorus trichloride	7719-12-2	3.9E+01	1.4E+01	1.9E+00
Health Effects	eye burns , irrit eyes , irrit nose , irrit skin , irrit throat , pulm edema , skin burns			
Propylene oxide	75-56-9	3.1E+03	1.1E+03	1.7E+02
Health Effects	carc , irrit eyes , irrit resp sys , irrit skin , skin blisters , skin burns			
Target Organs	Epithelium, Nasal - pharynx, Nose			
Sulfur dioxide	7446-09-5	7.9E+01	2.0E+00	5.2E-01
Health Effects	choking , cough , irrit eyes , irrit nose , irrit throat , liquid: frostbite , reflex bronchoconstriction , rhin			
Target Organs	Respiration - unspecified			
Sulfur trioxide	7446-11-9	2.7E+02	8.7E+00	2.0E-01
Sulfuric acid	7664-93-9	2.7E+02	8.7E+00	2.0E-01
Health Effects	bron , conj , dental erosion , derm , emphy , eye burns , irrit eyes , irrit nose , irrit skin , irrit throat , pulm edema , skin burns , stomatis			
Target Organs	Lungs			

Table C-4. 10-minute Air Military Exposure Guidelines for Key Toxic Industrial Che

All concentrations in mg/m³

Chemical Name	CASRN	10-minute Critical	10-minute Marginal	10-minute Negligible

CASRN = Chemical Abstract Service Registry Number
TICs = Toxic Industrial Chemicals
MEG = Military Exposure Guideline
mg/m³ = milligrams per cubic meter

Potential Health Effects: please see Appendix B for acronyms and definitions. Health effects information was obtained from the following sources:

1) CDC 2004. Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health (NIOSH) Pocket Guide to Chemical Hazards, 97-140, Feb 2004.

2) NRC/COT 2003. National Research Council, Committee on Toxicology. Acute Exposure Guideline Levels for Selected Airborne Chemicals, Volume 3. Committee on Toxicology, Subcommittee on Acute Exposure Guideline Levels. National Academy Press, Washington, DC.

Target organs were identified using the sources providing the inhalation value used to develop the Air-MEGs. Sources included: 1) EPA/NRC 2007, 2) EPA 2005c, 3) EPA 2005a, 4) ATSDR 2006, 5) EPA 2005d, and 6) ACGIH 2005.

Odor threshold data were obtained from the following sources:

1) AIHA 1989. American Industrial Hygiene Association. Odor Thresholds for Chemicals with Established Occupational Health Standards. Akron, OH.

2) NLM 2006. National Library of Medicine's Hazardous Substances Data Base (HSDB), http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB, accessed August 2006.

3) Ruth, J.H. 1986. Odor Thresholds and Irritation Levels of Several Chemical Substances: A Review. American Industrial Hygiene Association Journal (47), p. A-142-151.

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
1,4-Dichloro-cis-2-butene	1476-11-5	1.1E-03	
2,2-Dimethylpentane	590-35-2	4.0E+02	
2,3-Dimethylpentane	565-59-3	4.0E+02	
2,4-Dimethylpentane	108-08-7	4.0E+02	
2-Methylhexane	591-76-4	4.0E+02	
3-Carene	13466-78-9	2.7E+01	
3-Methylhexane	589-34-4	4.0E+02	
Acetaldehyde	75-07-0	6.2E-02	B2
Health Effects	carc , CNS depres , conj , cough , delayed pulm edema , derm , eye burns , in animals: kidney effects , in animals: repro effects , in animals: terato effects , irrit eyes , irrit nose , irrit throat , skin burns		
Target Organs	Nose		
Acetic acid	64-19-7	8.4E+00	
Health Effects	black skin , chronic bron , conj , dental erosion , eye burns , hyperkeratosis , irrit eyes , irrit nose , irrit skin , irrit throat , lac , phar edema , skin burns , skin sens		
Acetic acid 2-methylbutyl ester	624-41-9	9.1E+01	
Acetone	67-64-1	2.1E+01	IN
Health Effects	CNS depres , derm , dizz , head , irrit eyes , irrit nose , irrit throat		
Target Organs	Nervous system - unspecified		
Acetone cyanohydrin	75-86-5	4.1E-02	IN
Health Effects	asphy , conf , convuls , dizz , head , irrit eyes , irrit resp sys , irrit skin , kidney inj , lass , liver inj , pulm edema		
Target Organs	CNS - unspecified		
Acetonitrile	75-05-8	4.1E-02	D
Health Effects	asphy , chest pain , convuls , in animals: kidney damage , in animals: liver damage , irrit nose , irrit throat , lass , nau , stupor , vomit		
Target Organs	Lungs, Whole body		
Acetophenone	98-86-2	1.7E+01	D
Acetylene tetrabromide	79-27-6	3.5E-01	
Health Effects	abdom pain , anor , CNS depres , head , irrit eyes , irrit nose , jaun , leucyt , nau		
Acetylsalicylic acid	50-78-2	1.2E+00	
Health Effects	incr blood clotting time , irrit eyes , irrit skin , irrit upper resp sys , kidney inj , liver inj , nau , vomit		
Target Organs	Blood		
Acrolein	107-02-8	1.4E-04	IN
Health Effects	chronic resp disease , decr pulm func , delayed pulm edema , irrit eyes , irrit muc memb , irrit skin		
Target Organs	Lungs, Nose, Respiration - unspecified		
Acrylamide	79-06-1	4.1E-03	B2
Health Effects	absent deep tendon reflex , ataxia , carc , drow , hand sweat , irrit eyes , irrit skin , lass , musc weak , numb limbs , pares , repro effects		
Target Organs	Breasts, CNS - unspecified, Mouth/palate, Skin, Thyroid, Uterus		
Acrylic acid	79-10-7	2.1E-03	3
Health Effects	eye burns , in animals: kidney inj , in animals: liver inj , in animals: lung inj , irrit eyes , irrit resp sys , irrit skin , skin burns , skin sens		

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Target Organs	Nasal-pharynx, Nose, Reproductive - unspecified by gender		
Acrylonitrile	107-13-1	7.1E-02	B1
Health Effects	asphy , carc , dizz , head , irrit eyes , irrit skin , lass , nau , scaling derm , skin vesic , sneez , vomit		
Target Organs	Lungs, Nervous system - unspecified, Nose, Respiration - unspecified		
Adipic acid	124-04-9	1.7E+00	
Adiponitrile	111-69-3	4.1E-02	D
Health Effects	abdom pain , blurred vision , conf , convuls , dizz , dysp , head , irrit eyes , irrit resp sys , irrit skin , lass , nau , vomit		
Target Organs	Blood, Lungs		
Alachlor	15972-60-8	2.4E-01	B2
Aldrin	309-00-2	9.8E-04	B2
Health Effects	azotemia , carc , clonic convuls , coma , dizz , head , hema , mal , myoclonic jerks of limbs , nau , tonic convuls , vomit		
Target Organs	Liver		
Allyl alcohol	107-18-6	6.8E-04	
Health Effects	irrit eyes , irrit skin , irrit upper resp sys , pulm edema , tissue damage		
Allyl chloride	107-05-1	6.8E-03	C
Health Effects	in animals: kidney inj , in animals: liver inj , irrit eyes , irrit muc memb , irrit nose , irrit skin , pulm edema		
Target Organs	Liver, Nervous system - unspecified		
Allyl glycidyl ether	106-92-3	1.6E+00	
Health Effects	derm , irrit eyes , irrit nose , irrit resp sys , irrit skin , narco , possible hemato effects , pulm edema , repro effects		
Target Organs	Skin		
Allyl propyl disulfide	2179-59-1	1.0E+00	
Health Effects	irrit eyes , irrit nose , irrit resp sys , lac		
Aluminum, elemental	7429-90-5	3.4E-03	D
Health Effects	irrit eyes , irrit resp sys , irrit skin		
Target Organs	Nervous system - unspecified		
Aminopyridine, 2-	504-29-0	4.7E-01	
Health Effects	convuls , dizz , excitement , head , high BP , irrit eyes , irrit nose , irrit throat , lass , nau , resp distress , stupor		
Target Organs	CNS - unspecified		
Amitrole	61-82-5	4.9E-02	3
Health Effects	anor , ataxia , depres (thyroid func suppression) , dysp , incr body temperature , irrit eyes , irrit skin , lass , musc spasm , salv , skin dryness		
Target Organs	Reproductive - unspecified by gender, Thyroid		
Ammonia	7664-41-7	6.8E-02	IN
Health Effects	chest pain , cough Respiration - unspecified, discomfort Eyes, dizz Whole body, dysp , head None, hyperpnea Respiration - unspecified, incr Nasal-pharynx, inebri Whole body, irrit Throat, irrit Eyes, irrit Nose, irrit Respiration - unspecified, irrit eyes		
Target Organs	Eyes, Lungs, Respiration - unspecified, Whole body		
Ammonium chloride	12125-02-9	3.4E+00	
Health Effects	cough , dysp , irrit eyes , irrit resp sys , irrit skin , pulm sens		
Ammonium perfluorooctanoate	3825-26-1	2.4E-03	

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Ammonium sulfamate	7773-06-0	3.4E+00	
Health Effects	cough , dysp , irrit eyes , irrit nose , irrit throat		
Amyl acetate	628-63-7	9.1E+01	
Health Effects	derm , irrit eyes , irrit nose , narco , possible CNS depres		
Amyl acetate, sec-	626-38-0	9.1E+01	
Health Effects	derm , irrit eyes , irrit nose , irrit skin , narco , possible CNS depres , possible kidney inj , possible liver inj		
Aniline	62-53-3	6.8E-03	B2
Health Effects	anxi , ataxia , carc , cirr , cyan , cyan , dizz , dizz , dysp , dysp on effort , ftg , head , head , hypox , hypox Heart, irrit eyes , lass , methemo , syncope , tacar , tacar , weak		
Target Organs	Blood, Spleen		
Anisidine, o-	90-04-0	1.2E-01	2B
Health Effects	carc , cyan , dizz , head , RBC Heinz bodies		
Anisidine, p-	104-94-9	1.2E-01	3
Health Effects	cyan , dizz , head , RBC Heinz bodies		
Antimony trioxide	1309-64-4	1.4E-04	2B
Antimony, elemental	7440-36-0	1.7E-01	
Health Effects	anor , cough , diarr , dizz , head , insom , irrit eyes , irrit mouth , irrit nose , irrit skin , irrit throat , nau , stomach cramps , unable to smell properly , vomit		
Target Organs	CVS - unspecified, Lungs		
ANTU	86-88-4	1.0E-01	3
Health Effects	after ingestion of large doses: coarse pulm rales , after ingestion of large doses: cyan , after ingestion of large doses: dysp , after ingestion of large doses: vomit , liver damage		
Target Organs	Lungs		
Aramite	140-57-8	6.8E-01	B2
Aroclor 1242	53469-21-9	3.4E-01	
Health Effects	carc , chloracne , irrit eyes , liver damage , repro effects		
Target Organs	Liver, Skin		
Aroclor 1254	11097-69-1	1.7E-01	
Health Effects	carc , chloracne , irrit eyes , liver damage , repro effects		
Target Organs	Liver		
Aromatic hydrocarbon solvents	64742-95-6	6.8E-01	
Arsenic compounds	As cmpds	2.4E-03	
Arsenic, elemental	7440-38-2	1.1E-03	A
Health Effects	carc , derm , GI dist , hyperpig of skin , peri neur , resp irrit , ulceration of nasal septum		
Target Organs	Lungs, Skin		
Arsine	7784-42-1	3.4E-05	
Health Effects	abdom pain , back pain , bronze skin , carc , dizz , dysp , head , hema , jaun , lass , liquid: frostbite , mal , nau , peri neur , vomit		
Target Organs	Blood, Kidneys, Spleen		
Asbestos	1332-21-4	2.1E-02	A
Health Effects	asbestosis (chronic exposure): dysp , asbestosis (chronic exposure): finger clubbing , asbestosis (chronic exposure): interstitial fib , asbestosis (chronic exposure): restricted pulm function , carc , irrit eyes		

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Target Organs	Lungs		
Asphalt	8052-42-4	1.7E-01	2B
Health Effects	carc , irrit eyes , irrit resp sys		
Atrazine	1912-24-9	1.7E+00	C
Health Effects	derm , dysp , hypothermia , inco , irrit eyes , irrit skin , lass , liver inj , salv , sens skin		
Azinphos methyl	86-50-0	6.8E-03	
Health Effects	aching eyes , anor , blurred vision , card irreg , chest tight , convuls , cyan , diarr , head , lac , lar spasm , low BP , miosis , nau , para , rhin , salv , sweat , twitch , vomit , wheez		
Target Organs	Nervous system - unspecified		
Azobenzene	103-33-3	1.5E-01	B2
Barium sulfate	7727-43-7	2.4E+00	
Health Effects	benign pneumoconiosis (baritosis) , irrit eyes , irrit nose , irrit upper resp sys		
Barium, elemental	7440-39-3	3.4E-03	D
Baygon	114-26-1	1.2E-01	
Health Effects	abdom cramps , blurred vision , diarr , head , lass , miosis , musc twitch , nau , salv , sweat , vomit		
Benomyl	17804-35-2	3.4E-01	
Health Effects	irrit eyes , irrit skin , irrit upper resp sys , possible repro effects , possible terato effects , skin sens		
Target Organs	Reproductive - unspecified by gender, Skin		
Benzene	71-43-2	5.5E-02	A
Health Effects	anor , bone marrow depres , carc , derm , dizz , head , irrit eyes , irrit nose , irrit resp sys , irrit skin , lass , nau , staggered gait		
Target Organs	Blood, IMM system - unspecified, WBC		
Benzenethiol	108-98-5	1.5E-01	
Health Effects	CNS depres , cough , cyan , derm , dizz , dysp , head , irrit eyes , irrit resp sys , irrit skin , kidney damage , liver damage , nau , pneu , pulm edema , spleen damage , vomit , wheez		
Target Organs	CNS - unspecified, Eyes, Skin		
Benzidine	92-87-5	7.2E-05	A
Health Effects	acute cystitis , acute liver disorders , carc , derm , hema , irreg urination , painful urination , secondary anemia from hemolysis		
Target Organs	Bladder		
Benzoic acid	65-85-0	1.4E-03	D
Benzoyl peroxide	94-36-0	1.7E+00	3
Health Effects	irrit eyes , irrit muc memb , irrit skin , sens derm		
Benzyl acetate	140-11-4	2.1E+01	3
Benzyl chloride	100-44-7	1.8E+00	B2
Health Effects	head , irrit eyes , irrit nose , irrit skin , irrity , lass , pulm edema , skin eruption		
Target Organs	Lungs		
Beryllium, elemental	7440-41-7	1.4E-05	B1
Health Effects	berylliosis (chronic exposure): anor , berylliosis (chronic exposure): chest pain , berylliosis (chronic exposure): clubbing of fingers , berylliosis (chronic exposure): cough , berylliosis (chronic exposure): cyan , berylliosis (chronic exposure): lass ,		

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Target Organs	Lungs		
beta-Pinene	127-91-3	2.7E+01	
Bidrin	141-66-2	1.2E-02	
Health Effects	abdom cramps , anor , anxi , diarr , dizz , head , inco , lac , lass , mal , musc twitch , nau , restless , rhinitis , salv , sweat , tremor , vomit		
Biphenyl, 1,1-	92-52-4	3.1E-01	D
Health Effects	head , irrit eyes , irrit throat , lass , liver damage , nau , numb limbs		
Target Organs	Lungs		
Bis(2-chloro-1-methylethyl) ether	108-60-1	4.8E-01	C
Bis(2-chloroethyl) ether	111-44-4	1.5E-02	B2
Health Effects	carc , cough , in animals: pulm edema , irrit nose , irrit resp sys , irrit throat , lac , liver damage , nau , vomit		
Target Organs	Liver, Lungs, Whole body		
Bis(2-dimethylaminoethyl)ether	3033-62-3	1.1E-01	
Health Effects	in animals: irrit eyes , in animals: irrit skin , neurological disorders , possible urinary dist		
Target Organs	Eyes		
Bis(2-ethylhexyl) phthalate	117-81-7	1.7E+00	B2
Health Effects	carc , in animals: liver damage , irrit eyes , irrit muc memb , terato effects		
Bis(chloromethyl) ether	542-88-1	7.7E-05	A
Health Effects	blood-stained sputum , bronchial secretions , carc , corn damage , cough , decr pulm function , dysp , edema , irrit eyes , irrit muc memb , irrit resp sys , irrit skin , nec , pulm congestion , wheez		
Target Organs	Lungs, Respiration - unspecified		
Bismuth telluride	1304-82-1	3.4E+00	
Health Effects	garlic breath , irrit eyes , irrit skin , irrit upper resp sys		
Borates, pentahydrate	12179-04-3	6.8E-01	
Health Effects	cough , derm , dysp , epis , irrit eyes , irrit skin , irrit upper resp sys		
Borax	1303-96-4	6.8E-01	
Health Effects	cough , derm , dysp , epis , irrit eyes , irrit skin , irrit upper resp sys		
Boric acid	10043-35-3	6.8E-01	
Boron	7440-42-8	6.8E-03	IN
Boron oxide	1303-86-2	3.4E+00	
Health Effects	conj , cough , irrit eyes , irrit resp sys , irrit skin , skin eryt		
Boron trifluoride	7637-07-2	4.8E-03	
Health Effects	epis , eye burns , in animals: kidney damage , in animals: pneu , irrit eyes , irrit nose , irrit resp sys , irrit skin , skin burns		
Target Organs	Kidneys		
Bromacil	314-40-9	3.4E+00	
Health Effects	in animals: thyroid inj , irrit eyes , irrit skin , irrit upper resp sys		
Bromine	7726-95-6	2.2E-01	
Health Effects	abdom pain , cough , diarr , dizz , epis , eye burns , feeling of oppression , head , lac , measle-like eruptions , pneu , pulm edema , skin burns		
Bromine pentafluoride	7789-30-2	2.5E-01	
Health Effects	corn nec , cough , dysp , irrit eyes , irrit resp sys , irrit skin , kidney inj , liver inj , pulm edema , skin burns		

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Bromobenzene	108-86-1	1.4E-01	
Bromochloromethane	74-97-5	6.8E-02	D
Health Effects	CNS depres , conf , dizz , irrit eyes , irrit skin , irrit throat , pulm edema		
Target Organs	CNS - unspecified, Liver		
Bromodichloromethane	75-27-4	1.4E-02	B2
Bromoethene	593-60-2	2.1E-03	B2
Health Effects	carc , conf , dizz , inco , irrit eyes , irrit skin , liquid: frostbite , narco , nau , vomit		
Target Organs	CNS - unspecified, Liver, Lungs		
Bromoform	75-25-2	2.0E+00	B2
Health Effects	CNS depres , irrit eyes , irrit resp sys , irrit skin , kidney damage , liver damage		
Target Organs	Large intestine, Lungs		
Bromopropane, 1-	106-94-5	1.2E+01	
Butadiene, 1,3-	106-99-0	1.4E-03	CA
Health Effects	carc , dizz , drow , irrit eyes , irrit nose , irrit throat , liquid: frostbite , repro effects , terato effects		
Target Organs	Blood, Multiple sites, Ovaries		
Butane	106-97-8	5.8E+02	
Health Effects	asphy , drow , liquid: frostbite , narco		
Butanethiol	109-79-5	6.3E-01	
Health Effects	conf , cyan , head , in animals: inco , in animals: lass , in animals: narco , irrit eyes , irrit skin , kidney damage , liver damage , mal , musc weak , nau , pulm irrit , sweat , vomit		
Target Organs	CNS - unspecified, Reproductive - unspecified by gender		
Butanol, 1-	71-36-3	2.1E+01	D
Health Effects	blurred vision , CNS depres , corn inflamm , derm , dizz , drow , head , hearing loss , irrit eyes , irrit nose , irrit throat , lac , photo , possible auditory nerve damage		
Butene	25167-67-3	1.4E+02	
Butene, 1-	106-98-9	1.4E+02	
Butene, 2-	107-01-7	1.4E+02	
Butene, cis-2-	590-18-1	1.4E+02	
Butene, trans-2-	624-64-6	1.4E+02	
Butoxyethanol acetate, 2-	112-07-2	4.5E+01	
Health Effects	CNS depres , head , hema , hemolysis , irrit eyes , irrit nose , irrit skin , irrit throat , vomit		
Target Organs	CNS - unspecified		
Butyl acetate, n-	123-86-4	2.4E+01	
Health Effects	drow , head , irrit eyes , irrit skin , irrit upper resp sys , narco		
Butyl acetate, sec-	105-46-4	3.3E+02	
Health Effects	drow , dry skin , dryness upper resp sys , head , irrit eyes , narco		
Butyl acetate, tert-	540-88-5	3.3E+02	
Health Effects	derm , head , inflamm eyes , irrit upper resp tract , itch eyes , narco		
Butyl acrylate, n-	141-32-2	3.6E+00	3
Health Effects	dysp , irrit eyes , irrit skin , irrit upper resp sys , sens derm		

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Butyl alcohol, sec-	78-92-2	2.1E+01	
Health Effects	irrit eyes , irrit nose , irrit skin , irrit throat , narco		
Butyl glycidyl ether, n-	2426-08-6	3.9E+00	
Health Effects	CNS depres , irrit eyes , irrit nose , irrit skin , narco , possible hemato effects , skin sens		
Butyl lactate, N-	138-22-7	1.0E+01	
Health Effects	CNS depres , drow , head , irrit eyes , irrit nose , irrit skin , irrit throat , nau , vomit		
Butylated hydroxytoluene	128-37-0	6.8E-01	3
Health Effects	in animals: decr growth rate , in animals: incr liver weight , irrit eyes , irrit skin		
Butylphenol, 2-sec-	89-72-5	1.1E+01	
Health Effects	irrit eyes , irrit resp sys , irrit skin , skin burns		
Butyltin compounds	z-136	2.7E-04	
Butyltoluene, p-tert-	98-51-1	2.1E+00	
Health Effects	abnor CVS stress , CNS depres , dry nose , dry throat , head , hemato depres , irrit eyes , irrit skin , kidney inj , liver inj , low BP , metallic taste , tacar		
Target Organs	CNS - unspecified, CVS - unspecified		
Cadmium, elemental	7440-43-9	6.8E-06	B1
Health Effects	anos , carc , chest tight , chills , cough , diarr , dysp , emphy , head , mild anemia , musc ache , nau , prot , pulm edema , subs pain , vomit		
Target Organs	Bronchi, Kidneys, Lungs, Trachea		
Calcium chromate	13765-19-0	2.4E-04	
Calcium cyanamide	156-62-7	1.7E-01	
Health Effects	antabuse-like effects , cough , dizz , head , irrit eyes , irrit resp sys , irrit skin , low BP , nau , rapid breath , skin burns , skin sens , vomit		
Target Organs	Skin		
Calcium hydroxide	1305-62-0	1.7E+00	
Health Effects	bron , cough , eye burns , irrit eyes , irrit skin , irrit upper resp sys , pneu , skin burns , skin vesic		
Calcium oxide	1305-78-8	6.8E-01	
Health Effects	derm , irrit eyes , irrit skin , irrit upper resp tract , perf nasal septum , pneu , ulcer		
Calcium sulfate	7778-18-9	2.4E+00	
Health Effects	conj , epis , irrit eyes , irrit skin , irrit upper resp sys , rhinitis		
Calcium sulfate dihydrate	10101-41-4	2.4E+00	
Calcium sulfate hemihydrate	10034-76-1	2.4E+00	
Camphor	76-22-2	4.3E+00	
Health Effects	diarr , dizz , epilep convuls , excitement , head , irrit eyes , irrit muc memb , irrit skin , nau , vomit		
Caprolactam	105-60-2	1.7E+00	4
Health Effects	abdom cramps , asthma , conf , derm , diarr , dizz , epis , head , irrit eyes , irrit resp sys , irrit skin , irrity , kidney inj , liver inj , nau , skin sens , vomit		
Captafol	2425-06-1	2.4E-02	C
Health Effects	bron , conj , derm , diarr , high BP , in animals: carc , in animals: terato effects , irrit eyes , irrit resp sys , irrit skin , kidney inj , liver inj , skin sens , vomit , wheez		
Target Organs	Skin		
Captan	133-06-2	1.7E+00	B2

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Health Effects	blurred vision , carc , derm , diarr , dysp , irrit eyes , irrit skin , irrit upper resp sys , skin sens , vomit		
Carbaryl	63-25-2	1.2E-01	3
Health Effects	abdom cramps , blurred vision , convuls , cyan , diarr , irrit skin , lac , miosis , nau , possible repro effects , rhin , salv , sweat , tremor , vomit		
Carbofuran	1563-66-2	2.4E-02	
Health Effects	abdom cramps , blurred vision , convuls , diarr , head , inco , lass , miosis , musc twitch , nau , salv , sweat , vomit		
Carbon dioxide	124-38-9	2.2E+03	
Health Effects	asphy , coma , convuls , dizz , dysp , frostbite (liq, dry ice) , head , incr BP , incr card output , incr heart rate , mal , pares , restless , sweat		
Carbon disulfide	75-15-0	4.8E-01	
Health Effects	anor , anxi , coronary heart disease , derm , dizz , eye burns , gastritis , head , kidney inj , lass , liver inj , low weight , ocular changes , Parkinson-like syndrome , polyneur , poor sleep , psychosis , repro effects , skin burns		
Target Organs	Nervous system - unspecified, PNS - unspecified		
Carbon monoxide	630-08-0	7.0E+00	
Health Effects	angina , conf , cyan , depres S_T segment of electrocardiogram , dizz , halu , head , lass , nau , syncope , tachypnea		
Target Organs	CNS - unspecified, CVS - unspecified, Reproductive - unspecified by gender		
Carbon tetrabromide	558-13-4	4.6E-01	
Health Effects	in animals: corn damage , irrit eyes , irrit resp sys , irrit skin , kidney inj , lac , liver inj , lung inj		
Target Organs	Liver		
Carbon tetrachloride	56-23-5	1.3E-01	B2
Health Effects	carc , CNS depres , dizz , drow , inco , irrit eyes , irrit skin , kidney inj , liver inj , nau , vomit		
Target Organs	Liver		
Carbonyl fluoride	353-50-4		
Health Effects	chronic exposure: GI pain , chronic exposure: musc fib , chronic exposure: skeletal fluorosis , cough , dysp , eye burns , irrit eyes , irrit muc memb , irrit resp sys , irrit skin , lac , liquid: frostbite , pulm edema , skin burns		
Target Organs	Bone		
Catechol	120-80-9	7.7E+00	2B
Health Effects	burn eyes , convuls , derm , incr BP , irrit eyes , irrit resp sys , irrit skin , kidney inj , lac , skin sens		
Target Organs	CNS - unspecified, Lungs		
Cellulose	9004-34-6	3.4E+00	
Health Effects	irrit eyes , irrit muc memb , irrit skin		
Ceric oxide	1306-38-3	6.2E-03	
Cesium hydroxide	21351-79-1	6.8E-01	
Health Effects	eye burns , irrit eyes , irrit skin , irrit upper resp sys , skin burns		
Chlordane	57-74-9	1.4E-04	B2
Health Effects	abdom pain , anuria , ataxia , blurred vision , carc , conf , convuls , cough , delirium , diarr , in animals: kidney damage , in animals: liver damage , in animals: lung damage , irrity , nau , tremor , vomit		
Target Organs	Liver		
Chlorinated diphenyl oxide	31242-93-0	1.2E-01	
Health Effects	acne-form derm , liver damage		
Target Organs	Liver		

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Chlorine	7782-50-5	4.0E-03	
Health Effects	burning mouth , burning nose , burning of eyes , choking , cough , derm , dizz , head , hypox , irrit Throat, irrit Nose, irrit Eyes, lac , liquid: frostbite , nau , pneu , pulm edema , rhin , subs pain , syncope , vomit		
Target Organs	Lungs, Whole body		
Chlorine dioxide	10049-04-4	9.4E-02	D
Health Effects	bron , chronic bron , cough , irrit eyes , irrit nose , irrit throat , pulm edema , wheez		
Target Organs	Circulatory system - unspecified, Eyes, Respiration - unspecified, Salivary glands, Skin, Whole body		
Chloro-1,3-butadiene	126-99-8	4.8E-02	2B
Health Effects	alopecia , anxi , carc , derm , irrit eyes , irrit resp sys , irrit skin , irrity , repro effects		
Target Organs	Liver, Nose, Reproductive - unspecified by gender		
Chloroacetic acid	79-11-8	1.7E-01	IN
Chloroacetophenone, 2-	532-27-4	2.1E-05	
Health Effects	irrit eyes , irrit resp sys , irrit skin , pulm edema		
Target Organs	Nose		
Chloroacetyl chloride	79-04-9	7.9E-02	
Health Effects	cough , dysp , eye burns , irrit eyes , irrit resp sys , irrit skin , lac , skin burns , wheez		
Target Organs	Lungs		
Chlorobenzene	108-90-7	3.4E-01	D
Health Effects	CNS depres , drow , in animals: kidney inj , in animals: liver inj , in animals: lung inj , inco , irrit eyes , irrit nose , irrit skin		
Target Organs	Kidneys, Liver		
Chlorobenzilate	510-15-6	6.1E-02	B2
Chlorobenzotrifluoride, 4-	98-56-6	2.1E+00	
Chlorodifluoromethane	75-45-6	3.4E+01	3
Health Effects	asphy , card arrhy , conf , drow , heart palp , irrit resp sys , kidney inj , liquid: frostbite , liver inj , ringing in ears , spleen inj		
Target Organs	Adrenal glands, CVS - unspecified, Kidneys, Pituitary glands		
Chloroform	67-66-3	1.7E-01	B2
Health Effects	anes , carc , conf , dizz , enlarged liver , head , irrit eyes , irrit skin , lass , mental dullness , nau		
Target Organs	Liver, Reproductive - unspecified by gender		
Chloronitrobenzene, o-	88-73-3	6.8E-05	C
Chloronitrobenzene, p-	100-00-5	1.6E-01	C
Health Effects	anemia , anoxia , bone marrow changes , carc , in animals: hema , kidney changes , methemo , repro effects , spleen changes , unpleasant taste		
Target Organs	Blood, Liver, Whole body		
Chloronitropropane	600-25-9	3.5E+00	
Health Effects	heart damage , in animals: irrit eyes , kidney damage , liver damage , pulm edema		
Target Organs	Liver, Lungs		
Chloropentafluoroethane	76-15-3	1.5E+03	
Health Effects	card arrhy , card asphy , dizz , drow , heart palp , inco , liquid: derm , liquid: frostbite , narco , nau , vomit		
Target Organs	CVS - unspecified		

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Chloropicrin	76-06-2	2.3E-01	
Health Effects	cough , irrit eyes , irrit resp sys , irrit skin , lac , nau , pulm edema , vomit		
Target Organs	Lungs		
Chloropropane, 2-	75-29-6	6.8E-01	
Chloropropionic acid, 2-	598-78-7	1.5E-01	
Chlorostyrene, o-	2039-87-4	6.9E+01	
Health Effects	acidosis , enlarged liver , hema , in animals: irrit eyes , in animals: irrit skin , jaun , prot		
Target Organs	CNS - unspecified, Kidneys, Liver		
Chlorotoluene, o-	95-49-8	8.9E+01	
Health Effects	anes , cough , derm , drow , inco , irrit eyes , irrit muc memb , irrit skin , kidney inj , liver inj		
Chlorpyrifos	2921-88-2	2.4E-02	
Health Effects	abdom cramps , bluish lips , bluish skin , blurred vision , diarr , lar spasm , miosis , nau , salv , vomit , wheez		
Chromate	11104-59-9	1.7E-02	
Chromium (III)	16065-83-1	3.4E-03	D
Health Effects	irrit eyes , sens derm		
Chromium (VI)	18540-29-9	4.0E-04	A
Chromium, elemental	7440-47-3	3.4E-03	3
Health Effects	irrit eyes , irrit skin , lung fib (histologic)		
Chromyl chloride	14977-61-8	3.9E-02	
Health Effects	carc , eye burns , irrit eyes , irrit skin , irrit upper resp sys , skin burns		
Target Organs	Kidneys, Liver, Respiration - unspecified		
Clopidol	2971-90-6	3.4E+00	
Health Effects	cough , irrit eyes , irrit nose , irrit skin , irrit throat		
Coal dust, anthracite	Coal dust a	9.8E-02	3
Health Effects	chronic bron , decr pulm func , emphy		
Target Organs	Lungs		
Coal dust, bituminous	Coal dust b	2.2E-01	3
Coal tar pitch volatiles (high temperature)	65996-93-2	4.9E-02	1
Health Effects	bron , carc , derm		
Cobalt	7440-48-4	5.3E-10	B1
Health Effects	asthma , cough , decr pulm func , derm , diffuse nodular fib , dysp , low weight , resp hypersensitivity , wheez		
Target Organs	CVS - unspecified, Respiration - generic, Respiration - unspecified		
Cobalt carbonyl	10210-68-1	2.4E-02	
Health Effects	cough , decr pulm func , dysp , in animals: kidney inj , in animals: liver inj , irrit eyes , irrit muc memb , irrit skin , pulm edema , wheez		
Target Organs	Lungs		
Cobalt hydrocarbonyl	16842-03-8	2.4E-02	
Health Effects	cough , decr pulm func , dysp , in animals: irrit resp sys , pulm edema		
Target Organs	Lungs		
Coke oven emissions	8007-45-2	7.7E-03	A

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Health Effects	carc , cough , dysp , irrit eyes , irrit resp sys , wheez		
Target Organs	Lungs, Respiration - unspecified		
Commercial Hexane	Com Hexane	1.8E+01	
Copper fume	Cu fume	6.8E-02	
Coumaphos	56-72-4	1.2E-02	
Cresol, m-	108-39-4	6.8E+00	C
Health Effects	CNS effects: conf , CNS effects: depres , CNS effects: resp fail , derm , dysp , eye burns , irreg rapid resp , irrit eyes , irrit muc memb , irrit skin , kidney damage , liver damage , lung damage , pancreas damage , skin burns , weak pulse		
Target Organs	CNS - unspecified, Skin		
Cresol, o-	95-48-7	6.8E+00	C
Health Effects	CNS effects: conf , CNS effects: depres , CNS effects: resp fail , derm , dysp , eye burns , irreg rapid resp , irrit eyes , irrit muc memb , irrit skin , kidney damage , liver damage , lung damage , pancreas damage , skin burns , weak pulse		
Target Organs	CNS - unspecified, Skin		
Cresol, p-	106-44-5	6.8E+00	C
Health Effects	CNS effects: conf , CNS effects: depres , CNS effects: resp fail , derm , dysp , eye burns , irreg rapid resp , irrit eyes , irrit muc memb , irrit skin , kidney damage , liver damage , lung damage , pancreas damage , skin burns , weak pulse		
Target Organs	CNS - unspecified, Skin		
Cristobalite	14464-46-1	6.1E-03	
Crufomate	299-86-5	1.2E+00	
Health Effects	abdom cramps , anor , blurred vision , diarr , dysp , irrit eyes , irrit resp sys , irrit skin , lac , nau , sweat , wheez		
Cumene	98-82-8	2.7E+00	D
Health Effects	coma , derm , head , irrit eyes , irrit muc memb , irrit skin , narco		
Target Organs	Adrenal glands, CNS - unspecified, Kidneys, Nose		
Cyanamide	420-04-2	6.8E-01	
Health Effects	antabuse-like effects , eye burns , irrit eyes , irrit resp sys , irrit skin , lac , miosis , salv , skin burns , twitch		
Cyanogen	460-19-5	7.3E+00	
Health Effects	bradycardia , cherry red lips , convuls , dizz , head , hypernea , irrit eyes , irrit nose , irrit upper resp sys , lac , liquid: frostbite , loss of appetite , low weight , tachypnea		
Cyclohexane	110-82-7	4.1E+00	IN
Health Effects	coma , derm , drow , irrit eyes , irrit resp sys , irrit skin , narco		
Target Organs	CNS - unspecified, Developmental - generic		
Cyclohexanol	108-93-0	7.0E+01	
Health Effects	irrit eyes , irrit nose , irrit skin , irrit throat , narco		
Target Organs	CNS - unspecified		
Cyclohexanone	108-94-1	1.9E+01	3
Health Effects	coma , derm , head , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit muc memb , irrit skin , narco		
Target Organs	CNS - unspecified, Kidneys, Liver		
Cyclohexene	110-83-8	3.5E+02	
Health Effects	drow , irrit eyes , irrit resp sys , irrit skin		

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Cyclohexylamine	108-91-8	7.3E+00	
Health Effects	cough , diarr , dizz , drow , eye burns , irrit eyes , irrit muc memb , irrit resp sys , irrit skin , nau , pulm edema , skin burns , skin sens , vomit		
Target Organs	Eyes, Respiration - unspecified, Whole body		
Cyclopentadiene	542-92-7	2.1E+00	
Health Effects	irrit eyes , irrit nose		
Cyclopentane	287-92-3	5.9E+02	
Health Effects	cracking skin , dizz , dry skin , euph , inco , irrit eyes , irrit nose , irrit skin , irrit throat , nau , stupor , vomit		
Cyhexatin	13121-70-5	1.7E+00	
Health Effects	abdom pain , cough , dizz , head , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit resp sys , irrit skin , pruritus , skin burns , sore throat , vomit		
Dalapon	75-99-0	1.7E+00	
Health Effects	CNS depres , diarr , irrit eyes , irrit skin , irrit upper resp sys , lass , loss of appetite , skin burns , slowing of pulse , vomit		
DDT	50-29-3	4.9E-02	B2
Health Effects	anxi , carc , conf , convuls , dizz , head , irrit eyes , irrit skin , lass , mal , pares face , pares lips , pares tongue , paresis hands , tremor , vomit		
Target Organs	Liver		
Decaborane	17702-41-9	6.1E-02	
Health Effects	convuls , dizz , drow , head , in animals: dysp , in animals: lass , inco , kidney damage , lass , liver damage , local musc spasm , nau , tremor		
Target Organs	CNS - unspecified, Lungs		
Demeton	8065-48-3	1.2E-02	
Health Effects	abdom cramps , aching eyes , anor , ataxia , card irreg , chest tight , coma , conf , convuls , cyan , diarr , dizz , head , irrit eyes , irrit skin , lar spasm , lass , local sweat , low BP , miosis , musc fasc , nau , para , rhin , salv , vomit , wheez		
Demeton-S-methyl	919-86-8	1.2E-02	
Diacetone alcohol	123-42-2	8.1E+01	
Health Effects	corn damage , in animals: liver damage , in animals: narco damage , irrit eyes , irrit nose , irrit skin , irrit throat		
Diazinon	333-41-5	2.4E-03	
Health Effects	abdom cramps , blurred vision , conf , convuls , dizz , dysp , irrit eyes , lass , miosis , nau , salv , vomit		
Target Organs	Nervous system - unspecified		
Diazomethane	334-88-3	1.2E-01	3
Health Effects	asthma , chest pain , cough , fever , flush skin , head , irrit eyes , lass , liquid: frostbite , pneu , pulm edema , short breath		
Target Organs	Lungs		
Diborane	19287-45-7	2.8E-02	
Health Effects	chest tight , chills , dizz , fever , head , hemorr , in animals: kidney damage , in animals: liver damage , lass , musc fasc , nau , nonproductive cough , precordial pain , pulm edema , short breath , tremor		
Target Organs	CNS - unspecified, Lungs		
Dibromo-3-chloropropane, 1,2-	96-12-8	8.0E-10	B2
Health Effects	carc , drow , irrit eyes , irrit nose , irrit skin , irrit throat , kidney inj , liver inj , nau , pulm edema , sterility , vomit		
Target Organs	Nasal - pharynx, Reproductive - unspecified by gender, Testes		
Dibromoethane, 1,2-	106-93-4	1.4E-03	LI
Health Effects	carc , derm with vesic , heart damage , irrit eyes , irrit resp sys , irrit skin , kidney damage , liver damage , repro		

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
	effects , spleen damage		
Target Organs	Kidneys, Liver, Nasal - pharynx, Nose, Sperm		
Dibutyl phenyl phosphate	2528-36-1	1.2E+00	
Dibutyl phosphate	107-66-4	1.7E+00	
Health Effects	head , irrit eyes , irrit resp sys , irrit skin		
Dibutyl phthalate	84-74-2	1.7E+00	D
Health Effects	irrit eyes , irrit stomach , irrit upper resp sys		
Target Organs	Reproductive - unspecified by gender		
Dibutylethanolamine	102-81-8	1.2E+00	
Health Effects	corn nec , derm , in animals: irrit eyes , in animals: irrit nose , in animals: irrit skin , low weight , skin nec		
Dichloro-1-nitroethane	594-72-9	4.0E+00	
Health Effects	in animals: pulm edema , in animals: heart damage , in animals: hemorr , in animals: irrit eyes , in animals: irrit skin , in animals: kidney damage , in animals: liver damage		
Dichloro-2-butene, 1,4-	764-41-0	1.1E-03	B2
Dichloro-5,5-dimethylhydantoin	118-52-5	6.8E-02	
Health Effects	irrit eyes , irrit muc memb , irrit resp sys		
Dichloroacetic acid	79-43-6	6.5E-01	LI
Dichlorobenzene, 1,2-	95-50-1	1.4E+00	D
Health Effects	irrit eyes , irrit nose , kidney damage , liver damage , skin blisters		
Target Organs	Liver		
Dichlorobenzene, 1,4-	106-46-7	1.6E+00	C
Health Effects	anor , cirr , head , in animals: carc , in animals: kidney inj , in animals: liver inj , irrit eyes , jaun , low weight , nau , profuse rhinitis , swell periorb , vomit		
Target Organs	Eyes, Kidneys, Liver, Respiration - unspecified		
Dichlorobutene-2, trans-1,4-	110-57-6	1.1E-03	3
Dichlorodifluoromethane	75-71-8	1.4E+00	
Health Effects	asphy , card arrest , card arrhy , dizz , liquid: frostbite , tremor , uncon		
Target Organs	CVS - unspecified		
Dichloroethane, 1,1-	75-34-3	1.4E+02	C
Health Effects	CNS depres , irrit skin , kidney damage , liver damage , lung damage		
Target Organs	Kidneys, Liver		
Dichloroethane, 1,2-	107-06-2	1.8E-01	B2
Health Effects	carc , CNS depres , corn opac , CVS damage , derm , irrit eyes , kidney damage , liver damage , nau , vomit		
Target Organs	Liver		
Dichloroethylene, 1,1-	75-35-4	1.4E-02	C
Health Effects	carc , dizz , dysp , head , irrit eyes , irrit skin , irrit throat , kidney dist , liver dist , nau , pneu		
Target Organs	CNS - unspecified, Kidneys, Liver		
Dichloroethylene, 1,2-	540-59-0	1.9E+02	
Health Effects	CNS depres , irrit eyes , irrit resp sys		
Target Organs	Liver		
Dichloroethylene, cis-1,2-	156-59-2	1.9E+02	D

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Dichloroethylene, trans-	156-60-5	5.4E-01	
Dichlorofluoromethane	75-43-4	4.2E+00	
Health Effects	asphy , card arrest , card arrhy , liquid: frostbite		
Target Organs	Liver		
Dichlorophenoxy acetic acid, 2,4-	94-75-7	3.4E+00	
Health Effects	convuls , derm , hyporeflexia , in animals: kidney inj , in animals: liver inj , lass , musc twitch , stupor		
Dichloropropane, 1,2-	78-87-5	8.2E-03	B2
Health Effects	carc , dizz , drow , in animals: CNS depres , irrit eyes , irrit resp sys , irrit skin , kidney damage , liver damage		
Target Organs	Nasal - pharynx, Nose, Respiration - unspecified		
Dichloropropene, 1,3-	542-75-6	2.5E-02	B2
Health Effects	carc , dizz , eye burns , head , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit resp sys , irrit skin , lac , liver damage , skin burns		
Target Organs	Bronchi, Kidneys, Liver, Lungs, Nasal - pharynx, Nose, Respiration - unspecified		
Dichlorotetrafluoroethane	76-14-2	8.7E+02	
Health Effects	asphy , card arrest , card arrhy , irrit resp sys , liquid: frostbite		
Target Organs	CVS - unspecified		
Dichlorvos	62-73-7	1.9E-03	B2
Health Effects	aching eyes , anor , ataxia , card irreg , chest tight , convuls , cyan , diarr , dizz , head , irrit eyes , irrit skin , lar spasm , low BP , miosis , musc fasc , nau , para , rhin , salv , sweat , vomit , wheez		
Target Organs	Brain, Nervous system - unspecified		
Dicyclopentadiene	77-73-6	1.4E-02	IN
Health Effects	cough , head , in animals: kidney damage , in animals: lung damage , inco , irrit eyes , irrit nose , irrit skin , irrit throat , skin blisters , sneez		
Target Organs	Liver		
Dicyclopentadienyl iron	102-54-5	3.4E+00	
Health Effects	in animals: liver changes , in animals: RBC changes , in animals: testicular changes , possible irrit eyes , possible irrit resp sys , possible irrit skin		
Target Organs	Blood, Liver		
Dieldrin	60-57-1	1.0E-03	B2
Health Effects	carc , clonic convuls , coma , dizz , head , in animals: kidney damage , in animals: liver damage , mal , myoclonic limb jerks , nau , sweat , tonic convuls , vomit		
Target Organs	CNS - unspecified, Liver		
Diesel engine exhaust	Diesel	3.4E-03	LI
Health Effects	carc , irrit eyes , pulm func changes		
Target Organs	Lungs		
Diesel fuel marine	77650-28-3	3.4E+01	2B
Diesel fuels	68334-30-5	3.4E+01	3
Diethanolamine	111-42-2	2.4E-01	3
Health Effects	corn nec , cough , eye burns , irrit eyes , irrit nose , irrit skin , irrit throat , lac , skin burns , sneez		
Target Organs	Blood, Kidneys, Liver		
Diethyl ketone	96-22-0	2.4E+02	
Health Effects	cough , irrit eyes , irrit muc memb , irrit resp sys , irrit skin , sneez		

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Diethyl phthalate	84-66-2	1.7E+00	D
Health Effects	dizz , head , in animals: repro effects , irrit eyes , irrit nose , irrit skin , irrit throat , lac , lass in arms & legs , nau , numb in arms & legs , pain in arms & legs , possible polyneur dysfunc , possible vestibular dist , spasms in arms & legs		
Diethylamine	109-89-7	5.1E+00	
Health Effects	in animals: myocardial degeneration , irrit eyes , irrit resp sys , irrit skin , myocardial degeneration		
Diethylaminoethanol, 2-	100-37-8	3.3E+00	
Health Effects	irrit eyes , irrit resp sys , irrit skin , nau , vomit		
Target Organs	CNS - unspecified		
Diethylene glycol monobutyl ether	112-34-5	6.8E-04	D
Diethylene glycol monoethyl ether	111-90-0	2.1E-03	D
Diethylene triamine	111-40-0	1.4E+00	
Health Effects	cough , derm , dysp , eye nec , irrit eyes , irrit muc memb , irrit skin , irrit upper resp sys , pulm sens , skin nec , skin sens		
Difluorodibromomethane	75-61-6	2.9E+02	
Health Effects	CNS symptoms , in animals: irrit resp sys , liver damage		
Target Organs	CNS - unspecified, Liver		
Difluoroethane, 1,1-	75-37-6	2.7E+01	
Difluorotetrachloroethane, 1,2-	76-12-0	1.0E+02	
Health Effects	in animals: narco , in animals: conj , in animals: irrit eyes , in animals: irrit skin , in animals: pulm edema		
Difluorotetrachloroethane, 2,2-	76-11-9	2.0E+02	
Health Effects	CNS depres , drow , dysp , irrit eyes , irrit skin , pulm edema		
Diglycidyl ether	2238-07-5	1.8E-02	
Health Effects	carc , in animals: hemato sys effects , in animals: kidney damage , in animals: liver damage , in animals: lung damage , irrit eyes , irrit resp sys , irrit skin , repro effects , skin burns		
Diisobutyl ketone	108-83-8	5.0E+01	
Health Effects	derm , dizz , head , irrit eyes , irrit nose , irrit skin , irrit throat , kidney damage , liver damage		
Diisopropyl ether	108-20-3	2.7E+00	D
Health Effects	derm , in animals: dizz , in animals: drow , in animals: narco , in animals: uncon , irrit eyes , irrit nose , irrit skin , resp discomfort		
Target Organs	Liver		
Diisopropylamine	108-18-9	7.1E+00	
Health Effects	head , irrit eyes , irrit resp sys , irrit skin , nau , vis dist , vomit		
Target Organs	Eyes		
Dimethyl acetamide, N, N-	127-19-5	8.7E+00	
Health Effects	delusions , depres , drow , halu , irrit skin , jaun , liver damage		
Target Organs	Liver, Reproductive - unspecified by gender		
Dimethyl carbamoly chloride	79-44-7	7.5E-03	2A
Health Effects	carc , cough , dysp , eye burns , head , irrit eyes , irrit nose , irrit resp sys , irrit skin , irrit throat , larnygitis , liver inj , nau , skin burns , vomit , wheez		
Dimethyl disulfide	624-92-0		
Dimethyl phthalate	131-11-3	1.7E+00	D

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Health Effects	irrit eyes , irrit upper resp sys , stomach pain		
Dimethyl sulfate	77-78-1	4.5E-02	B2
Health Effects	analgesia , aphonia , carc , chest pain , conj , cyan , delirium , diarr , dizz , dysp , dysphagia , dysphonia , dysuria , eye burns , fever , head , hema , irrit eyes , irrit nose , periorb edema , photo , productive cough , prot , skin burns , vomit		
Dimethyl sulfide	75-18-3	1.3E+00	IN
Dimethylamine	124-40-3	3.2E+00	
Health Effects	conj , cough , derm , dysp , irrit nose , irrit throat , liquid: frostbite , pulm edema , sneez		
Dimethylaniline, N,N-	121-69-7	6.1E+00	3
Health Effects	anoxia symptoms: ataxia , anoxia symptoms: cyan , anoxia symptoms: dizz , anoxia symptoms: lass , anoxia symptoms: methemo		
Dimethylbenzidine, 3,3'-	119-93-7	4.2E+00	B2
Health Effects	carc , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit nose		
Target Organs	Blood, Kidneys, Liver		
Dimethylethoxysilane	14857-34-2	7.3E-01	
Dimethylformamide	68-12-2	4.8E-02	3
Health Effects	colic , derm , enlarged liver , face flush , high BP , in animals: heart damage , in animals: kidney damage , irrit eyes , irrit resp sys , irrit skin , liver damage , nau , vomit		
Target Organs	GI tract - unspecified, Liver		
Dimethylhydrazine, 1,1-	57-14-7	5.5E-06	B2
Health Effects	anoxia , carc , chest pain , choking , convuls , drow , dysp , dysp , head , irrit Skin, irrit Respiration - unspecified, irrit Throat, irrit Nervous system - unspecified, irrit eyes , irrit skin , liver inj , nau , nau , tight Respiration - unspecified,		
Target Organs	Liver, Muscles (non-heart), Whole body		
Dimethypropyl acetate, 1,1-	625-16-1	9.1E+01	
Dinitolmide	148-01-6	2.4E-01	
Health Effects	contact eczema , in animals: liver changes , in animals: methemo changes		
Dinitrobenzene (mixed isomers)	0-323*	2.5E-01	
Dinitrobenzene, 1,2-	528-29-0	2.5E-01	D
Health Effects	anemia , anoxia , bad taste , burning mouth , central scotomas , cyan , dry throat , liver damage , thirst , vis dist , yellowing eyes , yellowing hair , yellowing skin		
Dinitrobenzene, 1,3-	99-65-0	2.5E-01	D
Health Effects	anemia , anoxia , bad taste , burning mouth , central scotomas , cyan , dry throat , liver damage , thirst , vis dist , yellowing eyes , yellowing hair , yellowing skin		
Dinitrobenzene, 1,4-	100-25-4	2.5E-01	D
Health Effects	anemia , anoxia , bad taste , burning mouth , central scotomas , cyan , dry throat , liver damage , thirst , vis dist , yellowing eyes , yellowing hair , yellowing skin		
Dinitro-o-cresol, 4,6-	534-52-1	4.9E-02	D
Health Effects	coma , cough , excess thirst , fever , head , hyperpnea , lass , profuse sweat , sense of well being , short breath , tacar		
Dinitrotoluene	25321-14-6	4.9E-02	B2
Health Effects	anemia , anoxia , carc , cyan , jaun , repro effects		

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Target Organs	CVS - unspecified, Reproductive - unspecified by gender		
Dioxane, 1,4-	123-91-1	2.5E+00	B2
Health Effects	carc , drow , head , irrit eyes , irrit nose , irrit skin , irrit throat , kidney failure , liver damage , nau , vomit		
Target Organs	Eyes, Kidneys, Liver		
Dioxathion	78-34-2	2.4E-02	
Health Effects	abdom cramps , chest tight , conf , diarr , dizz , drow , head , irrit eyes , irrit skin , lass , miosis , musc fasc , nau , rhin , salv , vomit		
Dioxolane	646-06-0	1.5E+01	
Diphenylamine	122-39-4	2.4E+00	
Health Effects	bladder inj , cough , eczema , heart rate , hema , hypertension , in animals: terato effects , incr BP , irrit eyes , irrit muc memb , irrit skin , methemo , prot , sneez , tacar		
Target Organs	Blood, Kidneys, Liver		
Diphenylhydrazine, 1,2-	122-66-7	2.2E-02	B2
Dipropyl ketone	123-19-3	8.0E+01	
Health Effects	CNS depres , decr breath , dizz , drow , in animals: liver inj , irrit eyes , irrit skin , narco		
Target Organs	CNS - unspecified, Kidneys, Liver		
Dipropylene glycol monomethyl ether	34590-94-8	2.1E+02	
Health Effects	dizz , head , irrit eyes , irrit nose , irrit throat , lass		
Target Organs	CNS - unspecified		
Diquat	2764-72-9	2.4E-02	
Diquat	85-00-7	3.4E-02	
Health Effects	chest pain , convuls , cough , delayed healing of wounds , diarr , dysp , epis , irrit eyes , irrit muc memb , irrit resp sys , irrit skin , kidney , liver inj , mal , nau , pulm edema , rhin , skin burns , tremor , vomit		
Target Organs	Eyes		
Diquat dibromide monohydrate	6385-62-2	2.4E-02	
Disulfiram	97-77-8	4.9E-01	3
Health Effects	dizz , head , irrit eyes , irrit resp sys , irrit skin , lass , liver damage , metallic taste , peri neur , restless , sens derm , tremor		
Target Organs	CVS - unspecified, GI tract - unspecified		
Disulfoton	298-04-4	1.4E-04	
Health Effects	abdom cramps , blurred vision , card irreg , chest tight , diarr , dizz , dysp , eye burns , head , irrit eyes , irrit skin , lass , miosis , musc fasc , nau , rhin , salv , skin burns , vomit		
Target Organs	Nervous system - unspecified		
Diuron	330-54-1	3.4E+00	
Health Effects	in animals: anemia , in animals: methemo , irrit eyes , irrit nose , irrit skin , irrit throat		
Target Organs	Blood		
Divinyl benzene	1321-74-0	1.8E+01	
Health Effects	in animals: CNS depres , irrit eyes , irrit resp sys , irrit skin , skin burns		
Dodecyl mercaptan	112-55-0	2.8E-01	
Health Effects	abdom pain , conf , cough , cyan , dizz , dysp , irrit eyes , irrit resp sys , irrit skin , lass , nau , skin sens		
EMPA	1832-53-7	2.1E-02	
Endosulfan	115-29-7	2.4E-02	
Health Effects	agitation , conf , convuls , decr testis weight , dry mouth , flushing , head , in animals: kidney inj , in animals: liver inj , irrit skin , nau , tremor		

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Target Organs	CNS - unspecified, Liver		
Endrin	72-20-8	2.4E-02	D
Health Effects	abdom discomfort , aggressiveness , anor , conf , dizz , drow , epilep convuls , head , in animals: liver damage , insom , lass , nau , stupor , vomit		
Target Organs	CNS - unspecified, Liver		
Enflurane	13838-16-9	1.4E+02	
Health Effects	analgesia , anes , CNS depres , convuls , irrit eyes , resp depres		
Target Organs	CNS - unspecified, CVS - unspecified		
Epichlorohydrin	106-89-8	6.8E-03	B2
Health Effects	abdom pain , carc , cough , cyan , irrit eyes , irrit skin with deep pain , nau , repro effects , resp distress , vomit		
Target Organs	Kidneys, Liver, Nasal - pharynx, Nose		
Epoxybutane, 1,2-	106-88-7	1.4E-02	2B
Ethanolamine	141-43-5	1.2E+00	
Health Effects	drow , irrit eyes , irrit resp sys , irrit skin		
Ethion	563-12-2	1.2E-02	
Health Effects	abdom cramps , blurred vision , card irreg , chest tight , diarr , dizz , dysp , head , irrit eyes , irrit skin , lass , miosis , musc fasc , nau , rhin , salv , vomit		
Ethoxyethanol, 2-	110-80-5	1.4E+00	
Health Effects	in animals: blood changes , in animals: irrit eyes , in animals: irrit resp sys , in animals: kidney damage , in animals: liver damage , in animals: lung damage , in animals: repro effects , in animals: terato effects		
Target Organs	Blood, Kidneys, RBC, Reproductive - unspecified by gender, Testes		
Ethoxyethyl acetate, 2-	111-15-9	2.1E-01	
Health Effects	in animals: repro effects , in animals: terato effects , irrit eyes , irrit nose , kidney damage , para , vomit		
Target Organs	Reproductive - unspecified by gender		
Ethyl acetate	141-78-6	4.9E+02	
Health Effects	derm , irrit eyes , irrit nose , irrit skin , irrit throat , narco		
Ethyl acrylate	140-88-5	7.0E+00	B2
Health Effects	carc , irrit eyes , irrit resp sys , irrit skin		
Target Organs	Respiration - unspecified		
Ethyl amyl ketone	541-85-5	1.3E+01	
Health Effects	coma , derm , head , irrit eyes , irrit muc memb , irrit skin , narco		
Ethyl bromide	74-96-4	5.5E+00	3
Health Effects	card arrest , card arrhy , CNS depres , irrit eyes , irrit resp sys , irrit skin , kidney disease , liver disease , pulm edema		
Target Organs	CVS - unspecified, Kidneys, Liver		
Ethyl butyl ketone	106-35-4	8.0E+01	
Health Effects	coma , derm , head , irrit eyes , irrit muc memb , irrit skin , narco		
Ethyl chloride	75-00-3	2.7E+00	3
Health Effects	abdom cramps , card arrest , card arrhy , inco , inebri , kidney damage , liver damage		
Target Organs	CNS - unspecified, Developmental - generic, Liver, Reproductive - unspecified by gender		
Ethyl cyanoacrylate	7085-85-0	3.5E-01	
Ethyl ether	60-29-7	2.1E+00	
Health Effects	dizz , drow , excited , head , irrit eyes , irrit skin , irrit upper resp sys , narco , nau , vomit		

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Ethyl formate	109-94-4	1.0E+02	
Health Effects	in animals: narco , irrit eyes , irrit upper resp sys		
Ethyl mercaptan	75-08-1	4.4E-01	
Health Effects	cyan , head , in animals: inco , in animals: lass , irrit muc memb , kidney damage , liver damage , narco , nau		
Target Organs	CNS - unspecified		
Ethyl p-nitrophenyl phenylphosphorothioate	2104-64-5	2.4E-02	
Health Effects	abdom cramps , anor , card irreg , chest tight , convuls , cyan , diarr , head , irrit eyes , irrit skin , lac , lar spasm , low BP , miosis , nau , para , rhin , salv , wheez		
Ethyl tert-butyl ether	637-92-3	7.2E+00	
Ethylamine	75-04-7	3.2E+00	
Health Effects	derm , irrit eyes , irrit resp sys , irrit skin , skin burns		
Ethylbenzene	100-41-4	2.1E+00	D
Health Effects	coma , derm , head , irrit eyes , irrit muc memb , irrit skin , narco		
Target Organs	Bone, CNS - unspecified, Developmental - generic, Reproductive - unspecified by gender		
Ethylene	74-85-1	5.6E+01	3
Ethylene diamine	107-15-3	8.4E+00	D
Health Effects	asthma , asthma , cough , irrit Nose, irrit nose , irrit resp sys , kidney damage , liver damage , phlegm , resp , sens derm , wheez		
Target Organs	Kidneys, Lungs, Whole body		
Ethylene glycol dinitrate	628-96-6	7.6E-02	
Health Effects	abdom pain , angina , CNS depres , delirium , dizz , flush , hypotension , in animals: anemia , in animals: kidney damage , in animals: liver damage , irrit skin , methemo , nau , palp , throb head , vomit		
Target Organs	CVS - unspecified		
Ethylene glycol monobutyl ether	111-76-2	9.9E+00	C
Health Effects	CNS depres , head , hema , hemolysis , irrit eyes , irrit nose , irrit skin , irrit throat , vomit		
Target Organs	Blood, CNS - unspecified, RBC		
Ethylene oxide	75-21-8	4.8E-02	B1
Health Effects	cyan , diarr , drow , dysp , EKG abnor , eye burns (liq or high vap conc) , head , in animals: carc , in animals: convuls , in animals: kidney damage , in animals: liver damage , inco , irrit eyes , irrit nose , irrit skin , irrit throat , lass , liquid:		
Target Organs	Blood, Brain, Kidneys, Reproductive - unspecified by gender		
Ethyleneimine	151-56-4	3.0E-02	2B
Health Effects	carc , dizz , eye burns , head , irrit eyes , irrit nose , irrit skin , irrit throat , kidney damage , liver damage , nau , pulm edema , skin sens , vomit		
Ethylhexanoic acid	149-57-5	1.2E+00	
Ethylpropyl ethanoate, 1-	620-11-1	9.1E+01	
Fenamiphos	22224-92-6	1.2E-02	
Health Effects	abdom cramps , blurred vision , card irreg , chest tight , diarr , dizz , dysp , head , lass , miosis , musc fasc , nau , rhin , salv , vomit		
Fensulfothion	115-90-2	2.4E-03	
Health Effects	abdom cramps , blurred vision , card irreg , chest tight , diarr , dizz , dysp , head , irrit skin , lass , miosis , musc fasc , nau , rhin , salv , vomit		

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Fenthion	55-38-9	1.2E-02	
Health Effects	abdom cramps , blurred vision , card irreg , chest tight , diarr , dizz , dysp , head , lass , miosis , musc fasc , nau , rhin , salv , vomit		
Ferbam	14484-64-1	1.7E+00	3
Health Effects	derm , GI dist , irrit eyes , irrit resp tract		
Ferric oxide	1309-37-1	1.2E+00	3
Health Effects	benign pneumoconiosis with X-ray shadows indistinguishable from fibrotic pneumoconiosis (siderosis) , irrit eyes , irrit resp sys , irrit skin		
Target Organs	Lungs, Respiration - unspecified		
Ferrovanadium	12604-58-9	3.4E-01	
Health Effects	in animals: bron , in animals: pneu , irrit eyes , irrit resp sys		
Target Organs	Respiration - unspecified		
Fluoride	16984-48-8	8.6E-01	3
Fluorine	7782-41-4	1.1E-02	
Health Effects	eye burns , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit nose , irrit resp sys , lar spasm , pulm edema , skin burns , wheez		
Target Organs	Respiration - unspecified		
Fonofos	944-22-9	2.4E-03	
Health Effects	abdom cramps , blurred vision , card irreg , chest tight , diarr , dizz , dysp , head , lass , miosis , musc fasc , nau , rhin , salv , vomit		
Formaldehyde	50-00-0	2.5E-02	B1
Health Effects	carc , cough , derm , irrit eyes , irrit nose , irrit resp sys , irrit throat , lac , wheez		
Target Organs	Nasal - pharynx, Respiration - unspecified, Skin		
Formamide	75-12-7	6.3E+00	
Health Effects	acidosis , drow , in animals: repro effects , irrit eyes , irrit muc memb , irrit skin , lass , nau , skin eruptions		
Target Organs	Liver		
Formic acid	64-18-6	3.2E+00	D
Health Effects	cough , derm , dysp , irrit eyes , irrit skin , irrit throat , lac , nau , rhin , skin burns		
Target Organs	Nasal-pharynx		
Fuel oil no. 2	68476-30-2	1.4E-02	
Fuel oil no. 2-D	68476-34-6	3.4E+01	
Fuel oil no. 4	68476-31-3	3.4E+01	
Furfural	98-01-1	3.4E-01	3
Health Effects	derm , head , irrit eyes , irrit skin , irrit upper resp sys		
Furfuryl alcohol	98-00-0	1.4E+01	
Health Effects	body temperature depres , derm , diarr , diuresis , dizz , irrit eyes , irrit muc memb , nau , resp depres , vomit		
Gallium arsenide	1303-00-0	7.3E-05	
Germanium tetrahydride	7782-65-2	1.5E-01	
Health Effects	dizz , dysp , fainting , head , hemolytic effects , kidney inj , mal , nau , vomit		
Target Organs	Blood		
Glycerin	56-81-5	3.4E+00	
Health Effects	head , irrit eyes , irrit resp sys , irrit skin , kidney inj , nau , vomit		

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Glycidaldehyde	765-34-4	6.8E-03	B2
Glycidol	556-52-5	2.1E+00	2A
Health Effects	irrit eyes , irrit nose , irrit skin , irrit throat , narco		
Glyoxal	107-22-2	3.4E-02	
Graphite	7782-42-5	4.9E-01	
Health Effects	black sputum , cough , decr pulm func , dysp , lung fib		
Target Organs	Lungs		
Gypsum	13397-24-5	2.4E+00	
Health Effects	cough , irrit eyes , irrit muc memb , irrit skin , irrit upper resp sys , rhin , sneez		
Hafnium	7440-58-6	1.7E-01	
Health Effects	in animals: irrit eyes , in animals: irrit muc memb , in animals: irrit skin , in animals: liver damage		
Target Organs	Liver		
Halothane	151-67-7	9.9E+01	
Health Effects	analgesia , anes , card arrhy , conf , decr audio-visual performance , dizz , drow , in animals: repro effects , irrit eyes , irrit resp sys , irrit skin , kidney damage , liver damage , nau		
Target Organs	CNS - unspecified, CVS - unspecified, Liver, Reproductive - unspecified by gender		
HCFC-142b	75-68-3	3.4E+01	
HD	505-60-2	1.4E-05	1
Health Effects	blepharospasm , blisters Skin, burn Skin, cell damage/death Skin, conj Eyes, conjunctivitis Eyes, erythema Skin, eye reddening Eyes, head , irrit Eyes, itching rash Skin, lac Eyes, lar Larynx, photo Eyes, pulm Lungs, rhinitis , swell , swell Eyes, swellin		
Target Organs	Eyes, Whole body		
Heptachlor	76-44-8	3.7E-03	B2
Health Effects	in animals: carc , in animals: convuls , in animals: liver damage , in animals: tremor		
Target Organs	Blood, CNS - unspecified, Liver		
Heptachlor epoxide	1024-57-3	1.8E-03	B2
Heptachlorodibenzofuran, 1,2,3,4,6,7,8-	67562-39-4		3
Heptachlorodibenzofuran, 1,2,3,4,7,8,9-	55673-89-7		3
Heptachlorodibenzo-p-dioxin, 1,2,3,4,6,7,8-	35822-46-9		3
Heptane, n-	142-82-5	5.6E+02	D
Health Effects	chemical pneu (aspir liquid) , derm , dizz , inco , loss of appetite , nau , stupor , uncon		
Hexachlorobenzene	118-74-1	4.9E-04	B2
Hexachlorobutadiene	87-68-3	7.3E-02	C
Health Effects	in animals: carc , in animals: irrit eyes , in animals: irrit resp sys , in animals: irrit skin , in animals: kidney damage		
Target Organs	Kidneys		
Hexachlorocyclohexane, alpha-	319-84-6	2.7E-03	B2
Hexachlorocyclohexane, beta-	319-85-7	9.0E-03	C

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Hexachlorocyclohexane, technical	608-73-1	9.4E-03	B2
Hexachlorocyclopentadiene	77-47-4	7.6E-02	E
Health Effects	cough , diarr , dysp , eye burns , in animals: kidney inj , in animals: liver inj , irrit eyes , irrit resp sys , irrit skin , lac , nau , pulm edema , salv , skin burns , sneez , vomit		
Target Organs	Nasal - pharynx, Nose, Respiration - unspecified		
Hexachlorodibenzodioxin, 1,2,3,4,7,8-	39227-28-6		
Hexachlorodibenzofuran, 1,2,3,4,7,8-	70648-26-9		3
Hexachlorodibenzofuran, 1,2,3,6,7,8-	57117-44-9		3
Hexachlorodibenzofuran, 1,2,3,7,8,9-	72918-21-9		3
Hexachlorodibenzofuran, 2,3,4,6,7,8-	60851-34-5		3
Hexachlorodibenzo-p-dioxin, 1,2,3,6,7,8-	57653-85-7		3
Hexachloroethane	67-72-1	1.2E+00	C
Health Effects	in animals: carc , in animals: kidney damage , irrit eyes , irrit muc memb , irrit skin		
Target Organs	Kidneys, Liver, Nervous system - unspecified		
Hexachloronaphthalene	1335-87-1	4.9E-02	
Health Effects	acne-form derm , coma , conf , jaun , nau		
Target Organs	Liver, Skin		
Hexafluoroacetone	684-16-2	1.7E-01	
Health Effects	in animals: kidney inj , in animals: repro effects , in animals: terato effects , irrit eyes , irrit muc memb , irrit resp sys , irrit skin , liquid: frostbite , pulm edema		
Target Organs	Kidneys, Reproductive - unspecified by gender		
Hexafluoropropylene	116-15-4	1.5E-01	
Hexamethylene diamine	124-09-4	8.1E-01	
Hexamethylene diisocyanate	822-06-0	1.4E-04	
Health Effects	asthma , bron , corn damage , cough , dysp , irrit eyes , irrit resp sys , irrit skin , pulm edema , skin blisters , wheez		
Target Organs	Nose, Respiration - unspecified		
Hexane, commercial	110-54-3	1.4E+00	
Health Effects	chemical pneu (aspir liquid) , derm , dizz , head , irrit eyes , irrit nose , nau , peri neur: musc weak , peri neur: numb extremities		
Target Organs	CNS - unspecified, Nervous system - unspecified, Whole body		
Hexane, other isomers	Hexane isom	6.0E+02	
Health Effects	chemical pneu (aspir liquid) , derm , dizz , head , irrit eyes , irrit resp sys , irrit skin , nau		
Target Organs	CNS - unspecified		
Hexanone, 2-	591-78-6	2.1E-01	
Health Effects	derm , drow , head , irrit eyes , irrit nose , peri neur: lass , peri neur: pares		
Hexene	592-41-6	4.2E+01	
Hexyl acetate, sec-	108-84-9	1.0E+02	
Health Effects	head , in animals: narco , irrit eyes , irrit nose , irrit skin , irrit throat		
HFC-134A	811-97-2	5.5E+01	

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Hydrazine	302-01-2	6.2E-05	B2
Health Effects	carc , convuls , derm , dizz , eye burns , in animals: bron , in animals: pulm edema , irrit eyes , irrit nose , irrit skin , irrit throat , kidney damage , liver damage , nau , skin burns , temporary blindness		
Target Organs	Liver, Nasal - pharynx, Nose		
Hydrogen chloride	7647-01-0	1.4E-02	3
Health Effects	choking , cough , derm , in animals: lar spasm , irrit Throat, irrit larynx , irrit nose , irrit throat , liquid: frostbite , pulm edema , solution: eye burns , solution: skin burns		
Target Organs	Larynx, Lungs, Nasal-pharynx, None, Nose, Trachea, Whole body		
Hydrogen cyanide	74-90-8	6.2E-03	
Health Effects	anor , asphy , blood changes , conf , dizz , ftg , head , head , incr rate and depth of respiration or respiration slow and gasping , irrit Eyes, lass , nau , nau , numb , thyroid changes , tremors , vertigo , vomit , vomit , weak		
Target Organs	CNS - unspecified, Lungs, Thyroid, Whole body		
Hydrogen fluoride	7664-39-3	3.3E-02	
Health Effects	bone changes , bron , cough Lungs, eye burns , irrit Throat, irrit Eyes, irrit Nose, irrit Respiration - unspecified, irrit Skin, irrit eyes , irrit nose , irrit skin , irrit throat , pulm edema , rhinitis , skin burns , tight Lungs, wheez Lungs		
Target Organs	Eyes, Lungs, Nasal-pharynx, Respiration - unspecified, Whole body		
Hydrogen peroxide	7722-84-1	4.8E-01	3
Health Effects	bleaching hair , corn ulcer , eryt , irrit eyes , irrit nose , irrit throat , vesic skin		
Target Organs	CNS - unspecified, Lungs		
Hydrogen selenide	7783-07-5	5.7E-02	
Health Effects	diarr , dizz , garlic breath , in animals: pneu , irrit eyes , irrit nose , irrit throat , lass , liquid: frostbite , liver damage , metallic taste , nau , vomit		
Target Organs	GI tract - unspecified		
Hydrogen sulfide	7783-06-4	1.4E-02	IN
Health Effects	apnea , coma , conj , convuls , corn vesic , dizz , eye pain , GI dist , head , insom , irrit eyes , irrit resp sys , irrity , lac , lass , liquid: frostbite , photo		
Target Organs	Nasal - pharynx, Nose, Respiration - unspecified		
Hydrogenated terphenyls	61788-32-7	1.7E+00	
Health Effects	hemato damage , irrit eyes , irrit resp sys , irrit skin , kidney damage , liver damage		
Target Organs	Liver		
Hydroquinone	123-31-9	2.4E-01	C
Health Effects	CNS excitement , collapse , colored urine , delirium , derm , dizz , irrit eyes: conj , irrit skin , kera , musc twitch , nau , rapid breath , sens , suffocation		
Indene	95-13-6	5.8E+00	
Health Effects	in animals: chemical pneu (aspir liquid) , in animals: derm , in animals: irrit eyes , in animals: irrit muc memb , in animals: irrit skin , In animals: kidney inj , in animals: liver inj , in animals: skin sens , in animals: spleen inj		
Target Organs	Kidneys, Liver		
Indium and compounds	7440-74-6	2.4E-02	
Health Effects	irrit eyes , irrit resp sys , irrit skin , possible blood effects , possible heart effects , possible kidney effects , possible liver effects , pulm edema		
Target Organs	Bone, GI tract -unspecified, Respiration - unspecified		
Iodine	7553-56-2	2.5E-02	
Health Effects	chest tight , cutaneous hypersensitivity , head , irrit eyes , irrit nose , irrit skin , lac , rash , skin burns		
Iodoform	75-47-8	2.4E+00	
Health Effects	CNS depres , dizz , dysp , heart damage , inco , irrit eyes , irrit skin , kidney damage , liver damage , nau , vis		

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
	dist		
Target Organs	CNS - unspecified, CVS - unspecified, Kidneys, Liver		
Iron pentacarbonyl	13463-40-6	2.0E-01	
Health Effects	cough , cyan , degenerative changes in CNS , dizz , dysp , fever , head , irrit eyes , irrit muc memb , irrit resp sys , kidney inj , liver inj , lung inj , nau , vomit		
Target Organs	CNS - unspecified, Whole body		
Iron salts, soluble	Fe salts	3.4E-01	
Health Effects	abdom pain , diarr , irrit eyes , irrit muc memb , irrit skin , possible liver damage , vomit		
Isoamyl acetate	123-92-2	9.1E+01	
Health Effects	derm , in animals: narco , irrit eyes , irrit nose , irrit skin , irrit throat		
Isoamyl alcohol	123-51-3	1.2E+02	
Health Effects	cough , diarr , dizz , dysp , head , in animals: narco , irrit eyes , irrit nose , irrit skin , irrit throat , nau , skin cracking , vomit		
Isobutyl acetate	110-19-0	2.4E+02	
Health Effects	anes , drow , head , in animals: narco , irrit eyes , irrit skin , irrit upper resp sys		
Isobutyl alcohol	78-83-1	5.2E+01	
Health Effects	drow , head , in animals: narco , irrit eyes , irrit skin , irrit throat , skin cracking		
Target Organs	Eyes		
Isooctyl alcohol	26952-21-6	9.1E+01	
Health Effects	eye burns , irrit eyes , irrit nose , irrit skin , irrit throat , skin burns		
Isopentane	78-78-4	6.1E+02	
Isophorone diisocyanate	4098-71-9	1.1E-02	
Health Effects	asthma , bron , chest tight , cough , dysp , irrit eyes , irrit resp sys , irrit skin , possible resp sens , pulm edema , sore throat , wheez		
Target Organs	Skin		
Isopropanol	67-63-0	2.5E+00	3
Health Effects	dizz , drow , dry cracking skin , head , in animals: narco , irrit eyes , irrit nose , irrit throat		
Target Organs	CNS - unspecified		
Isopropoxyethanol	109-59-1	2.6E+01	
Health Effects	in animals: anemia , in animals: hema , in animals: irrit eyes , in animals: irrit skin , in animals: pulm edema		
Target Organs	Blood		
Isopropyl acetate	108-21-4	1.4E+02	
Health Effects	derm , in animals: narco , irrit eyes , irrit nose , irrit skin		
Target Organs	Eyes		
Isopropyl glycidyl ether	4016-14-2	8.1E+01	
Health Effects	irrit eyes , irrit skin , irrit upper resp sys , possible hemato effects , possible repro effects , skin sens		
Target Organs	Skin		
Isopropylamine	75-31-0	4.1E+00	
Health Effects	derm , eye burns , irrit eyes , irrit nose , irrit skin , irrit throat , pulm edema , skin burns , vis dist		
Isopropylaniline, N-	768-52-5	2.7E+00	
Health Effects	ataxia , cyan , dizz , dysp on effort , head , irrit eyes , irrit skin , lass , methemo , tacar		
Target Organs	Blood		
JP-4 jet fuel	50815-00-4	6.2E+00	3

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Kaolin	1332-58-7	4.9E-01	
Health Effects	chronic pulm fib , stomach granuloma		
Target Organs	Lungs		
Kerosene	8008-20-6	6.8E-03	
Health Effects	burning sensation in chest , chemical pneu (aspir liquid) , conf , derm , diarr , drow , head , inco , irrit eyes , irrit nose , irrit skin , irrit throat , lass , nau , restless , vomit		
Target Organs	CNS - unspecified, Liver, Skin		
Kerosene, hydrodesulfurized	64742-81-0	4.9E+01	
Ketene	463-51-4		
Ketene	463-51-4	2.9E-01	
Health Effects	irrit eyes , irrit nose , irrit resp sys , irrit skin , irrit throat , pulm edema		
Target Organs	Lungs		
Lead and compounds (inorganic)	7439-92-1	1.2E-02	B2
Health Effects	abdom pain , anemia , anor , colic , constip , encephalopathy , facial pallor , gingival lead line , hypotension , insom , irrit eyes , kidney disease , lass , low weight , malnut , para ankles , para wrist , tremor		
Target Organs	Blood, CNS - unspecified, Kidneys, Reproductive - unspecified by gender		
Lead chromate	7758-97-6	2.9E-03	
Lewisite oxide	3088-37-7	3.4E-01	
Lindane	58-89-9	1.2E-01	B2
Health Effects	aplastic anemia , clonic convuls , cyan , head , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit nose , irrit skin , irrit throat , musc spasm , nau , resp difficulty		
Target Organs	CNS - unspecified, Liver		
Lithium hydride	7580-67-8	8.6E-03	
Health Effects	blurred vision , esophagus burns (if ingested) , eye burns , irrit eyes , irrit skin , mental conf , mouth burns (if ingested) , musc twitches , nau , skin burns		
Magnesium oxide	1309-48-4	3.4E+00	
Health Effects	irrit eyes , irrit nose , metal fume fever: chest pain , metal fume fever: cough , metal fume fever: flu-like fever		
Malathion	121-75-5	1.4E-02	3
Health Effects	abdom cramps , aching eyes , anor , ataxia , blurred vision , chest tight , conf , diarr , dizz , head , irrit eyes , irrit skin , lac , lar spasm , miosis , nau , rhin , salv , vomit , wheez		
Target Organs	Nervous system - unspecified, Respiration - unspecified		
Manganese	7439-96-5	3.4E-03	D
Health Effects	asthenia , insom , kidney damage , lass , low-back pain , mal , mental conf , metal fume fever: chest tight , metal fume fever: cough , metal fume fever: dry throat , metal fume fever: dysp , metal fume fever: flu-like fever , metal fume fever: rales , Pa		
Target Organs	CNS - unspecified, Lungs, Nervous system - unspecified, Reproductive - unspecified by gender		
Manganese cyclopentadienyl tricarbonyl	12079-65-1	2.4E-02	
Health Effects	CNS changes , convuls , decr resistance to infection , in animals: irrit skin , kidney changes , pulm edema , resp sys changes		
Target Organs	CNS - unspecified		
Mercury, alkyl compounds	Hg alkyl	2.4E-03	
Health Effects	ataxia , constip , diarr , dizz , dysarthria , emotional dist , hearing dist , jerking limbs , kidney inj , lac , nau , pares , possible terato effects , salv , skin burns , spasticity , vis dist , vomit		
Target Organs	CNS - unspecified		
Mercury, aryl compounds	Hg aryl	2.4E-02	

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Mercury, elemental	7439-97-6	2.1E-04	C
Health Effects	anor , bron , chest pain , cough , dysp , GI dist , head , indecision , insom , irrit eyes , irrit skin , irrity , lass , low weight , pneu , prot , salv , stomatitis , tremor		
Target Organs	CNS - unspecified, Kidneys, Nervous system - unspecified, Reproductive - unspecified by gender		
Mesityl oxide	141-79-7	2.1E+01	
Health Effects	CNS effects , coma , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit muc memb , irrit skin , narco		
Target Organs	Kidneys, Liver		
Methacrylic acid	79-41-4	2.4E+01	
Health Effects	eye burns , irrit eyes , irrit muc memb , irrit skin , skin burns		
Methacrylonitrile	126-98-7	4.8E-03	
Health Effects	in animals: convuls , in animals: loss of motor control in hind limbs , irrit eyes , irrit skin , lac		
Target Organs	CNS - unspecified		
Methane	74-82-8	1.6E+02	
Methanol	67-56-1	1.3E+01	
Health Effects	derm , dizz , drow , head , irrit eyes , irrit skin , irrit upper resp sys , nau , optic nerve damage (blindness) , vis dist , vomit		
Target Organs	CNS - unspecified, Eyes		
Methomyl	16752-77-5	6.1E-01	
Health Effects	abdom cramps , blurred vision , dysp , irrit eyes , kidney damage , lass , liver damage , miosis , musc twitch , nau , salv , vomit		
Methoxychlor	72-43-5	2.4E+00	D
Health Effects	in animals: carc , in animals: convuls , in animals: fasc , in animals: kidney damage , in animals: liver damage , in animals: trembling		
Target Organs	CNS - unspecified, Liver		
Methoxyethanol, 2-	109-86-4	7.6E-02	
Health Effects	anemic pallor , ataxia , drow , head , in animals: repro effects , in animals: terato effects , irrit eyes , irrit nose , irrit throat , lass , tremor		
Target Organs	Blood, Reproductive - unspecified by gender, Testes		
Methoxyethyl acetate, 2-	110-49-6	1.2E-01	
Health Effects	brain damage , in animals: narco , irrit eyes , irrit nose , irrit throat , kidney damage , repro effects , terato effects		
Target Organs	Blood, Reproductive - unspecified by gender		
Methoxyphenol, 4-	150-76-5	1.2E+00	
Health Effects	CNS depres , eye burns , irrit eyes , irrit nose , irrit skin , irrit throat , irrit upper resp sys , skin burns		
Target Organs	Eyes		
Methyl 2-cyanoacrylate	137-05-3	3.1E-01	
Health Effects	blurred vision , irrit eyes , irrit nose , irrit skin , lac , rhinitis		
Target Organs	Skin		
Methyl acetate	79-20-9	2.1E+02	
Health Effects	chest tight , drow , head , in animals: narco , irrit eyes , irrit nose , irrit skin , irrit throat , optic nerve atrophy		
Methyl acetylene	74-99-7	4.0E+02	
Health Effects	anes , hyperexcitability , irrit resp sys , liquid: frostbite , tremor		
Methyl acetylene-propadiene mixture	59355-75-8	4.0E+02	
Health Effects	anes , conf , excitement , irrit resp sys , liquid: frostbite		

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Methyl acrylate	96-33-3	2.4E+00	D
Health Effects	irrit eyes , irrit skin , irrit upper resp sys		
Methyl aniline, N-	100-61-8	5.4E-01	
Health Effects	cyan , dizz , dysp , head , kidney damage , lass , liver damage , methemo , pulm edema		
Target Organs	Blood		
Methyl bromide	74-83-9	6.8E-02	D
Health Effects	carc , convuls , dizz , dysp , hand tremor , head , inco , irrit eyes , irrit resp sys , irrit skin , liquid: frostbite , mal , musc weak , nau , skin vesic , vis dist , vomit		
Target Organs	Nervous system - unspecified, Nose		
Methyl chloride	74-87-3	6.2E-01	D
Health Effects	carc , coma , convuls , dizz , kidney damage , liquid: frostbite , liver damage , nau , repro effects , slurred speech , stagger , terato effects , vis dist , vomit		
Target Organs	Brain, CNS - unspecified, Kidneys, Liver, Nervous system - unspecified, Reproductive - unspecified by gender		
Methyl cyclopentadienyl manganese tricarbonyl	12108-13-3	4.9E-02	
Health Effects	dizz , head , in animals: kidney inj , in animals: lass , in animals: liver inj , in animals: severe clonic spasms , in animals: slow respiration , in animals: tremor , irrit eyes , nau		
Target Organs	CNS - unspecified, Kidneys, Liver		
Methyl demeton	8022-00-2	1.2E-02	
Health Effects	aching eyes , dizz , head , irrit eyes , irrit skin , nau , rhin , vomit		
Methyl ethyl ketone	78-93-3	6.8E-01	IN
Health Effects	derm , dizz , head , irrit eyes , irrit nose , irrit skin , vomit		
Target Organs	CNS - unspecified, Conceptuses/Fetuses, Developmental - generic		
Methyl formate	107-31-3	8.4E+01	
Health Effects	chest tight , CNS depres , dysp , in animals: narco , in animals: pulm edema , irrit eyes , irrit nose , vis dist		
Target Organs	Lungs		
Methyl hydrazine	60-34-4	6.5E-03	B2
Health Effects	anoxia , ataxia , carc , convuls , cyan , diarr , irrit eyes , irrit resp sys , irrit skin , tremor , vomit		
Target Organs	Liver		
Methyl iodide	74-88-4	4.0E+00	3
Health Effects	ataxia , carc , derm , dizz , drow , irrit eyes , irrit resp sys , irrit skin , nau , slurred speech , vomit		
Target Organs	CNS - unspecified		
Methyl isoamyl ketone	110-12-3	8.0E+01	
Health Effects	coma , derm , head , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit muc memb , irrit skin , narco		
Target Organs	Kidneys, Liver		
Methyl isobutyl carbinol	108-11-2	3.6E+01	
Health Effects	derm , drow , head , in animals: narco , irrit eyes , irrit skin		
Methyl isobutyl ketone	108-10-1	5.5E-01	IN
Health Effects	coma , derm , head , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit muc memb , irrit skin , narco		
Target Organs	Bone, Developmental - generic, Kidneys		
Methyl isocyanate	624-83-9	1.6E-02	
Health Effects	asthma , chest pain , cough , dysp , eye damage , in animals: pulm edema , irrit upper respiratory tract, irrit		

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
	Eyes, irrit Nasal-pharynx, irrit eyes , irrit nose , irrit skin , irrit throat , lac , pulm secretions , resp sens , skin damage		
Target Organs	Developmental - generic, Heart, Lungs		
Methyl isopropyl ketone	563-80-4	2.4E+02	
Health Effects	cough , irrit eyes , irrit muc memb , irrit resp sys , irrit skin		
Methyl mercaptan	74-93-1	9.8E-03	IN
Health Effects	convuls , cyan , irrit eyes , irrit resp sys , irrit skin , liquid: frostbite , narco		
Target Organs	Liver, Whole body		
Methyl methacrylate	80-62-6	4.8E-01	E
Health Effects	derm , irrit eyes , irrit nose , irrit skin , irrit throat		
Target Organs	Nose, Skin		
Methyl n-amyl ketone	110-43-0	8.0E+01	
Health Effects	coma , derm , head , irrit eyes , irrit muc memb , irrit skin , narco		
Methyl parathion	298-00-0	4.9E-03	3
Health Effects	abdom cramps , blurred vision , card irreg , chest tight , diarr , dizz , dysp , head , irrit eyes , irrit skin , lass , miosis , musc fasc , nau , rhin , salv , vomit		
Methyl tertiary butyl ether	1634-04-4	1.7E+00	3
Methyl-5-nitroaniline, 2-	99-55-8	2.4E-01	C
Methylal	109-87-5	1.1E+03	
Health Effects	anes , irrit eyes , irrit skin , irrit upper resp sys		
Target Organs	CNS - unspecified		
Methylaniline, 2-	95-53-4	2.1E+00	B2
Health Effects	anoxia , carc , cyan , derm , dizz , drow , eye burns , head , irrit eyes , lass , micro hema		
Target Organs	Kidneys		
Methylcyclohexane	108-87-2	5.5E+02	IN
Health Effects	dizz , drow , in animals: narco , irrit eyes , irrit nose , irrit skin , irrit throat		
Methylcyclohexanol	25639-42-3	8.0E+01	
Health Effects	head , in animals: narco , irrit eyes , irrit skin , irrit upper resp sys , kidney damage , liver damage		
Target Organs	Kidneys, Liver		
Methylcyclohexanone, o-	583-60-8	7.9E+01	
Health Effects	derm , in animals: irrit eyes , in animals: irrit muc memb , narco		
Methylene chloride	75-09-2	7.1E-01	B2
Health Effects	carc , dizz , drow , irrit eyes , irrit skin , lass , nau , numb limbs , tingle limbs		
Target Organs	CNS - unspecified, Liver, Nervous system - unspecified, Unspecified		
Methylene diphenyl diisocyanate	101-68-8	1.4E-05	D
Health Effects	asthma , chest pain , cough , dysp , irrit eyes , irrit nose , irrit throat , pulm secretions , resp sens		
Target Organs	Lungs, Nasal - pharynx, Nose		
Methylene-bis(2-chroloaniline), 4,4'-	101-14-4	2.7E-02	LI
Health Effects	carc , cyan , hema , kidney irrit , methemo , nau		
Target Organs	Lungs		

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Methylene-bis(4-cyclohexylisocyanate)	5124-30-1	1.8E-02	
Health Effects	chest tight , cough , dry throat , dysp , irrit eyes , irrit resp sys , irrit skin , pulm edema , resp sens , skin blisters , skin sens , wheez		
Methylenedianiline, 4,4'-	101-77-9	2.0E-01	2B
Health Effects	hepatitis , in animals: carc , in animals: heart damage , in animals: liver damage , in animals: spleen damage , irrit eyes , jaun , myocardial damage		
Target Organs	Liver		
Methylnaphthalene, 1-	90-12-0	1.0E+00	
Methylnapthalene, 2-	91-57-6	1.0E+00	IN
Methylphosphonic acid	993-13-5	1.6E-02	D
Methylpropene, 2-	115-11-7	1.4E+02	
Methylstyrene, alpha-	98-83-9	1.7E+01	
Health Effects	derm , drow , irrit eyes , irrit nose , irrit skin , irrit throat		
Metribuzin	21087-64-9	1.2E+00	D
Health Effects	in animals: CNS depres , liver enzyme changes , thyroid changes		
Target Organs	Blood, Liver		
Mica	12001-26-2	7.3E-01	
Health Effects	cough , dysp , irrit eyes , lass , low weight , pneumoconiosis		
Target Organs	Lungs		
Midrange Aliphatic Hydrocarbon Streams	Mid HC stream	6.8E-02	
Molybdenum	7439-98-7	1.2E-01	
Health Effects	anemia , in animals: anor , in animals: diarr , in animals: dysp , in animals: inco , in animals: irrit eyes , in animals: irrit nose , in animals: irrit throat , in animals: kidney damage , in animals: listlessness , in animals: liver damage , in animals		
Target Organs	CNS - unspecified, Lungs		
Monocrotophos	6923-22-4	1.2E-02	
Health Effects	abdom cramps , blurred vision , convuls , diarr , dizz , dysp , in animals: possible terato effects , irrit eyes , miosis , nau , salv , vomit		
Monomethylamine	74-89-5	2.2E+00	
Health Effects	conj , cough , derm , irrit eyes , irrit resp sys , irrit skin , liquid: frostbite , muc memb burns , skin burns		
Morpholine	110-91-8	2.4E+01	3
Health Effects	cough , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit nose , irrit resp sys , irrit skin , vis dist		
Target Organs	Eyes		
Naled	300-76-5	2.4E-02	
Health Effects	abdom cramps , anor , ataxia , card irreg , chest tight , convuls , cyan , diarr , dizz , head , irrit eyes , irrit skin , lac , lar spasm , lass , low BP , miosis , nau , para , salv , twitch , vomit , wheez		
Naphthalene	91-20-3	2.1E-03	C
Health Effects	abdom pain , conf , corn damage , derm , excitement , head , hema , irrit bladder , irrit eyes , jaun , mal , nau , optical neuritis , profuse sweat , renal shutdown , vomit		
Target Organs	Blood, Eyes, Nose, Respiration - unspecified		

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
N-Ethylmorpholine	100-74-3	8.1E+00	
Health Effects	irrit eyes , irrit nose , irrit throat , vis dist: blue-gray vision , vis dist: colored haloes , vis dist: corn edema		
Target Organs	Eyes		
Nickel	7440-02-0	2.4E-02	2B
Health Effects	allergic asthma , carc , pneu , sens derm		
Target Organs	Lungs, Respiration - unspecified, Skin		
Nickel carbonyl	13463-39-3	1.2E-01	B2
Health Effects	carc , convuls , cough , cyan , delirium , dizz , epigastric pain , head , hyperpnea , in animals: repro effects , in animals: terato effects , lass , leucyt , nau , pneu , subs pain , vomit		
Target Organs	CNS - unspecified, Lungs, Whole body		
Nickel compounds	Ni cmpds	1.4E-04	
Nickel insoluble inorganic compounds	Ni insol inorg	6.8E-02	2B
Nickel refinery dust	Ni ref dust	2.0E-02	A
Nickel subsulfide	12035-72-2	1.0E-02	A
Nicotine	54-11-5	1.2E-01	
Health Effects	abdom pain , card arrhy , conf , convuls , diarr , dizz , dysp , head , hearing dist , in animals: terato effects , inco , lass , nau , salv , vis dist , vomit		
Target Organs	CNS - unspecified, CVS - unspecified, GI tract - unspecified		
Nitrapyrin	1929-82-4	2.4E+00	
Health Effects	no adverse effects noted in ingestion studies with animals		
Target Organs	Liver		
Nitric acid	7697-37-2	1.4E+00	
Health Effects	bron , delayed pulm edema , dental erosion , irrit eyes , irrit muc memb , irrit skin , pneu		
Target Organs	Lungs		
Nitric oxide	10102-43-9	3.7E+00	
Health Effects	drow , irrit eyes , irrit nose , irrit throat , methemo , uncon , wet skin		
Nitroaniline, 2-	88-74-4	2.7E-04	D
Nitroaniline, 4-	100-01-6	7.3E-01	C
Health Effects	anemia , ataxia , convuls , cyan , diarr , dysp , irrit nose , irrit throat , irrity , jaun , methemo , resp arrest , tacar , tachypnea , vomit		
Target Organs	Blood, Liver		
Nitrobenzene	98-95-3	1.4E-02	D
Health Effects	anemia , anoxia , derm , in animals: kidney damage , in animals: liver damage , in animals: testicular effects , irrit eyes , irrit skin , methemo		
Nitroethane	79-24-3	1.1E+02	
Health Effects	derm , in animals: dysp , in animals: edema , in animals: kidney inj , in animals: lac , in animals: liver inj , in animals: narco , in animals: pulm rales		
Target Organs	Liver		
Nitrogen dioxide	10102-44-0	9.4E-01	
Health Effects	chest pain , chronic bron , cough , cyan , decr pulm func , dysp , irrit eyes , irrit nose , irrit throat , mucoid frothy sputum , pulm edema , tacar , tachypnea		
Target Organs	Lungs		

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Nitrogen trifluoride	7783-54-2	7.1E+00	
Health Effects	dizz , head , in animals: anoxia , in animals: cyan , kidney inj , lass , liver inj , methemo		
Target Organs	Blood, Kidneys, Liver		
Nitroglycerin	55-63-0	1.1E-01	
Health Effects	abdom pain , angina , CNS depres , delirium , dizz , flush , hypotension , irrit skin , methemo , nau , palp , throb head , vomit		
Target Organs	CVS - unspecified		
Nitromethane	75-52-5	5.3E-07	LI
Health Effects	convuls , derm , in animals: irrit eyes , in animals: irrit resp sys , liver damage , narco		
Target Organs	Breast, Nasal-pharynx, Thyroid		
Nitrophenol, 2-	88-75-5	3.4E-04	
Nitropropane, 1-	108-03-2	3.1E+01	
Health Effects	diarr , head , in animals: kidney damage , in animals: liver damage , irrit eyes , nau , vomit		
Target Organs	Liver		
Nitropropane, 2-	79-46-9	1.8E-03	B2
Health Effects	anor , carc , diarr , head , irrit eyes , irrit nose , irrit resp sys , irrit skin , kidney damage , liver damage , nau , vomit		
Target Organs	Liver		
Nitrosodiethylamine, N-	55-18-5	1.1E-04	B2
Nitrosodimethylamine, N-	62-75-9	3.4E-04	B2
Health Effects	abdom cramps , carc , decr kidney func , decr liver func , decr pulm func , diarr , enlarged liver , fever , head , jaun , nau , vomit		
Target Organs	Liver		
Nitroso-di-n-butylamine, N-	924-16-3	3.0E-03	B2
Nitrosopyrrolidine, N-	930-55-2	7.9E-03	B2
Nitrotoluene, m-	99-08-1	2.7E+00	D
Health Effects	anoxia , ataxia , cyan , dizz , dysp , head , lass , nau , tacar , vomit		
Nitrotoluene, o-	88-72-2	2.7E+00	B2
Health Effects	anoxia , ataxia , cyan , dizz , dysp , head , lass , nau , tacar , vomit		
Nitrotoluene, p-	99-99-0	2.7E+00	C
Health Effects	anoxia , ataxia , cyan , dizz , dysp , head , lass , nau , tacar , vomit		
Nitrous oxide	10024-97-2	2.2E+01	
Health Effects	asphy , drow , head , liquid: frostbite , repro effects		
Target Organs	Blood, CNS - unspecified, Reproductive - unspecified by gender		
Nonane	111-84-2	1.4E+00	
Health Effects	chemical pneu (aspir liquid) , conf , dizz , drow , head , inco , irrit eyes , irrit nose , irrit skin , irrit throat , nau , tremor		
Target Organs	CNS - unspecified, Skin		
Octachlorodibenzodioxin, 1,2,3,4,6,7,8,9-	3268-87-9		
Octachlorodibenzofuran, 1,2,3,4,6,7,8,9-	39001-02-0		3

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Octachloronaphthalene	2234-13-1	2.4E-02	
Health Effects	acne-form derm , jaun , liver damage		
Target Organs	Liver, Skin		
Octane	111-65-9	4.8E+02	
Health Effects	chemical pneu (aspir liquid) , derm , drow , in animals: narco , irrit eyes , irrit nose		
Oil mist, mineral	8012-95-1	1.2E+00	
Health Effects	irrit eyes , irrit resp sys , irrit skin		
Target Organs	Lungs		
Osmium tetroxide	20816-12-0	7.1E-04	
Health Effects	conj , cough , derm , dysp , head , irrit eyes , irrit resp sys , lac , vis dist		
Target Organs	Eyes		
Oxalic acid	144-62-7	3.4E-01	
Health Effects	collapse , convuls , cyan , eye burns , irrit eyes , irrit muc memb , irrit skin , kidney damage , local pain , shock		
Oxybis(benzenesulfonyl hydrazide), 4,4'-	80-51-3	3.4E-02	
Ozone	10028-15-6	3.9E-02	
Health Effects	chronic resp disease , irrit eyes , irrit muc memb , pulm edema		
Target Organs	Lungs		
Paraffin wax fume	8002-74-2	6.8E-01	
Health Effects	discomfort , irrit eyes , irrit resp sys , irrit skin , nau		
Paraquat	4685-14-7	3.4E-02	
Parathion	56-38-2	1.2E-02	C
Health Effects	abdom cramps , anor , ataxia , card irreg , chest tight , coma , conf , convuls , cyan , diarr , dizz , head , irrit eyes , irrit resp sys , irrit skin , lar spasm , lass , low BP , miosis , musc fasc , nau , para , rhin , salv , sweat , vomit , wheez		
Pentaborane	19624-22-7	3.2E-03	
Health Effects	behavioral changes , convuls , dizz , drow , head , inco , irrit eyes , irrit skin , tonic spasm abdom , tonic spasm face , tonic spasm limbs , tonic spasm neck , tremor		
Target Organs	CNS - unspecified		
Pentachlordibenzofuran, 2,3,4,7,8-	57117-31-4		3
Pentachlorodibenzofuran, 1,2,3,7,8-	57117-41-6		3
Pentachlorodibenzo-p-dioxin, 1,2,3,7,8-	40321-76-4		
Pentachloronaphthalene	1321-64-8	1.2E-01	
Health Effects	acne-form skin eruptions , anor , dizz , head , jaun , lass , liver nec , pruritus		
Target Organs	Liver, Skin		
Pentachloronitrobenzene	82-68-8	1.2E-01	C
Pentachlorophenol	87-86-5	1.2E-01	B2
Health Effects	anor , chest pain , cough , derm , dizz , dysp , head , high fever , irrit eyes , irrit nose , irrit throat , lass , low weight , nau , sneez , sweat , vomit		
Target Organs	CNS - unspecified, CVS - unspecified		
Pentaerythritol	115-77-5	3.4E+00	
Health Effects	irrit eyes , irrit resp sys		

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Pentane, n-	109-66-0	6.8E+00	
Health Effects	chemical pneu (aspir liquid) , derm , drow , in animals: narco , irrit eyes , irrit nose , irrit skin		
Perchloroethylene	127-18-4	1.9E-01	2A
Health Effects	carc , dizz , drow , flush face , flush neck , head , inco , irrit eyes , irrit nose , irrit resp sys , irrit skin , irrit throat , liver damage , nau , skin eryt		
Target Organs	CNS - unspecified, Nervous system - unspecified		
Perchloromethyl mercaptan	594-42-3	9.9E-02	
Health Effects	acidosis , anuria , coarse rales , cough , deep breath pain , dysp , irrit eyes , irrit nose , irrit skin , irrit throat , kidney damage , lac , liver damage , pallor , tacar , vomit		
Target Organs	Lungs		
Perchloryl fluoride	7616-94-6		
Health Effects	in animals: anoxia , in animals: cyan , in animals: dizz , in animals: head , in animals: lass , in animals: methemo , in animals: pneu , in animals: pulm edema , irrit resp sys , liquid: frostbite		
Target Organs	Blood		
Perfluorobutyl ethylene	19430-93-4	2.5E+02	
Persulfates	persufate	3.4E-02	
Phenol	108-95-2	6.6E+00	D
Health Effects	anor , convuls , cyan , dark urine , derm , irrit eyes , irrit nose , irrit throat , kidney damage , lass , liver damage , low weight , musc ache , musc pain , ochronosis , skin burns , tremor , twitch		
Target Organs	Blood, CNS - unspecified, Respiration - unspecified		
Phenothiazine	92-84-2	1.7E+00	
Health Effects	abdom cramps , hemolytic anemia , hepatitis , irrit skin , itch , kidney damage , reddening skin , skin photo sens , tacar		
Target Organs	Eyes, Kidneys, Liver		
Phenyl ether vapor	101-84-8	2.4E+00	
Health Effects	irrit eyes , irrit nose , irrit skin , nau		
Phenyl glycidyl ether	122-60-1	2.1E-01	2B
Health Effects	carc , irrit eyes , irrit skin , irrit upper resp sys , narco , possible hemato effects , possible repro effects , skin sens		
Target Organs	Skin		
Phenyl mercaptan	108-98-5	1.1E-01	
Phenylenediamine, m-	108-45-2	3.4E-02	3
Phenylenediamine, o-	95-54-5	3.4E-02	B2
Phenylenediamine, p-	106-50-3	2.4E-02	3
Health Effects	bronchial asthma , irrit larynx , irrit pharynx , sens derm		
Target Organs	Eyes, Skin		
Phenylhydrazine	100-63-0	1.1E-01	
Health Effects	carc , cyan , dysp , hemolytic anemia , jaun , kidney damage , skin sens , vascular thrombosis		
Target Organs	Skin		
Phorate	298-02-2	1.2E-02	
Health Effects	abdom cramps , anor , ataxia , card irreg , chest tight , coma , conf , convuls , cyan , diarr , dizz , head , irrit eyes , irrit resp sys , irrit skin , lar spasm , lass , low BP , miosis , musc fasc , nau , para , rhin , salv , sweat , vomit , wheez		

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Phosdrin	7786-34-7	2.4E-03	
Health Effects	abdom cramps , anor , ataxia , card irreg , chest tight , convuls , cyan , diarr , head , irrit eyes , irrit resp sys , irrit skin , lar spasm , low BP , miosis , nau , para , rhin , salv , vomit , wheez		
Phosgene	75-44-5	6.2E-04	
Health Effects	chest pain , cough Lungs, cough , cyan , dry burning throat , dysp , foamy sputum , inj Lungs, irrit Throat, irrit Respiration - unspecified, irrit Eyes, irrit eyes , liquid: frostbite , pulmonary edema Lungs, vomit		
Target Organs	Lungs, None		
Phosphine	7803-51-2	2.1E-03	D
Health Effects	abdom pain , chest tight , chills , diarr , dysp , liquid: frostbite , musc pain , nau , pulm edema , stupor or syncope , thirst , vomit		
Target Organs	CNS - unspecified, GI tract - unspecified, Nose, Whole body		
Phosphoric acid	7664-38-2	6.8E-02	
Health Effects	burns , derm , eye burns , irrit eyes , irrit skin , irrit upper resp sys , skin burns		
Target Organs	Bronchi		
Phosphorus (yellow)	0-143*	2.4E-02	
Phosphorus oxychloride	10025-87-3	2.1E-01	
Health Effects	abdom pain , cough , dizz , dysp , eye burns , head , irrit eyes , irrit resp sys , irrit skin , lass , nau , neph , pulm edema , skin burns , vomit		
Target Organs	Kidneys		
Phosphorus pentachloride	10026-13-8	2.9E-01	
Health Effects	bron , derm , irrit eyes , irrit resp sys , irrit skin		
Phosphorus pentasulfide	1314-80-3	3.4E-01	
Health Effects	apnea , coma , conj pain , convuls , corn vesic , dizz , GI dist , head , insom , irrit eyes , irrit resp sys , irrit skin , irrity , kerato-conj , lac , lass , photo		
Phosphorus trichloride	7719-12-2	3.8E-01	
Health Effects	eye burns , irrit eyes , irrit nose , irrit skin , irrit throat , pulm edema , skin burns		
Phthalic acid, p-	100-21-0	2.4E+00	
Phthalic anhydride	85-44-9	8.2E-02	
Health Effects	bron , bronchial asthma , conj , derm , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit skin , irrit upper resp sys , nasal ulcer bleeding		
Target Organs	Lungs, Nose		
Phthalodinitrile, m-	626-17-5	1.7E+00	
Health Effects	conf , head , in animals: irrit eyes , in animals: irrit skin , nau		
Picloram	1918-02-1	2.4E+00	3
Health Effects	in animals: kidney changes , in animals: liver changes , irrit eyes , irrit resp sys , irrit skin , nau		
Picric acid	88-89-1	3.4E-02	D
Health Effects	album prot , anuria , bitter taste , GI dist , hema , hepatitis , irrit eyes , irrit skin , lass , myalgia , neph , polyuria , sens derm , yellow-stained hair , yellow-stained skin		
Target Organs	Eyes, Skin		
Pindone	83-26-1	2.4E-02	
Health Effects	abdom pain , back pain , black tarry stools , bruises , epis , excess bleeding from minor cuts , smoky urine		
Target Organs	Kidneys, Liver		
Pinene, alpha-	80-56-8	4.9E+00	

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Piperazine dihydrochloride	142-64-3	1.7E+00	
Health Effects	asthma , GI upset , head , inco , irrit eyes , irrit resp sys , irrit skin , musc weak , nau , skin burns , skin sens , vomit		
Platinum, metal	7440-06-4	3.4E-01	
Health Effects	derm , irrit resp sys , irrit skin		
Platinum, soluble salts	Pt sol salts	6.8E-04	
Health Effects	cough , cyan , derm , dysp , irrit eyes , irrit nose , lymphocytosis , sens skin , wheez		
Polychlorinated biphenyls	1336-36-3	4.2E-02	B2
Polyvinyl chloride	9002-86-2	2.4E-01	3
Portland cement	65997-15-1	3.4E-01	
Health Effects	chronic bron , cough , derm , exertional dysp , expectoration , irrit eyes , irrit nose , irrit skin , wheez		
Propane	74-98-6	4.4E+02	
Health Effects	asphy , conf , dizz , excitation , liquid: frostbite		
Propargyl alcohol	107-19-7	7.9E-01	
Health Effects	CNS depres , in animals: kidney damage , in animals: liver damage , irrit muc memb , irrit skin		
Target Organs	Kidneys, Liver		
Propiolactone, beta-	57-57-8	5.0E-01	2B
Health Effects	carc , corn opac , dysuria , frequent urination , hema , irrit skin , skin blisters , skin burns		
Propionaldehyde	123-38-6	5.5E-02	
Propionic acid	79-09-4	1.0E+01	
Health Effects	abdom pain , blurred vision , corn burns , irrit eyes , irrit nose , irrit skin , irrit throat , nau , skin burns , vomit		
Propyl acetate, n-	109-60-4	2.9E+02	
Health Effects	in animals: derm , in animals: irrit eyes , in animals: irrit nose , in animals: irrit throat , in animals: narco		
Propyl alcohol, n-	71-23-8	8.4E+01	
Health Effects	abdom cramps , ataxia , diarr , drow , dry cracking skin , GI pain , head , in animals: narco , irrit eyes , irrit nose , irrit throat , nau , vomit		
Propyl nitrate, n-	627-13-4	2.6E+01	
Health Effects	anoxia , cyan , dizz , dysp , head , in animals: irrit eyes , in animals: irrit skin , lass , methemo		
Target Organs	Blood		
Propylene	115-07-1	2.9E+02	3
Propylene chlorohydrin	127-00-4	9.5E-01	
Propylene glycol	57-55-6	1.9E-02	E
Propylene glycol dinitrate	6423-43-4	1.9E-04	
Health Effects	conj , head , head , impaired balance , in animals: kidney damage , in animals: liver damage , irrit Eyes, irrit eyes , methemo , vis dist		
Target Organs	Blood, CNS - unspecified, CVS - unspecified, Nervous system - unspecified, Whole body		
Propylene glycol monoacrylate	999-61-1	9.1E-01	
Health Effects	cough , dysp , eye burns , irrit eyes , irrit resp sys , irrit skin , skin burns		
Propylene glycol monomethyl ether	107-98-2	1.4E+01	
Health Effects	diarr , dizz , drow , head , inco , irrit eyes , irrit nose , irrit skin , irrit throat , nau , vomit		
Target Organs	CNS - unspecified		

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Propylene oxide	75-56-9	2.1E-02	B2
Health Effects	carc , irrit eyes , irrit resp sys , irrit skin , skin blisters , skin burns		
Target Organs	Epithelium, Nasal - pharynx, Nose		
Propylenechlorohydrin	78-89-7	9.5E-01	
Propyleneimine	75-55-8	1.6E-01	2B
Health Effects	carc , eye burns , skin burns		
Target Organs	CNS - unspecified		
Pyrethrum	8003-34-7	1.2E+00	
Health Effects	asthma , derm , eryt , papules , pruritus , rhin , sneez		
Target Organs	CNS - unspecified, Liver, Skin		
Pyridine	110-86-1	9.8E-01	3
Health Effects	anor , anxi , derm , dizz , head , insom , irrit eyes , kidney damage , liver damage , nau		
Target Organs	CNS - unspecified, Kidneys, Liver		
Quinone	106-51-4	1.5E-01	3
Health Effects	conj , irrit eyes , irrit skin , kera		
Target Organs	Eyes		
RDX	121-82-4	1.7E-01	C
Health Effects	convuls , dizz , head , insom , irrit eyes , irrit skin , irrity , lass , nau , tremor , vomit		
Target Organs	Blood, CNS - unspecified, Liver		
Refractory ceramic fibers	ref ceramic fiber	2.1E-02	B2
Resorcinol	108-46-3	1.5E+01	3
Health Effects	bluish skin , convuls , cyan , derm , dizz , drow , dysp , hema , hypothermia , incr heart rate , irrit eyes , irrit nose , irrit skin , irrit throat , irrit upper resp sys , kidney changes , liver changes , methemo , restless , spleen changes		
Target Organs	Blood, Skin		
Rhodium	7440-16-6	3.4E-01	
Health Effects	possible resp sens		
Rhodium soluble compounds	RH sol	3.4E-03	
Health Effects	CNS damage , in animals: irrit eyes		
Ronnel	299-84-3	1.2E+00	
Health Effects	chol inhibition , in animals: irrit eyes , kidney damage , liver damage		
Rotenone	83-79-4	1.7E+00	
Health Effects	abdom pain , clonic convuls , inco , irrit eyes , irrit resp sys , irrit skin , musc tremor , nau , numb muc memb , stupor , vomit		
Target Organs	CNS - unspecified		
Rubber dust	9006-04-6	2.4E-04	
Selenium	7782-49-2	6.8E-02	D
Health Effects	bron , chills , cirr , derm , dysp , eye burns , fever , garlic breath , GI dist , head , in animals: anemia , irrit eyes , irrit nose , irrit skin , irrit throat , kidney damage , liver nec , metallic taste , skin burns , spleen damage , vis dist		
Selenium hexafluoride	7783-79-1	9.7E-02	
Health Effects	edema , in animals: pulm irrit		

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Sesone	136-78-7	3.4E+00	
Health Effects	in animals: CNS effects , in animals: convuls , irrit eyes , irrit skin , kidney damage , liver damage		
Silica, crystalline quartz	14808-60-7	6.1E-03	1
Health Effects	carc , cough , decr pulm func , dysp , irrit eyes , progressive resp symptoms (silicosis) , wheez		
Silica, crystalline tripoli	1317-95-9	6.1E-03	
Silicon carbide, nonfibrous, inhalable	Sil carb inhal	7.3E-01	
Silicon tetrahydride	7803-62-5	2.2E+00	
Health Effects	head , irrit eyes , irrit muc memb , irrit skin , nau		
Silver	7440-22-4	2.4E-02	D
Health Effects	blue-gray eyes , blue-gray nasal septum , blue-gray skin , blue-gray throat , GI dist , irrit skin , ulceration skin		
Target Organs	Eyes, Mucosa, Skin		
Silver soluble compounds	Ag sol cmpds	2.4E-03	
Soapstone, respirable dust	sil soap resp	7.3E-01	
Sodium bisulfite	7631-90-5	1.2E+00	
Health Effects	irrit eyes , irrit muc memb , irrit skin		
Sodium fluoroacetate	62-74-8	1.2E-02	
Health Effects	anxi , auditory halu , card arrhy , convuls , ectopic heartbeat , facial pares , kidney damage , liver damage , nystagmus , pulm edema , pulsus altenans , tacar , twitch face musc , vomit		
Target Organs	CNS - unspecified, CVS - unspecified		
Sodium metabisulfite	7681-57-4	1.7E+00	
Health Effects	irrit eyes , irrit muc memb , irrit skin		
Sodium tetraborate	1330-43-4	6.8E-01	
Health Effects	cough , derm , dysp , epis , irrit eyes , irrit skin , irrit upper resp sys		
Starch	9005-25-8	2.4E+00	
Health Effects	chest pain , cough , derm , irrit eyes , irrit muc memb , irrit skin , rhin		
Target Organs	Lungs, Skin		
Stearates	stearates	3.4E+00	
Stibine	7803-52-3	1.7E-01	
Health Effects	abdom pain , head , hema , hemolytic anemia , jaun , lass , lumbar pain , nau , pulm irrit		
Target Organs	Blood		
Stoddard solvent	8052-41-3	2.0E+02	
Health Effects	chemical pneu (aspir liquid) , derm , dizz , in animals: kidney damage , irrit eyes , irrit nose , irrit throat		
Target Organs	Kidneys		
Strontium chromate	7789-06-2	1.2E-04	
Strychnine	57-24-9	3.7E-02	
Health Effects	anxi , cyan , incr acuity of perception , incr reflex excitability , restless , stiff facial musc , stiff neck , tetanic convuls with opisthotonos		
Target Organs	CNS - unspecified		
Styrene	100-42-5	5.8E-01	2B
Health Effects	conf , defatting derm , dizz , drow , head , irrit eyes , irrit nose , irrit resp sys , lass , mal , narco , possible liver inj , repro effects , unsteady gait		
Target Organs	CNS - unspecified, Nervous system - unspecified		

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Sucrose	57-50-1	2.4E+00	
Health Effects	cough , irrit eyes , irrit skin , irrit upper resp sys		
Target Organs	Lungs		
Sulfometuron methyl	74222-97-2	1.7E+00	
Sulfur hexafluoride	2551-62-4	1.5E+03	
Health Effects	asphy: incr breath rate , asphy: pulse rate , convuls , emotional upset , lass , liquid: frostbite , nau , slight musc inco , vomit		
Sulfuric acid	7664-93-9	4.9E-02	
Health Effects	bron , conj , dental erosion , derm , emphy , eye burns , irrit eyes , irrit nose , irrit skin , irrit throat , pulm edema , skin burns , stomatis		
Target Organs	Lungs		
Sulfuryl fluoride	2699-79-8	7.1E+00	
Health Effects	conj , in animals: convuls , in animals: kidney inj , in animals: narco , in animals: pulm edema , in animals: tremor , liquid: frostbite , pares , pharyngitis , rhinitis		
Target Organs	CNS - unspecified		
Sulprofos	35400-43-2	2.4E-02	
Health Effects	abdom cramps , blurred vision , card irreg , chest tight , diarr , dizz , dysp , head , lass , miosis , musc fasc , nau , rhin , salv , vomit		
Talc	14807-96-6	4.9E-01	3
Health Effects	fibrotic pneumoconiosis , irrit eyes		
Target Organs	Lungs		
TCDD, 2,3,7,8-	1746-01-6	1.1E-07	B2
Health Effects	allergic derm , chloracne , GI dist , in animals: carc , in animals: hemorr , in animals: kidney damage , in animals: liver damage , irrit eyes , porphyria , possible repro effects , possible terato effects		
Target Organs	Liver, Respiration - unspecified		
Tellurium and compounds	13494-80-9	2.4E-02	
Health Effects	anor , derm , drow , dry mouth , garlic breath , in animals: CNS changes , in animals: RBC changes , metallic taste , nau , no sweat , sweat		
Target Organs	CNS - unspecified, Liver		
Tellurium hexafluoride	7783-80-4	6.8E-02	
Health Effects	dysp , garlic breath , head , in animals: pulm edema		
Temephos	3383-96-8	2.4E-01	
Health Effects	abdom cramps , blurred vision , diarr , dizz , dysp , irrit eyes , nau , salv , vomit		
Terbufos	13071-79-9	2.4E-03	
Tert-amyl methyl ether	994-05-8	2.0E+01	
Tert-butyl alcohol	75-65-0	1.0E+02	
Health Effects	drow , irrit eyes , irrit nose , irrit skin , irrit throat , narco		
Tert-pentane	463-82-1	6.1E+02	
Tetrachlorodibenzofuran, 2,3,7,8-	51207-31-9		3
Tetrachloroethane, 1,1,1,2-	630-20-6	6.5E-01	C
Health Effects	in animals: liver changes , irreg respiration , irrit eyes , irrit skin , lass , musc inco , restless		
Target Organs	Liver		
Tetrachloroethane, 1,1,2,2-	79-34-5	8.3E-02	C

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Health Effects	abdom pain , carc , derm , hepatitis , jaun , kidney damage , leucyt , liver tend , nau , tremor fingers , vomit		
Target Organs	CNS - unspecified, GI tract - unspecified, Kidneys, Liver		
Tetrachloronaphthalene	1335-88-2	4.9E-01	
Health Effects	acne-form derm , anor , dizz , head , jaun , lass , liver inj		
Target Organs	Liver		
Tetraethoxysilane	78-10-4	2.9E+01	
Health Effects	in animals: anemia , in animals: dysp , in animals: kidney damage , in animals: lac , in animals: liver damage , in animals: narco , in animals: pulm edema , in animals: tremor , irrit eyes , irrit nose		
Target Organs	Kidneys		
Tetraethyl dithiopyrophosphate	3689-24-5	2.4E-02	
Health Effects	anor , blurred vision , card irreg , Cheyne-Stokes respiration , convuls , cyan , diarr , eye pain , head , irrit eyes , irrit skin , lac , lass , local sweat , low BP , nau , para , rhin , twitch , vomit		
Tetraethyl lead	78-00-2	2.4E-02	
Health Effects	anor , anxi , bradycardia , coma , conf , convuls , halu , hyper-reflexia , hypotension , hypothermia , insom , irrit eyes , lass , low weight , mania , nau , pallor , psychosis , spasticity , tremor		
Target Organs	CNS - unspecified		
Tetraethyl pyrophosphate	107-49-3	2.4E-03	
Health Effects	anor , blurred vision , card irreg , chest tight , Cheyne-Stokes respiration , convuls , cyan , diarr , eye pain , head , lac , lass , low BP , nau , para , rhin , sweat , twitch , vomit		
Tetrafluoroethylene	116-14-3	2.0E+00	
Tetrafluoroethylene	116-14-3	2.0E+00	2B
Tetrahydrofuran	109-99-9	5.0E+01	
Health Effects	CNS depres , dizz , head , irrit eyes , irrit upper resp sys , nau		
Target Organs	CNS, Kidneys, Liver		
Tetrakis (hydroxymethyl) phosphonium chloride	124-64-1	4.9E-01	
Tetrakis (hydroxymethyl) phosphonium sulfate	55566-30-8	4.9E-01	
Tetramethoxysilane	681-84-5	1.5E+00	
Health Effects	corn damage (following even short-term exposure to the vapor) , irrit eyes , kidney inj , lung inj , pulm edema		
Target Organs	Eyes, Lungs		
Tetramethyl lead	75-74-1	3.7E-02	
Health Effects	anor , anxi , bad dreams , coma , convuls , delirium , hypotension , insom , mania , nau , restless		
Target Organs	CNS - unspecified		
Tetramethyl succinonitrile	3333-52-6	6.8E-01	
Health Effects	coma , convuls , GI effects , head , kidney effects , liver effects , nau		
Target Organs	CNS - unspecified		
Tetranitromethane	509-14-8	1.4E-02	2B
Health Effects	chest pain , cyan , dizz , dysp , head , irrit eyes , irrit nose , irrit skin , irrit throat , methemo , skin burns		
Target Organs	Lungs		
Thioglycolic acid	68-11-1	1.3E+00	
Health Effects	blisters , corn damage , in animals: convuls , in animals: gasping respirations , in animals: lass , irrit eyes , irrit nose , irrit skin , irrit throat , lac , skin burns		
Thiram	137-26-8	1.7E-02	3
Health Effects	antabuse-like effects , derm , irrit eyes , irrit muc memb , irrit skin		

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Tin organic compounds	Sn organ cmpd	3.4E-02	
Health Effects	abdom pain , cough , dizz , focal anes , head , in animals: hemolysis , in animals: hepatic nec , irrit eyes , irrit resp sys , irrit skin , kidney damage , paresis , pruritus , psycho-neurologic dist , skin burns , sore throat , urine retention , vomit		
Target Organs	CNS - unspecified, IMM system - unspecified		
Tin oxide	18282-10-5	4.9E-01	
Health Effects	decr pulm func , Stannosis (benign pneumoconiosis): dysp		
Tin, inorganic	7440-31-5	4.9E-01	
Health Effects	in animals: diarr , in animals: para with musc twitch , in animals: vomit , irrit eyes , irrit resp sys , irrit skin		
Titanium dioxide	13463-67-7	2.4E+00	3
Health Effects	carc , lung fib		
Target Organs	Lungs		
Titanium tetrachloride	7550-45-0	6.8E-03	
Toluene	108-88-3	3.4E+00	D
Health Effects	anxi , conf , derm , dilated pupils , dizz , euph , head , insom , irrit eyes , irrit nose , kidney damage , lac , lass , liver damage , musc ftg , pares		
Target Organs	CNS - unspecified, Nervous system - unspecified		
Toluene diisocyanate mixture, 2,4-/2,6-	26471-62-5	4.8E-05	2B
Toluidine, m-	108-44-1	2.1E+00	
Health Effects	anemia , convuls , cyan , derm , hema , irrit eyes , irrit skin , lass , low BP , methemo , nau , vomit		
Target Organs	Kidneys		
Toluidine, p-	106-49-0	2.1E+00	C
Health Effects	anemia , carc , convuls , cyan , derm , hema , irrit eyes , irrit skin , lass , low BP , methemo , nau , vomit		
Target Organs	Kidneys		
Toxaphene	8001-35-2	1.5E-02	B2
Health Effects	agitation , carc , conf , convuls , dry skin , nau , reddening skin , tremor , uncon		
Target Organs	Liver		
Tributyl phosphate	126-73-8	7.5E-01	B2
Health Effects	head , irrit eyes , irrit resp sys , irrit skin , nau		
Trichloro-1,2,2-trifluoroethane, 1,1,2-	76-13-1	2.1E+01	
Health Effects	CNS depres , derm , drow , in animals: card arrhy , in animals: narco , irrit skin , irrit throat		
Target Organs	CVS - unspecified, Whole body		
Trichloroacetic acid	76-03-9	2.3E+00	C
Health Effects	cough , delayed pulm edema , derm , diarr , dysp , eye burns , irrit eyes , irrit nose , irrit resp sys , irrit skin , irrit throat , salv , skin burns , vomit		
Trichlorobenzene, 1,2,4-	120-82-1	1.4E-02	D
Health Effects	in animals: kidney damage , in animals: liver damage , in animals: possible terato effects , irrit eyes , irrit muc memb , irrit skin		
Target Organs	Liver, Ureters/urethra		
Trichloroethane, 1,1,1-	71-55-6	2.6E+00	D
Health Effects	card arrhy , CNS depres , derm , head , irrit eyes , irrit skin , lass , liver damage , poor equi		
Target Organs	Brain, CNS - unspecified, Liver, Nervous system - unspecified		

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Trichloroethane, 1,1,2-	79-00-5	3.0E-01	C
Health Effects	carc , CNS depres , derm , irrit eyes , irrit nose , kidney damage , liver damage		
Target Organs	CNS - unspecified, Liver		
Trichloroethylene	79-01-6	3.7E-01	2A
Health Effects	carc , card arrhy , derm , dizz , drow , head , irrit eyes , irrit skin , lass , liver inj , nau , pares , tremor , vis dist , vomit		
Target Organs	Nervous system - unspecified		
Trichlorofluoromethane	75-69-4	6.8E-01	
Health Effects	asphy , card arrest , card arrhy , derm , inco , liquid: frostbite , tremor		
Target Organs	CNS - unspecified, CVS - unspecified		
Trichlorofon	52-68-6	2.4E-01	3
Trichloronaphthalene	1321-65-9	1.2E+00	
Health Effects	anor , dizz , jaun , liver inj , nau		
Target Organs	Liver		
Trichlorophenol, 2,4,6-	88-06-2	1.5E+00	B2
Trichlorophenoxyacetic acid	93-76-5	3.4E+00	
Health Effects	acne-like rash , in animals: ataxia , irrit skin , liver damage		
Trichloropropane, 1,2,3-	96-18-4	1.2E-03	B2
Health Effects	carc , CNS depres , in animals: kidney inj , in animals: liver inj , irrit eyes , irrit nose , irrit throat		
Target Organs	Kidneys, Liver, Respiration - unspecified		
Trichloropropene, 1,2,3-	96-19-5	2.1E-03	D
Tricresol	1319-77-3	6.8E+00	
Triethanolamine	102-71-6	1.7E+00	3
Triethylamine	121-44-8	4.8E-02	
Health Effects	in animals: kidney damage , in animals: liver damage , in animals: myocardial damage , irrit eyes , irrit resp sys , irrit skin		
Target Organs	Eyes, Nasal-pharynx, None		
Trifluorobromomethane	75-63-8	6.1E+02	
Health Effects	card arrhy , dizz , liquid: frostbite		
Target Organs	CNS - unspecified, CVS - unspecified		
Triglycidyl isocyanurate	2451-62-9	1.2E-02	
Trimellitic anhydride	552-30-7	1.2E-04	
Health Effects	asthma , cough , dysp , fever , irrit eyes , irrit nose , irrit resp sys , irrit skin , mal , musc ache , pulm edema , resp sens , rhinitis , sneez , wheez		
Target Organs	IMM system - unspecified, Lungs		
Trimethyl benzene	25551-13-7	4.2E+01	
Trimethyl phosphite	121-45-9	3.5E+00	
Health Effects	derm , in animals: terato effects , irrit eyes , irrit skin , irrit upper resp sys		
Trimethylamine	75-50-3	4.1E+00	
Health Effects	blurred vision , corn nec , cough , delayed pulm edema , dysp , irrit eyes , irrit nose , irrit resp sys , irrit skin , irrit throat , liquid: frostbite , skin burns		

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Trimethylbenzene, 1,2,4-	95-63-6	4.8E-02	
Health Effects	bron , chemical pneu (aspir liquid) , conf , dizz , drow , head , hypochromic anemia , inco , irrit eyes , irrit nose , irrit resp sys , irrit skin , irrit throat , lass , nau , vomit		
Target Organs	Blood, Lungs		
Trimethylbenzene, 1,3,5-	108-67-8	6.8E-03	
Trimethylbenzene, 1,3,5-	108-67-8	6.8E-03	D
Health Effects	bron , chemical pneu (aspir liquid) , conf , dizz , drow , head , hypochromic anemia , inco , irrit eyes , irrit nose , irrit resp sys , irrit skin , irrit throat , lass , nau , vomit		
Target Organs	Blood, Nervous system - unspecified, Respiration - generic		
Trinitrophenylmethylnitramine	479-45-8	3.7E-01	IN
Health Effects	anemia , coryza , cough , edema on cheeks , edema on nasal folds , edema on neck , eryt , head , insom , irrity , itch , kera , kidney damage , lass , liver damage , mal , nau , sens derm , sneez , vomit		
Target Organs	Liver, Skin		
Trinitrotoluene, 2,4,6-	118-96-7	3.4E-02	C
Health Effects	anemia , card irreg , cataract , cough , cyan , irrit muc memb , irrit skin , jaun , kidney damage , leucyt , liver damage , musc pain , peri neur , sens derm , sneez , sore throat		
Target Organs	Blood, Eyes, Liver		
Triorthocresyl phosphate	78-30-8	2.4E-02	
Health Effects	cramps in calves , GI dist , para , pares in feet or hands , peri neur , weak feet , wrist drop		
Target Organs	CNS - unspecified		
Triphenyl phosphate	115-86-6	1.0E+00	
Health Effects	in animals: musc weak , in animals: para , minor changes in blood enzymes		
Target Organs	Skin		
Tungsten	7440-33-7	1.7E+00	D
Health Effects	blood changes , cough , diffuse pulm fib , irrit eyes , irrit resp sys , irrit skin , loss of appetite , nau		
Tungsten, soluble compounds	W sol	3.4E-01	
Health Effects	in animals: body weight changes , in animals: behavioral changes , in animals: blood changes , in animals: CNS dist , in animals: diarr , in animals: resp failure , irrit eyes , irrit resp sys , irrit skin		
Target Organs	CNS - unspecified		
Turpentine	8006-64-2	3.8E+01	
Health Effects	abdom pain , chemical pneu (aspir liquid) , convuls , diarr , dizz , head , hema , irrit eyes , irrit nose , irrit skin , irrit throat , kidney damage , nau , prot , skin sens , vomit		
Target Organs	Lungs		
Uranium compounds	0-287*	4.9E-02	
Uranium, highly soluble salts	HZ1800-90-T	2.7E-04	
Health Effects	carc. Potential for cancer is a result of alpha-emitting properties & radioactive decay products (e.g. radon) , casts in urine , chest rales , conj , cough , high BUN , lac , nau , prot , RBC in urine , short breath , skin burns , vomit		
Target Organs	Kidneys		
Valeraldehyde, n-	110-62-3	6.0E+01	
Health Effects	irrit eyes , irrit nose , irrit skin , irrit throat		
Vanadium	7440-62-2	6.8E-05	
Vanadium pentoxide	1314-62-1	1.4E-04	2B
Health Effects	bron , cough , drow , dysp , eczema , fine rales , green tongue , irrit eyes , irrit skin , irrit throat , metallic taste , wheez		

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Vinyl acetate	108-05-4	2.4E-02	2B
Health Effects	cough , eye burns , hoarseness , irrit eyes , irrit nose , irrit skin , irrit throat , loss of smell , skin blisters		
Target Organs	Nasal - pharynx, Nasal-pharynx, Respiration - unspecified		
Vinyl chloride	75-01-4	5.3E-02	A
Health Effects	abdom pain , carc , enlarged liver , GI bleeding , lass , liquid: frostbite , pallor or cyan of extremities		
Target Organs	Developmental - generic, Liver		
Vinyl cyclohexene dioxide	106-87-6	2.0E-01	2B
Health Effects	in animals: carc , in animals: irrit eyes , in animals: irrit resp sys , in animals: irrit skin , in animals: leupen , in animals: nec thymus , in animals: skin sens , in animals: testicular atrophy		
Target Organs	Reproductive - unspecified by gender, Skin		
Vinyl fluoride	75-02-5	4.6E-01	2A
Health Effects	conf , dizz , head , inco , liquid: frostbite , narco , nau , vomit		
Target Organs	Liver		
Vinyl toluene	25013-15-4	2.7E-02	3
Health Effects	drow , in animals: narco , irrit eyes , irrit skin , irrit upper resp sys		
Vinyl-2-pyrrolidone, N-	88-12-0	5.6E-02	3
Vinylcyclohexene, 4-	100-40-3	1.5E-01	2B
Vinylidene fluoride	75-38-7	3.2E+02	3
Health Effects	dizz , head , liquid: frostbite , nau		
Target Organs	Liver		
Warfarin	81-81-2	2.4E-02	
Health Effects	abdom pain , abnor hematologic indices , back pain , bleeding lips , epis , fecal blood , hema , hematoma arms , hematoma legs , muc memb hemorr , petechial rash , vomit		
Target Organs	Blood		
Wood dust	wood dust	2.4E-01	1
Wood dust, western red cedar	wood dust cedar	1.2E-01	1
Health Effects	asthma , carc , cough , derm , epis , granulomatous pneuitis , irrit eyes , prolonged colds , resp hypersensitivity , sinusitis , wheez		
Wood dusts (birch, mahogany, teak, walnut)	Wood dust (others)	2.4E-01	
Xylene, m-	108-38-3	2.7E-01	
Health Effects	abdom pain , anor , corn vacuolization , derm , dizz , drow , excitement , inco , irrit eyes , irrit nose , irrit skin , irrit throat , nau , staggering gait , vomit		
Xylene, o-	95-47-6	2.7E-01	
Health Effects	abdom pain , anor , corn vacuolization , derm , dizz , drow , excitement , inco , irrit eyes , irrit nose , irrit skin , irrit throat , nau , staggering gait , vomit		
Xylene, p-	106-42-3	2.7E-01	
Health Effects	abdom pain , anor , corn vacuolization , derm , dizz , drow , excitement , inco , irrit eyes , irrit nose , irrit skin , irrit throat , nau , staggering gait , vomit		
Xylenes, total	1330-20-7	2.7E-01	IN

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class
Xylidine	1300-73-8	6.1E-01	
Health Effects	anoxia , cyan , kidney damage , liver damage , lung damage , methemo		
Yttrium	7440-65-5	2.4E-01	
Health Effects	in animals: eye inj , in animals: possible liver damage , in animals: pulm irrit , irrit eyes		
Zinc chloride fume	7646-85-7	3.4E-01	
Health Effects	chest pain , conj , copious sputum , cor pulmonale , cough , cyan , dysp , fever , irrit eyes , irrit nose , irrit skin , irrit throat , pneu , pulm edema , pulm fib , skin burns , tachypnea		
Target Organs	Lungs		
Zinc chromate	11103-86-9	2.4E-03	
Zinc chromate	13530-65-9	2.4E-03	
Zinc oxide	1314-13-2	4.9E-01	
Health Effects	blurred vision , chest tight , decr pulm func , dysp , head , lass , low back pain , mal , metal fume fever: chills , metal fume fever: cough , metal fume fever: dry throat , metal fume fever: fever , metal fume fever: musc ache , metal fume fever: nau ,		
Target Organs	Lungs		
Zirconium	7440-67-7	1.2E+00	
Health Effects	in animals: irrit muc memb , in animals: irrit skin , lung granulomas , skin granulomas , X-ray evidence of retention in lungs		
Target Organs	Lungs		

Table C-5. Long-Term Air Military Exposure Guidelines for General Air Pollutants

All concentrations in mg/m³ (asbestos and refractory ceramic fibers are in f/cc)

Chemical Name	CASRN	1-year Negligible	Cancer Class

CASRN = Chemical Abstract Service Registry Number
MEG = Military Exposure Guideline
mg/m³ = milligrams per cubic meter

All MEGs are provided in mg/m³ and ppm units with the exception of asbestos which is provided in f/cc.

Cancer Classes were obtained from the U.S. Environmental Protection Agency (EPA) when available. If EPA did not list a chemical, the International Agency for Research on Cancer (IARC) was consulted. Class descriptions are provided below. Please see RD 230 for additional information.

EPA's Previous Weight-of-Evidence Classifications (EPA 1986a):
- A - Human carcinogen
- B - Probable human carcinogen
- C - Possible human carcinogen
- D - Not classifiable
- E - No evidence of human carcinogenicity

EPA's Current Weight-of-Evidence Classifications (EPA 2005b):
- CA - Carcinogenic to humans
- LI - Likely to be carcinogenic to humans
- SU - Suggestive evidence of carcinogenic potential
- IN - Inadequate information to assess carcinogenic potential
- NO - Not likely to be carcinogenic to humans

IARC's Classifications (IARC 2006):
- 1 - Carcinogenic to humans
- 2A - Probably carcinogenic to humans
- 2B - Possibly carcinogenic to humans
- 3 - Not classifiable as to carcinogenicity in humans
- 4 - Probably not carcinogenic to humans

Potential Health Effects: please see Appendix B for acronyms and definitions. Health effects information was obtained from the following sources:

1) CDC 2004b. Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health (NIOSH)
Pocket Guide to Chemical Hazards, 97-140, Feb 2004.

2) NRC/COT 2003. National Research Council, Committee on Toxicology. Acute Exposure Guideline Levels for Selected Airborne Chemicals, Volume 3. Committee on Toxicology, Subcommittee on Acute Exposure Guideline Levels. National Academy Press, Washington, DC.

Target organs were identified using the sources providing the inhalation value used to develop the Air-MEGs. Sources included: 1) EPA/NRC 2007, 2) EPA 2005c, 3) EPA 2005a, 4) ATSDR 2006, 5) EPA 2005d, and 6) ACGIH 2005.

Odor threshold data were obtained from the following sources:

1) AIHA 1989. Odor Thresholds for Chemicals with Established Occupational Health Standards. Akron, OH: American Industrial Hygiene Association.
2) NLM 2006. National Library of Medicine's Hazardous Substances Data Base (HSDB), http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB, accessed August 2006.
3) Ruth, J.H. 1986. Odor Thresholds and Irritation Levels of Several Chemical Substances: A Review. American Industrial Hygiene Association Journal (47), p. A-142-151.

APPENDIX D

MILITARY EXPOSURE GUIDELINES FOR WATER

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Appendix D. Military Exposure Guidelines For Water

All concentrations in mg/L (asbestos is in f/L)

Chemical Name	CASRN	5 L/day 7-day Negligible	5 L/day 14-day Negligible	5 L/day 1-year Negligible	15 L/day 7-day Negligible	15 L/day 14-day Negligible	15 L/day 1-year Negligible	Cancer Class
2,4,6-Tribromophenol	118-79-6			1.3E+00			4.2E-01	
Acenaphthene	83-32-9			8.4E+00			2.8E+00	
Acephate	30560-19-1			5.6E-02			1.9E-02	C
Acetochlor	34256-82-1			2.8E-01			9.3E-02	
Acetone	67-64-1			3.8E+01			1.3E+01	IN
Health Effects	CNS depres , derm , dizz , head , irrit eyes , irrit nose , irrit throat							
Target Organs	Blood							
Acetone cyanohydrin	75-86-5			4.2E-01			1.4E-01	IN
Health Effects	asphy , conf , convuls , dizz , head , irrit eyes , irrit resp sys , irrit skin , kidney inj , lass , liver inj , pulm edema							
Acetonitrile	75-05-8			8.4E-01			2.8E-01	D
Health Effects	asphy , chest pain , convuls , in animals: kidney damage , in animals: liver damage , irrit nose , irrit throat , lass , nau , stupor , vomit							
Acetophenone	98-86-2			1.4E+01			4.7E+00	D
Acifluorfen-sodium	62476-59-9	2.8E+00	2.8E+00	1.8E-01	9.3E-01	9.3E-01	6.1E-02	
Acrolein	107-02-8			5.6E-02			1.9E-02	IN
Health Effects	chronic resp disease , decr pulm func , delayed pulm edema , irrit eyes , irrit muc memb , irrit skin							
Target Organs	GI tract - unspecified							
Acrylamide	79-06-1	2.1E+00	4.2E-01	2.8E-02	7.0E-01	1.4E-01	9.3E-03	B2
Health Effects	absent deep tendon reflex , ataxia , carc , drow , hand sweat , irrit eyes , irrit skin , lass , musc weak , numb limbs , pares , repro effects							
Target Organs	Breasts, CNS - unspecified, Mouth/palate, Thyroid glands, Uterus							
Acrylic acid	79-10-7			7.0E+00			2.3E+00	3
Health Effects	eye burns , in animals: kidney inj , in animals: liver inj , in animals: lung inj , irrit eyes , irrit resp sys , irrit skin , skin burns , skin sens							
Acrylonitrile	107-13-1	1.4E+00	1.4E+00	1.4E-01	4.7E-01	4.7E-01	4.7E-02	B1
Health Effects	asphy , carc , dizz , head , irrit eyes , irrit skin , lass , nau , scaling derm , skin vesic , sneez , vomit							
Target Organs	Blood, Brain, Developmental - generic, Other ducted glands, Reproductive - unspecified by gender, Spinal cord, Stomach							
Adipic acid	124-04-9			2.8E+01			9.3E+00	
Alachlor	15972-60-8	1.4E-01	1.4E-01	1.4E-01	4.7E-02	4.7E-02	4.7E-02	B2
Alar	1596-84-5			2.1E+00			7.0E-01	
Aldicarb	116-06-3	1.4E-02	1.4E-02	1.4E-02	4.7E-03	4.7E-03	4.7E-03	D
Aldicarb sulfone	1646-88-4	1.4E-02	1.4E-02	1.4E-02	4.7E-03	4.7E-03	4.7E-03	
Aldicarb sulfoxide	1646-87-3	1.4E-02	1.4E-02		4.7E-03	4.7E-03		
Aldrin	309-00-2			5.6E-04			1.9E-04	B2
Health Effects	azotemia , carc , clonic convuls , coma , dizz , head , hema , mal , myoclonic jerks of limbs , nau , tonic convuls , vomit							
Target Organs	Developmental - generic, Liver							
Ally	74223-64-6			3.5E+00			1.2E+00	
Allyl alcohol	107-18-6			5.6E-02			1.9E-02	
Health Effects	irrit eyes , irrit skin , irrit upper resp sys , pulm edema , tissue damage							

Footnotes on Page D-31

Appendix D. Military Exposure Guidelines For Water

All concentrations in mg/L (asbestos is in f/L)

Chemical Name	CASRN	5 L/day 7-day Negligible	5 L/day 14-day Negligible	5 L/day 1-year Negligible	15 L/day 7-day Negligible	15 L/day 14-day Negligible	15 L/day 1-year Negligible	Cancer Class
Aluminum phosphide	20859-73-8			5.6E-03			1.9E-03	
Amdro	67485-29-4			4.2E-02			1.4E-02	
Ametryn	834-12-8	1.3E+01	1.3E+01	1.3E+00	4.2E+00	4.2E+00	4.2E-01	
Aminophenol, 3-	591-27-5			4.2E+00			1.4E+00	
Aminophenol, 4-	123-30-8			2.8E+00			9.3E-01	
Aminopyridine, 4-	504-24-5			2.8E-03			9.3E-04	D
Amitraz	33089-61-1			3.5E-02			1.2E-02	
Ammonium perchlorate	7790-98-9			9.8E-03			3.3E-03	NO
Ammonium sulfamate	7773-06-0	2.8E+01	2.8E+01	2.8E+01	9.3E+00	9.3E+00	9.3E+00	
Health Effects	cough , dysp , irrit eyes , irrit nose , irrit throat							
Target Organs	Blood							
Aniline	62-53-3			1.7E+01			5.7E+00	B2
Health Effects	anxi , ataxia , carc , cirr , cyan , cyan , dizz , dizz , dysp , dysp on effort , ftg , head , head , hypox , hypox Heart, irrit eyes , lass , methemo , syncope , tacar , tacar , weak							
Target Organs	Spleen							
Anthracene	120-12-7			1.4E+01			4.7E+00	D
Antimony pentoxide	1314-60-9			7.0E-03			2.3E-03	
Antimony potassium tartrate	28300-74-5			1.3E-02			4.2E-03	
Antimony potassium tartrate anhydrous	11071-15-1			5.6E-03			1.9E-03	
Antimony tetroxide	1332-81-6			5.6E-03			1.9E-03	
Antimony trioxide	1309-64-4			7.0E+00			2.3E+00	2B
Antimony, elemental	7440-36-0	1.4E-02	1.4E-02	6.0E-03	6.0E-03	6.0E-03	6.0E-03	
Health Effects	anor , cough , diarr , dizz , head , insom , irrit eyes , irrit mouth , irrit nose , irrit skin , irrit throat , nau , stomach cramps , unable to smell properly , vomit							
Target Organs	Whole body							
Apollo	74115-24-5			1.8E-01			6.1E-02	C
Aramite	140-57-8			1.4E+00			4.7E-01	B2
Aroclor 1016	12674-11-2			2.9E-03			9.8E-04	
Aroclor 1254	11097-69-1			8.4E-04			2.8E-04	
Health Effects	carc , chloracne , irrit eyes , liver damage , repro effects							
Target Organs	IMM system - unspecified, Nervous system - unspecified							
Arsenic, elemental	7440-38-2	3.0E-01	6.0E-02	6.0E-02	1.0E-01	2.0E-02	2.0E-02	A
Health Effects	abdom pain , carc , derm , edema , GI dist , GI problems , head , hyperpig of skin , nau , neurological changes , peri neur , peripheral vascular disease , resp irrit , skin effects , ulceration of nasal septum , vomit							
Target Organs	GI tract - unspecified, Skin							
Asbestos	1332-21-4			7.0E+06			7.0E+06	A
Health Effects	asbestosis (chronic exposure): dysp , asbestosis (chronic exposure): finger clubbing , asbestosis (chronic exposure): interstitial fib , asbestosis (chronic exposure): restricted pulm function , carc , irrit eyes							
Assure	76578-14-8			1.3E-01			4.2E-02	D
Asulam	3337-71-1			7.0E-01			2.3E-01	

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Appendix D. Military Exposure Guidelines For Water

All concentrations in mg/L (asbestos is in f/L)

Chemical Name	CASRN	5 L/day 7-day Negligible	5 L/day 14-day Negligible	5 L/day 1-year Negligible	15 L/day 7-day Negligible	15 L/day 14-day Negligible	15 L/day 1-year Negligible	Cancer Class
Atrazine	1912-24-9	1.4E-01	1.4E-01	4.2E-02	4.7E-02	4.7E-02	1.4E-02	C
Health Effects	derm , dysp , hypothermia , inco , irrit eyes , irrit skin , lass , liver inj , salv , sens skin							
Target Organs	Blood, Breasts, CVS - unspecified, Developmental - generic, Reproductive - unspecified by gender, Whole body							
Avermectin B1	65195-55-3			5.6E-03			1.9E-03	
Azinphos methyl	86-50-0	1.4E-01	1.4E-01	4.2E-02	4.7E-02	4.7E-02	1.4E-02	
Health Effects	aching eyes , anor , blurred vision , card irreg , chest tight , convuls , cyan , diarr , head , lac , lar spasm , low BP , miosis , nau , para , rhin , salv , sweat , twitch , vomit , wheez							
Target Organs	Nervous system - unspecified							
Azobenzene	103-33-3			8.9E-01			3.0E-01	B2
Barium, elemental	7440-39-3			2.0E+00			2.0E+00	D
Baygon	114-26-1			5.6E-02			1.9E-02	
Health Effects	abdom cramps , blurred vision , diarr , head , lass , miosis , musc twitch , nau , salv , sweat , vomit							
Target Organs	RBC							
Bayleton	43121-43-3			4.2E-01			1.4E-01	
Baythroid	68359-37-5			3.5E-01			1.2E-01	
Benefin	1861-40-1			4.2E+00			1.4E+00	
Benomyl	17804-35-2			7.0E-01			2.3E-01	
Health Effects	irrit eyes , irrit skin , irrit upper resp sys , possible repro effects , possible terato effects , skin sens							
Bentazon	25057-89-0			4.2E-01			1.4E-01	E
Benzene	71-43-2	2.8E-01	2.8E-01	1.4E-01	9.3E-02	9.3E-02	4.7E-02	A
Health Effects	anor , bone marrow depres , carc , derm , dizz , head , irrit eyes , irrit nose , irrit resp sys , irrit skin , lass , nau , staggered gait							
Target Organs	Blood							
Benzenethiol	108-98-5			1.4E-03			4.7E-04	
Health Effects	CNS depres , cough , cyan , derm , dizz , dysp , head , irrit eyes , irrit resp sys , irrit skin , kidney damage , liver damage , nau , pneu , pulm edema , spleen damage , vomit , wheez							
Benzidine	92-87-5			4.3E-04			1.4E-04	A
Health Effects	acute cystitis , acute liver disorders , carc , derm , hema , irreg urination , painful urination , secondary anemia from hemolysis							
Benzo(a)pyrene	50-32-8			1.3E-02			4.5E-03	B2
Benzoic acid	65-85-0			5.6E+01			1.9E+01	D
Benzotrichloride	98-07-7			7.5E-03			2.5E-03	B2
Beryllium, elemental	7440-41-7	4.2E+01	4.2E+01	7.0E-02	1.4E+01	1.4E+01	2.3E-02	B1
Health Effects	berylliosis (chronic exposure): anor , berylliosis (chronic exposure): chest pain , berylliosis (chronic exposure): clubbing of fingers , berylliosis (chronic exposure): cough , berylliosis (chronic exposure): cyan , berylliosis (chronic exposure): lass ,							
Target Organs	GI tract - unspecified							
Bidrin	141-66-2			1.4E-03			4.7E-04	
Health Effects	abdom cramps , anor , anxi , diarr , dizz , head , inco , lac , lass , mal , musc twitch , nau , restless , rhinitis , salv , sweat , tremor , vomit							
Bifenox	42576-02-3			1.4E+01			4.7E+00	
Biphenthrin	82657-04-3			2.1E-01			7.0E-02	

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Appendix D. Military Exposure Guidelines For Water

All concentrations in mg/L (asbestos is in f/L)

Chemical Name	CASRN	5 L/day 7-day Negligible	5 L/day 14-day Negligible	5 L/day 1-year Negligible	15 L/day 7-day Negligible	15 L/day 14-day Negligible	15 L/day 1-year Negligible	Cancer Class
Biphenyl, 1,1-	92-52-4			7.0E-01			2.3E-01	D
Health Effects	head , irrit eyes , irrit throat , lass , liver damage , nau , numb limbs							
Bis(2-chloro-1-methylethyl) ether	108-60-1			5.6E-01			1.9E-01	C
Bis(2-chloroethoxy)methane	111-91-1			4.2E-01			1.4E-01	D
Bis(2-chloroethyl) ether	111-44-4			8.9E-02			3.0E-02	B2
Health Effects	carc , cough , in animals: pulm edema , irrit nose , irrit resp sys , irrit throat , lac , liver damage , nau , vomit							
Target Organs	Liver							
Bis(2-chloroisopropyl) ether	39638-32-9	5.6E+00	5.6E+00	5.6E-01	1.9E+00	1.9E+00	1.9E-01	
Bis(2-ethylhexyl) phthalate	117-81-7			2.8E+00			9.3E-01	B2
Health Effects	carc , in animals: liver damage , irrit eyes , irrit muc memb , terato effects							
Target Organs	Liver, Reproductive - unspecified by gender							
Bis(chloromethyl) ether	542-88-1			4.5E-04			1.5E-04	A
Health Effects	blood-stained sputum , bronchial secretions , carc , corn damage , cough , decr pulm function , dysp , edema , irrit eyes , irrit muc memb , irrit resp sys , irrit skin , nec , pulm congestion , wheez							
Bisphenol A	80-05-7			7.0E+00			2.3E+00	
Boron	7440-42-8	5.6E+00	2.8E+00	2.8E+00	1.9E+00	9.3E-01	9.3E-01	IN
Bromacil	314-40-9	7.0E+00	7.0E+00		2.3E+00	2.3E+00		
Health Effects	in animals: thyroid inj , irrit eyes , irrit skin , irrit upper resp sys							
Target Organs	Liver, None							
Bromate	15541-45-4			5.6E-02			1.9E-02	B2
Bromobenzene	108-86-1	5.6E+00	5.6E+00	2.8E-01	1.9E+00	1.9E+00	9.3E-02	
Bromochloromethane	74-97-5	7.0E+01	1.4E+00		2.3E+01	4.7E-01		D
Health Effects	CNS depres , conf , dizz , irrit eyes , irrit skin , irrit throat , pulm edema							
Target Organs	Kidneys, Liver							
Bromodichloromethane	75-27-4	1.4E+00	8.4E-01	1.1E-01	4.7E-01	2.8E-01	3.7E-02	B2
Bromoform	75-25-2	7.0E+00		4.2E-01	2.3E+00		1.4E-01	B2
Health Effects	CNS depres , irrit eyes , irrit resp sys , irrit skin , kidney damage , liver damage							
Target Organs	Large intestine, Liver							
Bromophos	2104-96-3			7.0E-01			2.3E-01	
Bromoxynil	1689-84-5			2.8E-01			9.3E-02	
Bromoxynil octanoate	1689-99-2			2.8E-01			9.3E-02	
Busan	21564-17-0			4.2E+00			1.4E+00	
Butanol, 1-	71-36-3			1.4E+01			4.7E+00	D
Health Effects	blurred vision , CNS depres , corn inflamm , derm , dizz , drow , head , hearing loss , irrit eyes , irrit nose , irrit throat , lac , photo , possible auditory nerve damage							
Butyl alcohol, sec-	78-92-2			2.8E+01			9.3E+00	
Health Effects	irrit eyes , irrit nose , irrit skin , irrit throat , narco							
Butyl benzyl phthalate	85-68-7			2.8E+01			9.3E+00	C
Butyl glycolyl butyl phthalate	85-70-1			1.4E+01			4.7E+00	

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Appendix D. Military Exposure Guidelines For Water

All concentrations in mg/L (asbestos is in f/L)

Chemical Name	CASRN	5 L/day 7-day Negligible	5 L/day 14-day Negligible	5 L/day 1-year Negligible	15 L/day 7-day Negligible	15 L/day 14-day Negligible	15 L/day 1-year Negligible	Cancer Class
Butylate	2008-41-5	2.8E+00	2.8E+00	7.0E-01	9.3E-01	9.3E-01	2.3E-01	
Butyltin compounds	z-136			4.2E-03			1.4E-03	
BZ	53800-72-9	7.0E-03			2.3E-03			
Health Effects	blurred vision , decreased mental performance , decreased salivation , delirium , dry mouth , halu , poor coordination , rapid pulse , restless , stupor							
Cacodylic acid	75-60-5			2.8E-01			9.3E-02	D
Cadmium, elemental	7440-43-9	5.6E-02	5.6E-02	7.0E-03	1.9E-02	1.9E-02	5.0E-03	B1
Health Effects	anos , carc , chest tight , chills , cough , diarr , dysp , emphy , head , mild anemia , musc ache , nau , prot , pulm edema , subs pain , vomit							
Target Organs	Kidneys							
Calcium cyanide	592-01-8			5.6E-01			1.9E-01	
Caprolactam	105-60-2			7.0E+00			2.3E+00	4
Health Effects	abdom cramps , asthma , conf , derm , diarr , dizz , epis , head , irrit eyes , irrit resp sys , irrit skin , irrity , kidney inj , liver inj , nau , skin sens , vomit							
Captafol	2425-06-1			2.8E-02			9.3E-03	C
Health Effects	bron , conj , derm , diarr , high BP , in animals: carc , in animals: terato effects , irrit eyes , irrit resp sys , irrit skin , kidney inj , liver inj , skin sens , vomit , wheez							
Target Organs	LYMP system - unspecified							
Captan	133-06-2			1.8E+00			6.1E-01	B2
Health Effects	blurred vision , carc , derm , diarr , dysp , irrit eyes , irrit skin , irrit upper resp sys , skin sens , vomit							
Carbaryl	63-25-2	1.4E+00	1.4E+00	1.4E+00	4.7E-01	4.7E-01	4.7E-01	3
Health Effects	abdom cramps , blurred vision , convuls , cyan , diarr , irrit skin , lac , miosis , nau , possible repro effects , rhin , salv , sweat , tremor , vomit							
Target Organs	None, RBC							
Carbazole	86-74-8			4.9E+00			1.6E+00	B2
Carbofuran	1563-66-2		7.0E-02	7.0E-02		2.3E-02	2.3E-02	
Health Effects	abdom cramps , blurred vision , convuls , diarr , head , inco , lass , miosis , musc twitch , nau , salv , sweat , vomit							
Target Organs	Blood, Nervous system - unspecified, Testes, Uterus							
Carbon disulfide	75-15-0			1.4E+00			4.7E-01	
Health Effects	anor , anxi , coronary heart disease , derm , dizz , eye burns , gastritis , head , kidney inj , lass , liver inj , low weight , ocular changes , Parkinson-like syndrome , polyneur , poor sleep , psychosis , repro effects , skin burns							
Target Organs	Liver							
Carbon tetrachloride	56-23-5	5.6E+00	2.8E-01	1.7E-01	1.9E+00	9.3E-02	5.6E-02	B2
Health Effects	carc , CNS depres , dizz , drow , inco , irrit eyes , irrit skin , kidney inj , liver inj , nau , vomit							
Target Organs	Liver							
Carbosulfan	55285-14-8			1.4E-01			4.7E-02	
Carboxin	5234-68-4	1.4E+00	1.4E+00	1.4E+00	4.7E-01	4.7E-01	4.7E-01	
Chloral	75-87-6			2.8E-01			9.3E-02	3
Chloral hydrate	302-17-0			1.4E+00			4.7E-01	C
Chloramben	133-90-4	4.2E+00	4.2E+00	2.1E-01	1.4E+00	1.4E+00	7.0E-02	
Chloranil	118-75-2			2.4E-01			8.1E-02	C

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Appendix D. Military Exposure Guidelines For Water

All concentrations in mg/L (asbestos is in f/L)

Chemical Name	CASRN	5 L/day 7-day Negligible	5 L/day 14-day Negligible	5 L/day 1-year Negligible	15 L/day 7-day Negligible	15 L/day 14-day Negligible	15 L/day 1-year Negligible	Cancer Class
Chlordane	57-74-9	8.4E-02	8.4E-02	8.4E-03	2.8E-02	2.8E-02	2.8E-03	B2
Health Effects	abdom pain , anuria , ataxia , blurred vision , carc , conf , convuls , cough , delirium , diarr , in animals: kidney damage , in animals: liver damage , in animals: lung damage , irrity , nau , tremor , vomit							
Target Organs	CNS-unspecified, Developmental - generic, Liver							
Chlordecone	143-50-0	1.4E-01	1.4E-01	7.0E-03	4.7E-02	4.7E-02	2.3E-03	B2
Health Effects	anxi , ataxia , carc , chest pain , head , kidney damage , liver damage , low sperm count , skin eryt , testicular atrophy , tremor , vis dist							
Target Organs	Kidneys, Nervous system - unspecified							
Chlorfenvinphos	470-90-6	2.8E-02	2.8E-02	2.8E-02	9.3E-03	9.3E-03	9.3E-03	
Chloride	16887-00-6	6.0E+02	6.0E+02		6.0E+02	6.0E+02		
Health Effects	apathy , delirium , heat stroke , impaired coord , weariness							
Chlorimuron-ethyl	90982-32-4			2.8E-01			9.3E-02	
Chlorine	7782-50-5	4.2E+00	4.2E+00	4.0E+00	4.0E+00	4.0E+00	4.0E+00	
Health Effects	burning mouth , burning nose , burning of eyes , choking , cough , derm , dizz , head , hypox , irrit Throat, irrit Nose, irrit Eyes, lac , liquid: frostbite , nau , pneu , pulm edema , rhin , subs pain , syncope , vomit							
Target Organs	Eyes, Nose, Stomach							
Chlorite	14998-27-7		1.4E+00	1.4E+00		1.0E+00	1.0E+00	
Chlorite (sodium chlorite)	7758-19-2	1.1E+00	1.1E+00	1.4E+00	3.7E-01	3.7E-01	4.7E-01	D
Chloro-1,3-butadiene	126-99-8			2.8E-01			9.3E-02	2B
Health Effects	alopecia , anxi , carc , derm , irrit eyes , irrit resp sys , irrit skin , irrity , repro effects							
Chloro-2-methylaniline hydrochloride, 4-	3165-93-3			2.1E-01			7.1E-02	B2
Chloro-2-methylaniline, 4-	95-69-2			1.7E-01			5.6E-02	B2
Chloroacetaldehyde	107-20-0			3.6E-01			1.2E-01	
Health Effects	eye damage , irrit eyes , irrit muc memb , irrit skin , pulm edema , resp sys sens , skin burns , skin sens							
Chloroacetaldehyde	107-20-0			3.6E-01			1.2E-01	
Chloroacetic acid	79-11-8	2.8E-01	2.8E-01	2.8E-01	9.3E-02	9.3E-02	9.3E-02	IN
Chloroaniline, 4-	106-47-8			7.0E-03			2.3E-03	2B
Chlorobenzene	108-90-7	5.6E+00	5.6E+00	9.8E-01	1.9E+00	1.9E+00	3.3E-01	D
Health Effects	CNS depres , drow , in animals: kidney inj , in animals: liver inj , in animals: lung inj , inco , irrit eyes , irrit nose , irrit skin							
Target Organs	Liver							
Chlorobenzilate	510-15-6			2.8E-01			9.3E-02	B2
Chlorobenzotrifluoride, 4-	98-56-6			4.2E-01			1.4E-01	
Chlorobutane, 1-	109-69-3			9.8E-01			3.3E-01	D
Chloroform	67-66-3	5.6E+00	5.6E+00	1.4E+00	1.9E+00	1.9E+00	4.7E-01	B2
Health Effects	anes , carc , conf , dizz , enlarged liver , head , irrit eyes , irrit skin , lass , mental dullness , nau							
Target Organs	Liver							
Chloronaphthalene, beta-	91-58-7			2.8E+00			9.3E-01	
Chloronitrobenzene, o-	88-73-3			2.8E-01			9.3E-02	C
Chlorophenol, 2-	95-57-8	7.0E-01	7.0E-01	1.1E-01	2.3E-01	2.3E-01	3.7E-02	

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Appendix D. Military Exposure Guidelines For Water

All concentrations in mg/L (asbestos is in f/L)

Chemical Name	CASRN	5 L/day 7-day Negligible	5 L/day 14-day Negligible	5 L/day 1-year Negligible	15 L/day 7-day Negligible	15 L/day 14-day Negligible	15 L/day 1-year Negligible	Cancer Class
Chlorophenol, 4-	106-48-9	1.4E-01	1.4E-01		4.7E-02	4.7E-02		
Chlorothalonil	1897-45-6	2.8E-01	2.8E-01	2.1E-01	9.3E-02	9.3E-02	7.0E-02	B2
Chlorotoluene, o-	95-49-8	2.8E+00	2.8E+00	2.8E+00	9.3E-01	9.3E-01	9.3E-01	
Health Effects	anes , cough , derm , drow , inco , irrit eyes , irrit muc memb , irrit skin , kidney inj , liver inj							
Target Organs	None							
Chlorotoluene, p-	106-43-4			9.8E+00			3.3E+00	IN
Chlorpropham	101-21-3			2.8E+00			9.3E-01	3
Chlorpyrifos	2921-88-2	4.2E-02	4.2E-02	4.2E-02	1.4E-02	1.4E-02	1.4E-02	
Health Effects	abdom cramps , bluish lips , bluish skin , blurred vision , diarr , lar spasm , miosis , nau , salv , vomit , wheez							
Target Organs	Nervous system - unspecified							
Chlorpyrifos methyl	5598-13-0			1.4E-01			4.7E-02	
Chlorsulfuron	64902-72-3			7.0E-01			2.3E-01	
Chlorthal	2136-79-0	1.4E+02	1.4E+02		4.7E+01	4.7E+01		
Chlorthiophos	60238-56-4			1.1E-02			3.7E-03	
Chromium (III)	16065-83-1			2.1E+01			7.0E+00	D
Health Effects	irrit eyes , sens derm							
Chromium (VI)	18540-29-9			1.3E-01			4.2E-02	A
Chromium, elemental	7440-47-3	1.4E+00	1.4E+00		4.7E-01	4.7E-01		3
Health Effects	irrit eyes , irrit skin , lung fib (histologic)							
Target Organs	Circulatory system - unspecified, GI tract - unspecified, Kidneys, Liver							
Cobalt	7440-48-4			4.2E-02			1.4E-02	B1
Health Effects	asthma , cough , decr pulm func , derm , diffuse nodular fib , dysp , low weight , resp hypersensitivity , wheez							
Target Organs	Blood							
Copper compounds	Cu cmpds	1.4E-01	1.4E-01	1.4E-01	4.7E-02	4.7E-02	4.7E-02	
Copper cyanide	544-92-3			7.0E-01			2.3E-01	
Cresol, m-	108-39-4			7.0E+00			2.3E+00	C
Health Effects	CNS effects: conf , CNS effects: depres , CNS effects: resp fail , derm , dysp , eye burns , irreg rapid resp , irrit eyes , irrit muc memb , irrit skin , kidney damage , liver damage , lung damage , pancreas damage , skin burns , weak pulse							
Target Organs	Respiration - unspecified							
Cresol, o-	95-48-7			7.0E+00			2.3E+00	C
Health Effects	CNS effects: conf , CNS effects: depres , CNS effects: resp fail , derm , dysp , eye burns , irreg rapid resp , irrit eyes , irrit muc memb , irrit skin , kidney damage , liver damage , lung damage , pancreas damage , skin burns , weak pulse							
Target Organs	Nervous system - unspecified							
Cresol, p-	106-44-5			7.0E-02			2.3E-02	C
Health Effects	CNS effects: conf , CNS effects: depres , CNS effects: resp fail , derm , dysp , eye burns , irreg rapid resp , irrit eyes , irrit muc memb , irrit skin , kidney damage , liver damage , lung damage , pancreas damage , skin burns , weak pulse							
Target Organs	Nervous system - unspecified							
Crotonaldehyde, trans-	123-73-9			5.2E-02			1.7E-02	C
Health Effects	irrit Respiration - unspecified, irrit Nose, irrit Eyes, lac Eyes, pares Eyes							

Appendix D. Military Exposure Guidelines For Water

All concentrations in mg/L (asbestos is in f/L)

Chemical Name	CASRN	5 L/day 7-day Negligible	5 L/day 14-day Negligible	5 L/day 1-year Negligible	15 L/day 7-day Negligible	15 L/day 14-day Negligible	15 L/day 1-year Negligible	Cancer Class
Target Organs	Liver							
Cumene	98-82-8	1.5E+01	1.5E+01	4.2E+00	5.1E+00	5.1E+00	1.4E+00	D
Health Effects	coma , derm , head , irrit eyes , irrit muc memb , irrit skin , narco							
Cyanazine	21725-46-2	1.4E-01	1.4E-01	2.8E-02	4.7E-02	4.7E-02	9.3E-03	C
Cyanide	57-12-5	6.0E+00	6.0E+00	2.8E-01	2.0E+00	2.0E+00	9.3E-02	D
Health Effects	giddiness , head , nau , palp , tremors , weak							
Cyanogen	460-19-5			5.6E-01			1.9E-01	
Health Effects	bradycardia , cherry red lips , convuls , dizz , head , hypernea , irrit eyes , irrit nose , irrit upper resp sys , lac , liquid: frostbite , loss of appetite , low weight , tachypnea							
Cyanogen bromide	506-68-3			1.3E+00			4.2E-01	
Cyanogen chloride	506-77-4			7.0E-01			2.3E-01	
Health Effects	conf , cough , delayed pulm edema , dizz , head , irreg heartbeat , irrit eyes , irrit skin (liquid) , irrit upper resp sys , lass , nau , vomit							
Cyclohexanone	108-94-1			7.0E+01			2.3E+01	3
Health Effects	coma , derm , head , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit muc memb , irrit skin , narco							
Cyclohexylamine	108-91-8			4.2E+00			1.4E+00	
Health Effects	cough , diarr , dizz , drow , eye burns , irrit eyes , irrit muc memb , irrit resp sys , irrit skin , nau , pulm edema , skin burns , skin sens , vomit							
Cyhalothrin	68085-85-8	1.4E-01	1.4E-01	1.4E-01	4.7E-02	4.7E-02	4.7E-02	
Cypermethrin	52315-07-8	2.8E-01	2.8E-01	1.4E-01	9.3E-02	9.3E-02	4.7E-02	
Cyromazine	66215-27-8			1.1E-01			3.5E-02	
Dacthal	1861-32-1	2.8E+00	2.8E+00	1.4E-01	9.3E-01	9.3E-01	4.7E-02	
Dalapon	75-99-0	4.2E+00	4.2E+00	4.2E-01	1.4E+00	1.4E+00	2.0E-01	
Health Effects	CNS depres , diarr , irrit eyes , irrit skin , irrit upper resp sys , lass , loss of appetite , skin burns , slowing of pulse , vomit							
Target Organs	Female reproduction - unspecified, Kidneys							
Danitol	39515-41-8			3.5E-01			1.2E-01	
DDD	72-54-8			4.1E-01			1.4E-01	B2
DDE	72-55-9			2.9E-01			9.6E-02	B2
DDT	50-29-3	7.0E-03	7.0E-03	7.0E-03	2.3E-03	2.3E-03	2.3E-03	B2
Health Effects	anxi , carc , conf , convuls , dizz , head , irrit eyes , irrit skin , lass , mal , pares face , pares lips , pares tongue , paresis hands , tremor , vomit							
Target Organs	Developmental - generic, Liver							
Decabromodiphenyl ether	1163-19-5			2.9E-01			9.8E-02	C
Demeton	8065-48-3			5.6E-04			1.9E-04	
Health Effects	abdom cramps , aching eyes , anor , ataxia , card irreg , chest tight , coma , conf , convuls , cyan , diarr , dizz , head , irrit eyes , irrit skin , lar spasm , lass , local sweat , low BP , miosis , musc fasc , nau , para , rhin , salv , vomit , wheez							
Di(2-ethylhexyl)adipate	103-23-1	2.8E+01	2.8E+01	8.4E+00	9.3E+00	9.3E+00	2.8E+00	C
Diallate	2303-16-4			1.6E+00			5.4E-01	B2

Appendix D. Military Exposure Guidelines For Water

All concentrations in mg/L (asbestos is in f/L)

Chemical Name	CASRN	5 L/day 7-day Negligible	5 L/day 14-day Negligible	5 L/day 1-year Negligible	15 L/day 7-day Negligible	15 L/day 14-day Negligible	15 L/day 1-year Negligible	Cancer Class
Diazinon	333-41-5	2.8E-02	2.8E-02	2.8E-02	9.3E-03	9.3E-03	9.3E-03	
Health Effects	abdom cramps , blurred vision , conf , convuls , dizz , dysp , irrit eyes , lass , miosis , nau , salv , vomit							
Target Organs	Blood, Nervous system - unspecified							
Dibenzofuran	132-64-9			5.6E-02			1.9E-02	D
Dibromo-3-chloropropane, 1,2-	96-12-8	2.8E-01	7.0E-02	2.8E-02	9.3E-02	2.3E-02	9.3E-03	B2
Health Effects	carc , drow , irrit eyes , irrit nose , irrit skin , irrit throat , kidney inj , liver inj , nau , pulm edema , sterility , vomit							
Target Organs	Kidneys, Liver, Male reproduction - unspecified, Reproductive - unspecified by gender, Stomach							
Dibromobenzene, 1,4-	106-37-6			1.4E+00			4.7E-01	
Dibromochloromethane	124-48-1			9.8E-01			3.3E-01	C
Dibromoethane, 1,2-	106-93-4			4.9E-02			1.6E-02	LI
Health Effects	carc , derm with vesic , heart damage , irrit eyes , irrit resp sys , irrit skin , kidney damage , liver damage , repro effects , spleen damage							
Target Organs	Stomach, Testes, Thyroid							
Dibromomethane	74-95-3			1.3E-01			4.2E-02	
Dibutyl phthalate	84-74-2			1.4E+01			4.7E+00	D
Health Effects	irrit eyes , irrit stomach , irrit upper resp sys							
Target Organs	Developmental - generic							
Dibutyl tin dichloride	683-18-1			7.0E-02			2.3E-02	
Dicamba	1918-00-9			4.2E-01			1.4E-01	
Dichloroacetic acid	79-43-6	7.0E+00	7.0E+00	1.7E-01	2.3E+00	2.3E+00	5.6E-02	LI
Dichlorobenzene, 1,2-	95-50-1	1.3E+01	1.3E+01	8.4E+00	4.2E+00	4.2E+00	2.8E+00	D
Health Effects	irrit eyes , irrit nose , kidney damage , liver damage , skin blisters							
Target Organs	Kidneys, Liver							
Dichlorobenzene, 1,3-	541-73-1	1.3E+01	1.3E+01	2.8E-01	4.2E+00	4.2E+00	9.3E-02	D
Dichlorobenzene, 1,4-	106-46-7	1.5E+01	1.5E+01	9.8E-01	5.1E+00	5.1E+00	3.3E-01	C
Health Effects	anor , cirr , head , in animals: carc , in animals: kidney inj , in animals: liver inj , irrit eyes , jaun , low weight , nau , profuse rhinitis , swell periorb , vomit							
Target Organs	Liver							
Dichlorobenzidine, 3,3'-	91-94-1			2.2E-01			7.3E-02	B2
Health Effects	carc , caustic burns , dizz , dysuria , frequent urination , GI upset , head , hema , skin derm , skin sens , upper resp infection							
Target Organs	Breasts							
Dichlorodifluoromethane	75-71-8	5.6E+01	5.6E+01	1.3E+01	1.9E+01	1.9E+01	4.2E+00	
Health Effects	asphy , card arrest , card arrhy , dizz , liquid: frostbite , tremor , uncon							
Target Organs	None							
Dichloroethane, 1,1-	75-34-3			2.8E+01			9.3E+00	C
Health Effects	CNS depres , irrit skin , kidney damage , liver damage , lung damage							
Dichloroethane, 1,2-	107-06-2			1.1E+00			3.6E-01	B2
Health Effects	carc , CNS depres , corn opac , CVS damage , derm , irrit eyes , kidney damage , liver damage , nau , vomit							
Target Organs	Blood vessels, Kidneys							
Dichloroethylene, 1,1-	75-35-4	2.8E+00	1.4E+00	1.3E-01	9.3E-01	4.7E-01	4.2E-02	C

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Appendix D. Military Exposure Guidelines For Water

All concentrations in mg/L (asbestos is in f/L)

Chemical Name	CASRN	5 L/day 7-day Negligible	5 L/day 14-day Negligible	5 L/day 1-year Negligible	15 L/day 7-day Negligible	15 L/day 14-day Negligible	15 L/day 1-year Negligible	Cancer Class
Health Effects	carc , dizz , dysp , head , irrit eyes , irrit skin , irrit throat , kidney dist , liver dist , nau , pneu							
Target Organs	Liver							
Dichloroethylene, 1,2-	540-59-0			1.3E-01			4.2E-02	
Health Effects	CNS depres , irrit eyes , irrit resp sys							
Dichloroethylene, cis-1,2-	156-59-2	5.6E+00	1.4E+00	1.4E+00	1.9E+00	4.7E-01	4.7E-01	D
Dichloroethylene, trans-	156-60-5	2.8E+01		2.8E+00	9.3E+00		9.3E-01	
Dichlorophenol, 2,4-	120-83-2			2.8E-01			9.3E-02	
Dichlorophenoxy acetic acid, 2,4-	94-75-7	1.4E+00	4.2E-01	1.4E-01	4.7E-01	1.4E-01	7.0E-02	
Health Effects	convuls , derm , hyporeflexia , in animals: kidney inj , in animals: liver inj , lass , musc twitch , stupor							
Target Organs	Blood, Kidneys, Liver, None							
Dichlorophenoxybutyric acid, 2,4-	94-82-6			1.1E+00			3.7E-01	
Dichloropropane, 1,2-	78-87-5	1.4E+00		9.8E-01	4.7E-01		3.3E-01	B2
Health Effects	carc , dizz , drow , in animals: CNS depres , irrit eyes , irrit resp sys , irrit skin , kidney damage , liver damage							
Target Organs	Blood, Liver, Nervous system - unspecified							
Dichloropropane, 1,3-	142-28-9			2.8E+00			9.3E-01	D
Dichloropropanol, 2,3-	616-23-9			4.2E-02			1.4E-02	
Dichloropropene, 1,3-	542-75-6			5.6E-01			1.9E-01	B2
Health Effects	carc , dizz , eye burns , head , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit resp sys , irrit skin , lac , liver damage , skin burns							
Target Organs	Bladder, GI tract - unspecified, Kidneys							
Dichlorvos	62-73-7	5.6E-02	5.6E-02	4.2E-02	1.9E-02	1.9E-02	1.4E-02	B2
Health Effects	aching eyes , anor , ataxia , card irreg , chest tight , convuls , cyan , diarr , dizz , head , irrit eyes , irrit skin , lar spasm , low BP , miosis , musc fasc , nau , para , rhin , salv , sweat , vomit , wheez							
Target Organs	Blood, Nervous system - unspecified, Pancreas, Stomach							
Dicyclopentadiene	77-73-6			1.1E+00			3.7E-01	IN
Health Effects	cough , head , in animals: kidney damage , in animals: lung damage , inco , irrit eyes , irrit nose , irrit skin , irrit throat , skin blisters , sneez							
Dieldrin	60-57-1			1.4E-03			4.7E-04	B2
Health Effects	carc , clonic convuls , coma , dizz , head , in animals: kidney damage , in animals: liver damage , mal , myoclonic limb jerks , nau , sweat , tonic convuls , vomit							
Target Organs	Liver, Nervous system - unspecified							
Diethyl phthalate	84-66-2			1.1E+02			3.7E+01	D
Health Effects	dizz , head , in animals: repro effects , irrit eyes , irrit nose , irrit skin , irrit throat , lac , lass in arms & legs , nau , numb in arms & legs , pain in arms & legs , possible polyneur dysfunc , possible vestibular dist , spasms in arms & legs							
Target Organs	Liver, Reproductive - unspecified by gender							
Diethylene glycol monobutyl ether	112-34-5			4.2E+00			1.4E+00	D
Diethylene glycol monoethyl ether	111-90-0			8.4E+00			2.8E+00	D
Diethylformamide	617-84-5			1.4E-02			4.7E-03	D
Diethylstilbestrol	56-53-1			2.1E+01			7.0E+00	A

Appendix D. Military Exposure Guidelines For Water

All concentrations in mg/L (asbestos is in f/L)

Chemical Name	CASRN	5 L/day 7-day Negligible	5 L/day 14-day Negligible	5 L/day 1-year Negligible	15 L/day 7-day Negligible	15 L/day 14-day Negligible	15 L/day 1-year Negligible	Cancer Class
Difenzoquat	43222-48-6			1.1E+00			3.7E-01	
Diflubenzuron	35367-38-5			2.8E-01			9.3E-02	
Diisopropyl methylphosphonate	1445-75-6			1.1E+01			3.7E+00	D
Dimethipin	55290-64-7			2.8E-01			9.3E-02	C
Dimethoate	60-51-5			2.8E-03			9.3E-04	
Dimethoxybenzidine, 3,3'-	119-90-4			7.0E+00			2.3E+00	B2
Health Effects	in animals: carc , in animals: kidney damage , in animals: liver damage , in animals: spleen changes , in animals: thyroid changes , irrit skin							
Target Organs	Stomach							
Dimethrin	70-38-2	1.4E+01	1.4E+01		4.7E+00	4.7E+00		
Dimethyl methylphosphonate	756-79-6	2.8E+00	2.8E+00	8.4E-01	9.3E-01	9.3E-01	2.8E-01	
Dimethyl terephthalate	120-61-6			1.4E+00			4.7E-01	
Dimethylaniline hydrochloride, 2,4-	21436-96-4			1.7E-01			5.6E-02	C
Dimethylaniline, 2,4-	95-68-1			1.3E-01			4.4E-02	C
Dimethylaniline, N,N-	121-69-7			2.8E-01			9.3E-02	3
Health Effects	anoxia symptoms: ataxia , anoxia symptoms: cyan , anoxia symptoms: dizz , anoxia symptoms: lass , anoxia symptoms: methemo							
Dimethylbenzidine, 3,3'-	119-93-7			8.9E-03			3.0E-03	B2
Health Effects	carc , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit nose							
Target Organs	Breasts							
Dimethylformamide	68-12-2			4.2E+00			1.4E+00	3
Health Effects	colic , derm , enlarged liver , face flush , high BP , in animals: heart damage , in animals: kidney damage , irrit eyes , irrit resp sys , irrit skin , liver damage , nau , vomit							
Dimethylhydrazine, 1,2-	540-73-8			1.1E-02			3.7E-03	B2
Health Effects	dysp , head , irrit Throat, irrit Skin, irrit Respiration - unspecified, irrit Nervous system - unspecified, nau , tight Respiration - unspecified, vomit , weak							
Target Organs	Liver							
Dimethylphenol, 2,4-	105-67-9			7.0E-01			2.3E-01	
Dimethylphenol, 2,6-	576-26-1			8.4E-02			2.8E-02	
Dimethylphenol, 3,4-	95-65-8			1.4E-01			4.7E-02	
Dinitrobenzene, 1,2-	528-29-0			1.4E-02			4.7E-03	D
Health Effects	anemia , anoxia , bad taste , burning mouth , central scotomas , cyan , dry throat , liver damage , thirst , vis dist , yellowing eyes , yellowing hair , yellowing skin							
Dinitrobenzene, 1,3-	99-65-0	5.6E-02	5.6E-02	1.4E-02	1.9E-02	1.9E-02	4.7E-03	D
Health Effects	anemia , anoxia , bad taste , burning mouth , central scotomas , cyan , dry throat , liver damage , thirst , vis dist , yellowing eyes , yellowing hair , yellowing skin							
Target Organs	Blood, Reproductive - unspecified by gender, Sperm, Spleen, Testes							
Dinitro-o-cresol, 4,6-	534-52-1	5.6E-02	5.6E-02	5.6E-02	1.9E-02	1.9E-02	1.9E-02	D
Health Effects	coma , cough , excess thirst , fever , head , hyperpnea , lass , profuse sweat , sense of well being , short breath , tacar							
Target Organs	Nervous system - unspecified							

Appendix D. Military Exposure Guidelines For Water

All concentrations in mg/L (asbestos is in f/L)

Chemical Name	CASRN	5 L/day 7-day Negligible	5 L/day 14-day Negligible	5 L/day 1-year Negligible	15 L/day 7-day Negligible	15 L/day 14-day Negligible	15 L/day 1-year Negligible	Cancer Class
Dinitro-o-cyclohexyl phenol, 4,6-	131-89-5			2.8E-01			9.3E-02	
Dinitrophenol, 2,4-	51-28-5			2.8E-01			9.3E-02	
Dinitrotoluene	25321-14-6			1.4E-01			4.8E-02	B2
Health Effects	anemia , anoxia , carc , cyan , jaun , repro effects							
Target Organs	Breasts, Liver							
Dinitrotoluene, 2,4-	121-14-2	7.0E-01	7.0E-01	2.8E-02	2.3E-01	2.3E-01	9.3E-03	2B
Dinitrotoluene, 2,6-	606-20-2	5.6E-01	5.6E-01	1.4E-01	1.9E-01	1.9E-01	4.7E-02	2B
Di-n-octyl phthalate	117-84-0	4.2E+01	4.2E+01	5.6E+00	1.4E+01	1.4E+01	1.9E+00	D
Dinoseb	88-85-7	4.2E-01	4.2E-01	1.4E-02	1.4E-01	1.4E-01	7.0E-03	D
Dioxane, 1,4-	123-91-1			8.4E+00			2.8E+00	B2
Health Effects	carc , drow , head , irrit eyes , irrit nose , irrit skin , irrit throat , kidney failure , liver damage , nau , vomit							
Target Organs	Liver, Nose, Respiration - unspecified							
Diphenamid	957-51-7	4.2E-01	4.2E-01	4.2E-01	1.4E-01	1.4E-01	1.4E-01	
Diphenylamine	122-39-4			3.5E-01			1.2E-01	
Health Effects	bladder inj , cough , eczema , heart rate , hema , hypertension , in animals: terato effects , incr BP , irrit eyes , irrit muc memb , irrit skin , methemo , prot , sneez , tacar							
Target Organs	Kidneys, Liver, Spleen, Whole body							
Diphenylhydrazine, 1,2-	122-66-7			1.2E-01			4.1E-02	B2
Diquat	85-00-7			3.1E-02			2.0E-02	
Health Effects	chest pain , convuls , cough , delayed healing of wounds , diarr , dysp , epis , irrit eyes , irrit muc memb , irrit resp sys , irrit skin , kidney , liver inj , mal , nau , pulm edema , rhin , skin burns , tremor , vomit							
Target Organs	Eyes							
Direct black 38	1937-37-7			1.1E-02			3.8E-03	A
Direct blue 6	2602-46-2			1.2E-02			4.0E-03	A
Direct brown 95	16071-86-6			1.1E-02			3.5E-03	A
Disulfoton	298-04-4	1.4E-02	1.4E-02	1.3E-03	4.7E-03	4.7E-03	4.2E-04	
Health Effects	abdom cramps , blurred vision , card irreg , chest tight , diarr , dizz , dysp , eye burns , head , irrit eyes , irrit skin , lass , miosis , musc fasc , nau , rhin , salv , skin burns , vomit							
Target Organs	Blood, Developmental - generic, Nerves, Nervous system - unspecified							
Dithiane, 1,4-	505-29-3			1.4E+00			4.7E-01	D
Diuron	330-54-1	1.4E+00	1.4E+00	2.8E-02	4.7E-01	4.7E-01	9.3E-03	
Health Effects	in animals: anemia , in animals: methemo , irrit eyes , irrit nose , irrit skin , irrit throat							
Target Organs	Blood, Developmental - generic, Whole body							
Dodine	2439-10-3			5.6E-02			1.9E-02	
EA 2192	73207-98-4			8.4E-06			2.8E-06	
EMPA	1832-53-7			3.5E-01			1.2E-01	
Endosulfan	115-29-7			7.0E-02			2.3E-02	
Health Effects	agitation , conf , convuls , decr testis weight , dry mouth , flushing , head , in animals: kidney inj , in animals: liver inj , irrit skin , nau , tremor							
Target Organs	IMM system - unspecified, Liver							

Appendix D. Military Exposure Guidelines For Water

All concentrations in mg/L (asbestos is in f/L)

Chemical Name	CASRN	5 L/day 7-day Negligible	5 L/day 14-day Negligible	5 L/day 1-year Negligible	15 L/day 7-day Negligible	15 L/day 14-day Negligible	15 L/day 1-year Negligible	Cancer Class
Endothall	145-73-3	1.1E+00	1.1E+00	2.8E-01	3.7E-01	3.7E-01	1.0E-01	
Endrin	72-20-8	2.8E-02		2.8E-02	9.3E-03		9.3E-03	D
Health Effects	abdom discomfort , aggressiveness , anor , conf , dizz , drow , epilep convuls , head , in animals: liver damage , insom , lass , nau , stupor , vomit							
Target Organs	Heart, Kidneys, Nervous system - unspecified, Whole body							
Epichlorohydrin	106-89-8	1.4E-01	1.4E-01	8.4E-02	4.7E-02	4.7E-02	2.8E-02	B2
Health Effects	abdom pain , carc , cough , cyan , irrit eyes , irrit skin with deep pain , nau , repro effects , resp distress , vomit							
Target Organs	Stomach							
EPTC	759-94-4			3.5E-01			1.2E-01	
Ethephon	16672-87-0			7.0E-02			2.3E-02	
Ethion	563-12-2	2.8E-02	2.8E-02	2.8E-02	9.3E-03	9.3E-03	9.3E-03	
Health Effects	abdom cramps , blurred vision , card irreg , chest tight , diarr , dizz , dysp , head , irrit eyes , irrit skin , lass , miosis , musc fasc , nau , rhin , salv , vomit							
Target Organs	Nervous system - unspecified							
Ethoxyethanol, 2-	110-80-5			7.0E+00			2.3E+00	
Health Effects	in animals: blood changes , in animals: irrit eyes , in animals: irrit resp sys , in animals: kidney damage , in animals: liver damage , in animals: lung damage , in animals: repro effects , in animals: terato effects							
Ethyl acetate	141-78-6			1.3E+02			4.2E+01	
Health Effects	derm , irrit eyes , irrit nose , irrit skin , irrit throat , narco							
Ethyl acrylate	140-88-5			2.0E+00			6.8E-01	B2
Health Effects	carc , irrit eyes , irrit resp sys , irrit skin							
Target Organs	Stomach							
Ethyl chloride	75-00-3			1.4E+00			4.7E-01	3
Health Effects	abdom cramps , card arrest , card arrhy , inco , inebri , kidney damage , liver damage							
Ethyl ether	60-29-7			7.0E+00			2.3E+00	
Health Effects	dizz , drow , excited , head , irrit eyes , irrit skin , irrit upper resp sys , narco , nau , vomit							
Ethyl methacrylate	97-63-2			1.3E+00			4.2E-01	
Ethyl p-nitrophenyl phenylphosphorothioate	2104-64-5			1.4E-03			4.7E-04	
Health Effects	abdom cramps , anor , card irreg , chest tight , convuls , cyan , diarr , head , irrit eyes , irrit skin , lac , lar spasm , low BP , miosis , nau , para , rhin , salv , wheez							
Ethylbenzene	100-41-4			7.0E+00			7.0E-01	D
Health Effects	coma , derm , head , irrit eyes , irrit muc memb , irrit skin , narco							
Target Organs	Kidneys, Liver							
Ethylene cyanohydrin	109-78-4			1.4E+00			4.7E-01	IN
Ethylene diamine	107-15-3			2.8E+00			9.3E-01	D
Health Effects	asthma , asthma , cough , irrit Nose, irrit nose , irrit resp sys , kidney damage , liver damage , phlegm , resp , sens derm , wheez							
Ethylene glycol	107-21-1	2.8E+01		1.1E+01	9.3E+00		3.7E+00	
Health Effects	abdom pain , CNS depres , convuls , dizz , irrit eyes , irrit nose , irrit skin , irrit throat , lass , nau , skin sens , stupor , vomit							
Target Organs	Developmental - generic, Kidneys							
Ethylene glycol monobutyl ether	111-76-2	5.6E+00	5.6E+00	9.8E-01	1.9E+00	1.9E+00	3.3E-01	C
Health Effects	CNS depres , head , hema , hemolysis , irrit eyes , irrit nose , irrit skin , irrit throat , vomit							

Appendix D. Military Exposure Guidelines For Water

All concentrations in mg/L (asbestos is in f/L)

Chemical Name	CASRN	5 L/day 7-day Negligible	5 L/day 14-day Negligible	5 L/day 1-year Negligible	15 L/day 7-day Negligible	15 L/day 14-day Negligible	15 L/day 1-year Negligible	Cancer Class
Target Organs	Blood, Liver							
Ethylene oxide	75-21-8			9.6E-02			3.2E-02	B1
Health Effects	cyan , diarr , drow , dysp , EKG abnor , eye burns (liq or high vap conc) , head , in animals: carc , in animals: convuls , in animals: kidney damage , in animals: liver damage , inco , irrit eyes , irrit nose , irrit skin , irrit throat , lass , liquid:							
Target Organs	Stomach							
Ethylene thiourea	96-45-7	4.2E-01	4.2E-01	1.1E-03	1.4E-01	1.4E-01	3.7E-04	B2
Health Effects	in animals: carc , in animals: goiter , in animals: terato effects , in animals: thickening of the skin , irrit eyes							
Target Organs	Conceptuses/Fetuses, Female reproduction - unspecified, Liver, Thyroid							
Ethylphthalyl ethyl glycolate	84-72-0			4.2E+01			1.4E+01	
Express	101200-48-0			1.1E-01			3.7E-02	
Fenamiphos	22224-92-6	1.3E-02	1.3E-02	3.5E-03	4.2E-03	4.2E-03	1.2E-03	
Health Effects	abdom cramps , blurred vision , card irreg , chest tight , diarr , dizz , dysp , head , lass , miosis , musc fasc , nau , rhin , salv , vomit							
Target Organs	Blood, Conceptuses/Fetuses, Female reproduction - unspecified							
Fluometuron	2164-17-2	2.8E+00	2.8E+00	1.8E-01	9.3E-01	9.3E-01	6.1E-02	3
Fluoranthene	206-44-0			5.6E+00			1.9E+00	D
Fluorene	86-73-7			5.6E+00			1.9E+00	D
Fluoride	16984-48-8			4.0E+00			2.0E+00	3
Fluorine	7782-41-4			8.4E-01			2.8E-01	
Health Effects	eye burns , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit nose , irrit resp sys , lar spasm , pulm edema , skin burns , wheez							
Fluridone	59756-60-4			1.1E+00			3.7E-01	
Flurprimidol	56425-91-3			2.8E-01			9.3E-02	
Flutolanil	66332-96-5			8.4E-01			2.8E-01	
Fluvalinate	69409-94-5			1.4E-01			4.7E-02	
Folpet	133-07-3			1.4E+00			4.7E-01	B2
Fomesafen	72178-02-0			5.2E-01			1.7E-01	C
Fonofos	944-22-9	2.8E-02	2.8E-02	2.8E-02	9.3E-03	9.3E-03	9.3E-03	
Health Effects	abdom cramps , blurred vision , card irreg , chest tight , diarr , dizz , dysp , head , lass , miosis , musc fasc , nau , rhin , salv , vomit							
Target Organs	Blood							
Formaldehyde	50-00-0	1.4E+01	7.0E+00	4.2E+00	4.7E+00	2.3E+00	1.4E+00	B1
Health Effects	carc , cough , derm , irrit eyes , irrit nose , irrit resp sys , irrit throat , lac , wheez							
Target Organs	GI tract - unspecified							
Fosetyl-aluminum	39148-24-8			4.2E+01			1.4E+01	C
Furan	110-00-9			1.4E-01			4.7E-02	2B
Furazolidone	67-45-8			2.6E-02			8.6E-03	B2
Furfural	98-01-1			4.2E-01			1.4E-01	3
Health Effects	derm , head , irrit eyes , irrit skin , irrit upper resp sys							

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Appendix D. Military Exposure Guidelines For Water

All concentrations in mg/L (asbestos is in f/L)

Chemical Name	CASRN	5 L/day 7-day Negligible	5 L/day 14-day Negligible	5 L/day 1-year Negligible	15 L/day 7-day Negligible	15 L/day 14-day Negligible	15 L/day 1-year Negligible	Cancer Class
Furium	531-82-8			2.0E-03			6.5E-04	B2
Furmecyclox	60568-05-0			3.3E+00			1.1E+00	B2
Fusariotoxin T2	21259-20-1	2.6E-02			8.7E-03			
Health Effects	diarr , generalized burning erythema , mental confusion , nau , vomit							
GA	77-81-6	1.4E-01			4.6E-02			
Health Effects	abdom cramps , diarr , head , resp distress , see entries for GB , vomit							
GB	107-44-8	2.8E-02			9.3E-03			
Health Effects	abdom cramps , cramp , decr RBC-ChE, diarr , dysp , head , head , irrit Throat, irrit Eyes, mal , miosis Eyes, miosis , nau , photo Eyes, resp distress , rhin , tight Chest, vomit , vomit							
GD	96-64-0	1.2E-02			4.0E-03			
Health Effects	abdom cramps , diarr , head , resp distress , see entries for GB , vomit							
Glufosinate ammonium	77182-82-2			5.6E-02			1.9E-02	
Glycidaldehyde	765-34-4			5.6E-02			1.9E-02	B2
Glyphosate	1071-83-6	2.8E+01	2.8E+01	1.4E+00	9.3E+00	9.3E+00	7.0E-01	D
Haloxyfop-methyl	69806-40-2			7.0E-04			2.3E-04	
Harmony	79277-27-3			1.8E-01			6.1E-02	
HD	505-60-2	1.4E-01	1.4E-01	9.8E-04	4.7E-02	4.7E-02	3.3E-04	1
Health Effects	blepharospasm , blisters Skin, burn Skin, cell damage/death Skin, conj Eyes, conjunctivitis Eyes, erythema Skin, eye reddening Eyes, head , irrit Eyes, itching rash Skin, lac Eyes, lar Larynx, photo Eyes, pulm Lungs, rhinitis , swell , swell Eyes, swellin							
Target Organs	Developmental - generic, GI tract - unspecified							
Heptachlor	76-44-8	1.4E-02	1.4E-02	1.4E-03	4.7E-03	4.7E-03	4.7E-04	B2
Health Effects	in animals: carc , in animals: convuls , in animals: liver damage , in animals: tremor							
Target Organs	IMM system - unspecified, Liver							
Heptachlor epoxide	1024-57-3	1.4E-02		2.0E-04	4.7E-03		2.0E-04	B2
Hexabromobenzene	87-82-1			2.8E-01			9.3E-02	
Hexachlorobenzene	118-74-1	7.0E-02	7.0E-02	1.4E-03	2.3E-02	2.3E-02	1.0E-03	B2
Hexachlorobutadiene	87-68-3	4.2E-01	4.2E-01	1.4E-02	1.4E-01	1.4E-01	4.7E-03	C
Health Effects	in animals: carc , in animals: irrit eyes , in animals: irrit resp sys , in animals: irrit skin , in animals: kidney damage							
Target Organs	Kidneys							
Hexachlorocyclohexane, alpha-	319-84-6			1.6E-02			5.2E-03	B2
Hexachlorocyclohexane, beta-	319-85-7	7.0E-01	7.0E-01	8.4E-03	2.3E-01	2.3E-01	2.8E-03	C
Hexachlorocyclohexane, technical	608-73-1			5.4E-02			1.8E-02	B2
Hexachlorocyclopentadiene	77-47-4			2.5E-01			8.4E-02	E
Health Effects	cough , diarr , dysp , eye burns , in animals: kidney inj , in animals: liver inj , irrit eyes , irrit resp sys , irrit skin , lac , nau , pulm edema , salv , skin burns , sneez , vomit							
Target Organs	Kidneys							
Hexachloroethane	67-72-1	7.0E+00	7.0E+00	1.4E-01	2.3E+00	2.3E+00	4.7E-02	C

Appendix D. Military Exposure Guidelines For Water

All concentrations in mg/L (asbestos is in f/L)

Chemical Name	CASRN	5 L/day 7-day Negligible	5 L/day 14-day Negligible	5 L/day 1-year Negligible	15 L/day 7-day Negligible	15 L/day 14-day Negligible	15 L/day 1-year Negligible	Cancer Class
Health Effects	in animals: carc , in animals: kidney damage , irrit eyes , irrit muc memb , irrit skin							
Target Organs	Kidneys, Liver							
Hexachlorophene	70-30-4			1.3E-02			4.2E-03	3
Hexane, commercial	110-54-3	1.4E+01	5.6E+00	4.2E+00	4.7E+00	1.9E+00	1.4E+00	
Health Effects	chemical pneu (aspir liquid) , derm , dizz , head , irrit eyes , irrit nose , nau , peri neur: musc weak , peri neur: numb extremities							
Hexanone, 2-	591-78-6			7.0E-02			2.3E-02	
Health Effects	derm , drow , head , irrit eyes , irrit nose , peri neur: lass , peri neur: pares							
Hexazinone	51235-04-2	4.2E+00	2.8E+00	4.6E-01	1.4E+00	9.3E-01	1.5E-01	
HMX	2691-41-0	7.0E+00	7.0E+00	7.0E+00	2.3E+00	2.3E+00	2.3E+00	D
Hydrazine	302-01-2			3.3E-02			1.1E-02	B2
Health Effects	carc , convuls , derm , dizz , eye burns , in animals: bron , in animals: pulm edema , irrit eyes , irrit nose , irrit skin , irrit throat , kidney damage , liver damage , nau , skin burns , temporary blindness							
Target Organs	Liver							
Hydrogen cyanide	74-90-8	6.0E-03	6.0E-03		2.0E-03	2.0E-03		
Health Effects	anor , asphy , blood changes , conf , dizz , ftg , giddiness , head , head , incr rate and depth of respiration or respiration slow and gasping , irrit Eyes, lass , nau , nau , nau , numb , palp , thyroid changes , tremors , tremors , vertigo , vomit , vo							
Hydrogen sulfide	7783-06-4			4.2E-01			1.4E-01	IN
Health Effects	apnea , coma , conj , convuls , corn vesic , dizz , eye pain , GI dist , head , insom , irrit eyes , irrit resp sys , irrity , lac , lass , liquid: frostbite , photo							
Hydroquinone	123-31-9			1.6E+00			5.4E-01	C
Health Effects	CNS excitement , collapse , colored urine , delirium , derm , dizz , irrit eyes: conj , irrit skin , kera , musc twitch , nau , rapid breath , sens , suffocation							
Imazalil	35554-44-0			1.8E-01			6.1E-02	
Imazaquin	81335-37-7			3.5E+00			1.2E+00	
Iodine	7553-56-2	1.4E-01	1.4E-01	1.4E-01	4.7E-02	4.7E-02	4.7E-02	
Health Effects	chest tight , cutaneous hypersensitivity , head , irrit eyes , irrit nose , irrit skin , lac , rash , skin burns							
Target Organs	Hormones - unspecified							
Iprodione	36734-19-7			5.6E-01			1.9E-01	
Iron	7439-89-6			9.8E+00			3.3E+00	
Isobutyl alcohol	78-83-1			4.2E+01			1.4E+01	
Health Effects	drow , head , in animals: narco , irrit eyes , irrit skin , irrit throat , skin cracking							
Isophorone	78-59-1			2.8E+01			9.3E+00	C
Health Effects	derm , dizz , head , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit nose , irrit throat , lass , mal , narco , nau							
Target Organs	Liver, Male supporting structures, Other							
Isopropalin	33820-53-0			2.1E+00			7.0E-01	
Isopropyl methyl phosphonic acid	1832-54-8	4.2E+01	4.2E+01	1.4E+01	1.4E+01	1.4E+01	4.7E+00	D
Isoxaben	82558-50-7			7.0E-01			2.3E-01	C
Lactofen	77501-63-4			2.8E-02			9.3E-03	
Lewisite	541-25-3	8.0E-02			2.7E-02			
Health Effects	GI tract injury							

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Appendix D. Military Exposure Guidelines For Water

All concentrations in mg/L (asbestos is in f/L)

Chemical Name	CASRN	5 L/day 7-day Negligible	5 L/day 14-day Negligible	5 L/day 1-year Negligible	15 L/day 7-day Negligible	15 L/day 14-day Negligible	15 L/day 1-year Negligible	Cancer Class
Lewisite oxide	3088-37-7			4.2E-03			1.4E-03	
Lindane	58-89-9	6.0E-01	6.0E-01	4.2E-02	2.0E-01	2.0E-01	1.4E-02	B2
Health Effects	aplastic anemia , clonic convuls , cyan , head , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit nose , irrit skin , irrit throat , musc spasm , nau , resp difficulty							
Target Organs	Developmental - generic, IMM system - unspecified, Liver, Nerves							
Linuron	330-55-2			2.8E-02			9.3E-03	C
Lithium	7439-93-2			2.8E-02			9.3E-03	
Londax	83055-99-6			2.8E+00			9.3E-01	
Lutetium	7439-94-3			7.0E+00			2.3E+00	
Magnesium	7439-95-4	1.0E+02	1.0E+02		3.0E+01	3.0E+01		
Health Effects	apathy , delirium , heat stroke , impaired coord , laxative effects , weariness							
Malathion	121-75-5	2.8E-01	2.8E-01	2.8E-01	9.3E-02	9.3E-02	9.3E-02	3
Health Effects	abdom cramps , aching eyes , anor , ataxia , blurred vision , chest tight , conf , diarr , dizz , head , irrit eyes , irrit skin , lac , lar spasm , miosis , nau , rhin , salv , vomit , wheez							
Target Organs	Nervous system - unspecified							
Maleic anhydride	108-31-6			1.4E+00			4.7E-01	
Health Effects	bronchial asthma , conj , derm , double vision , irrit nose , irrit upper resp sys , photo vision							
Maleic hydrazide	123-33-1	1.4E+01	1.4E+01	7.0E+00	4.7E+00	4.7E+00	2.3E+00	3
Malononitrile	109-77-3			1.4E-02			4.7E-03	D
Health Effects	abdom pain , conf , convuls , dizz , dysp , head , irrit eyes , irrit nose , irrit skin , irrit throat , lass , nau , vomit							
Mancozeb	8018-01-7			4.2E-01			1.4E-01	
Maneb	12427-38-2			7.0E-01			2.3E-01	3
Manganese	7439-96-5			2.0E+00			6.5E-01	D
Health Effects	asthenia , insom , kidney damage , lass , low-back pain , mal , mental conf , metal fume fever: chest tight , metal fume fever: cough , metal fume fever: dry throat , metal fume fever: dysp , metal fume fever: flu-like fever , metal fume fever: rales , Pa							
Target Organs	Nervous system - unspecified, None							
MCPA	94-74-6	1.4E-01	1.4E-01	7.0E-03	4.7E-02	4.7E-02	2.3E-03	
MCPB	94-81-5			1.4E+00			4.7E-01	
MCPP	93-65-2			1.4E-01			4.7E-02	
Mephosfolan	950-10-7			1.3E-02			4.2E-03	
Mepiquat chloride	24307-26-4			4.2E+00			1.4E+00	
Mercuric chloride	7487-94-7			4.2E-02			1.4E-02	C
Mercuric sulfide	1344-48-5			4.2E-03			1.4E-03	D
Merphos	150-50-5			4.2E-03			1.4E-03	
Merphos oxide	78-48-8			4.2E-03			1.4E-03	
Metalaxyl	57837-19-1			8.4E-01			2.8E-01	
Methacrylonitrile	126-98-7			1.4E-02			4.7E-03	
Health Effects	in animals: convuls , in animals: loss of motor control in hind limbs , irrit eyes , irrit skin , lac							
Methamidophos	10265-92-6			7.0E-04			2.3E-04	

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Appendix D. Military Exposure Guidelines For Water

All concentrations in mg/L (asbestos is in f/L)

Chemical Name	CASRN	5 L/day 7-day Negligible	5 L/day 14-day Negligible	5 L/day 1-year Negligible	15 L/day 7-day Negligible	15 L/day 14-day Negligible	15 L/day 1-year Negligible	Cancer Class
Methanol	67-56-1			7.0E+01			2.3E+01	
Health Effects	derm , dizz , drow , head , irrit eyes , irrit skin , irrit upper resp sys , nau , optic nerve damage (blindness) , vis dist , vomit							
Methidathion	950-37-8			1.4E-02			4.7E-03	C
Methomyl	16752-77-5	4.2E-01	4.2E-01	3.5E-01	1.4E-01	1.4E-01	1.2E-01	
Health Effects	abdom cramps , blurred vision , dysp , irrit eyes , kidney damage , lass , liver damage , miosis , musc twitch , nau , salv , vomit							
Target Organs	Blood							
Methoxy-5-nitroaniline, 2-	99-59-2			2.1E+00			7.1E-01	B2
Methoxychlor	72-43-5	7.0E-02	7.0E-02	7.0E-02	4.0E-02	4.0E-02	4.0E-02	D
Health Effects	in animals: carc , in animals: convuls , in animals: fasc , in animals: kidney damage , in animals: liver damage , in animals: trembling							
Target Organs	Liver, None, Reproductive - unspecified by gender, Whole body							
Methoxyethanol, 2-	109-86-4			1.4E-01			4.7E-02	
Health Effects	anemic pallor , ataxia , drow , head , in animals: repro effects , in animals: terato effects , irrit eyes , irrit nose , irrit throat , lass , tremor							
Methoxyethyl acetate, 2-	110-49-6			2.8E-01			9.3E-02	
Health Effects	brain damage , in animals: narco , irrit eyes , irrit nose , irrit throat , kidney damage , repro effects , terato effects							
Methyl acetate	79-20-9			1.4E+02			4.7E+01	
Health Effects	chest tight , drow , head , in animals: narco , irrit eyes , irrit nose , irrit skin , irrit throat , optic nerve atrophy							
Methyl acrylate	96-33-3			4.2E-01			1.4E-01	D
Health Effects	irrit eyes , irrit skin , irrit upper resp sys							
Methyl bromide	74-83-9	1.4E-01	1.4E-01	7.0E-02	4.7E-02	4.7E-02	2.3E-02	D
Health Effects	carc , convuls , dizz , dysp , hand tremor , head , inco , irrit eyes , irrit resp sys , irrit skin , liquid: frostbite , mal , musc weak , nau , skin vesic , vis dist , vomit							
Target Organs	GI tract - unspecified, Stomach							
Methyl chloride	74-87-3	1.3E+01		7.5E+00	4.2E+00		2.5E+00	D
Health Effects	carc , coma , convuls , dizz , kidney damage , liquid: frostbite , liver damage , nau , repro effects , slurred speech , stagger , terato effects , vis dist , vomit							
Target Organs	Kidneys, Nervous system - unspecified							
Methyl ethyl ketone	78-93-3	1.1E+02		2.8E+01	3.5E+01		9.3E+00	IN
Health Effects	derm , dizz , head , irrit eyes , irrit nose , irrit skin , vomit							
Methyl isobutyl ketone	108-10-1			1.1E+01			3.7E+00	IN
Health Effects	coma , derm , head , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit muc memb , irrit skin , narco							
Methyl methacrylate	80-62-6			1.1E+00			3.7E-01	E
Health Effects	derm , irrit eyes , irrit nose , irrit skin , irrit throat							
Methyl parathion	298-00-0	4.2E-01	4.2E-01	9.8E-03	1.4E-01	1.4E-01	3.3E-03	3
Health Effects	abdom cramps , blurred vision , card irreg , chest tight , diarr , dizz , dysp , head , irrit eyes , irrit skin , lass , miosis , musc fasc , nau , rhin , salv , vomit							
Target Organs	Blood, Nervous system - unspecified							
Methyl tertiary butyl ether	1634-04-4	5.6E+00	5.6E+00	4.2E+00	1.9E+00	1.9E+00	1.4E+00	3
Methyl-5-nitroaniline, 2-	99-55-8			3.0E+00			9.9E-01	C

Appendix D. Military Exposure Guidelines For Water

All concentrations in mg/L (asbestos is in f/L)

Chemical Name	CASRN	5 L/day 7-day Negligible	5 L/day 14-day Negligible	5 L/day 1-year Negligible	15 L/day 7-day Negligible	15 L/day 14-day Negligible	15 L/day 1-year Negligible	Cancer Class
Methylaniline hydrochloride, 2-	636-21-5			5.4E-01			1.8E-01	B2
Methylaniline, 2-	95-53-4			4.1E-01			1.4E-01	B2
Health Effects	anoxia , carc , cyan , derm , dizz , drow , eye burns , head , irrit eyes , lass , micro hema							
Target Organs	Skin							
Methylcyclopentane	96-37-7			5.6E+00			1.9E+00	D
Methylene chloride	75-09-2	1.4E+01	2.8E+00	8.4E-01	4.7E+00	9.3E-01	2.8E-01	B2
Health Effects	carc , dizz , drow , irrit eyes , irrit skin , lass , nau , numb limbs , tingle limbs							
Target Organs	Liver, Nervous system - unspecified							
Methylene-bis(2-chroloaniline), 4,4'-	101-14-4			2.8E-02			9.3E-03	LI
Health Effects	carc , cyan , hema , kidney irrit , methemo , nau							
Target Organs	Liver, Lungs							
Methylenebis(N,N'-dimethyl)aniline, 4,4'-	101-61-1			2.1E+00			7.1E-01	B2
Methylenedianiline, 4,4'-	101-77-9	2.8E+00	2.8E+00	1.1E+00	9.3E-01	9.3E-01	3.7E-01	2B
Health Effects	hepatitis , in animals: carc , in animals: heart damage , in animals: liver damage , in animals: spleen damage , irrit eyes , jaun , myocardial damage							
Target Organs	Liver							
Methylmercury	22967-92-6			1.4E-03			4.7E-04	C
Methylnaphthalene, 1-	90-12-0			9.8E-01			3.3E-01	
Methylnapthalene, 2-	91-57-6			5.6E-02			1.9E-02	IN
Methylstyrene, alpha-	98-83-9			9.8E+00			3.3E+00	
Health Effects	derm , drow , irrit eyes , irrit nose , irrit skin , irrit throat							
Metolachlor	51218-45-2	2.8E+00	2.8E+00	2.1E+00	9.3E-01	9.3E-01	7.0E-01	C
Metribuzin	21087-64-9	7.0E+00	7.0E+00	3.5E-01	2.3E+00	2.3E+00	1.2E-01	D
Health Effects	in animals: CNS depres , liver enzyme changes , thyroid changes							
Target Organs	Whole body							
Mineral oil, white	8042-47-5			4.2E+02			1.4E+02	3
Mirex	2385-85-5			2.8E-03			9.3E-04	B2
Molinate	2212-67-1			2.8E-02			9.3E-03	
Molybdenum	7439-98-7	1.1E-01	1.1E-01	7.0E-02	3.7E-02	3.7E-02	2.3E-02	
Health Effects	anemia , in animals: anor , in animals: diarr , in animals: dysp , in animals: inco , in animals: irrit eyes , in animals: irrit nose , in animals: irrit throat , in animals: kidney damage , in animals: listlessness , in animals: liver damage , in animals							
Monochloramine	10599-90-3			4.0E+00			4.0E+00	D
Naled	300-76-5			2.8E-02			9.3E-03	
Health Effects	abdom cramps , anor , ataxia , card irreg , chest tight , convuls , cyan , diarr , dizz , head , irrit eyes , irrit skin , lac , lar spasm , lass , low BP , miosis , nau , para , salv , twitch , vomit , wheez							
Naphthalene	91-20-3			2.8E+00			9.3E-01	C
Health Effects	abdom pain , conf , corn damage , derm , excitement , head , hema , irrit bladder , irrit eyes , jaun , mal , nau , optical neuritis , profuse sweat , renal shutdown , vomit							

Appendix D. Military Exposure Guidelines For Water

All concentrations in mg/L (asbestos is in f/L)

Chemical Name	CASRN	5 L/day 7-day Negligible	5 L/day 14-day Negligible	5 L/day 1-year Negligible	15 L/day 7-day Negligible	15 L/day 14-day Negligible	15 L/day 1-year Negligible	Cancer Class
Target Organs	Nervous system - unspecified, Whole body							
Napropamide	15299-99-7			1.4E+00			4.7E-01	
Nickel	7440-02-0	1.4E+00	1.4E+00		4.7E-01	4.7E-01		2B
Health Effects	allergic asthma , carc , pneu , sens derm							
Nickel, soluble salts	Ni sol salts			2.8E-01			1.0E-01	1
Nitrobenzene	98-95-3			8.4E-02			2.8E-02	D
Health Effects	anemia , anoxia , derm , in animals: kidney damage , in animals: liver damage , in animals: testicular effects , irrit eyes , irrit skin , methemo							
Nitrocellulose	9004-70-0			4.2E+04			1.4E+04	
Nitrofurantoin	67-20-9			9.8E+00			3.3E+00	3
Nitrofurazone	59-87-0			6.5E-02			2.2E-02	B2
Nitroglycerin	55-63-0	7.0E-03	7.0E-03	1.4E-03	2.3E-03	2.3E-03	4.7E-04	
Health Effects	abdom pain , angina , CNS depres , delirium , dizz , flush , hypotension , irrit skin , methemo , nau , palp , throb head , vomit							
Target Organs	CVS - unspecified							
Nitroguanidine	556-88-7	1.4E+01	1.4E+01	1.4E+00	4.7E+00	4.7E+00	4.7E-01	D
Nitrosodiethanolamine, N-	1116-54-7			3.5E-02			1.2E-02	B2
Nitrosodiethylamine, N-	55-18-5			6.5E-04			2.2E-04	B2
Nitrosodimethylamine, N-	62-75-9			1.1E-04			3.7E-05	B2
Health Effects	abdom cramps , carc , decr kidney func , decr liver func , decr pulm func , diarr , enlarged liver , fever , head , jaun , nau , vomit							
Target Organs	Liver							
Nitroso-di-n-butylamine, N-	924-16-3			1.8E-02			6.0E-03	B2
Nitrosodiphenylamine, N-	86-30-6			2.0E+01			6.7E+00	B2
Nitrosodipropylamine, N-	621-64-7	1.3E+00	1.3E+00	1.4E-02	4.4E-01	4.4E-01	4.7E-03	B2
Nitroso-N-ethylurea, N-	759-73-9			7.0E-04			2.3E-04	B2
Nitroso-N-methylethylamine, N-	10595-95-6			4.5E-03			1.5E-03	B2
Nitrosopyrrolidine, N-	930-55-2			4.7E-02			1.6E-02	B2
Nitrotoluene, m-	99-08-1			1.4E-02			4.7E-03	D
Health Effects	anoxia , ataxia , cyan , dizz , dysp , head , lass , nau , tacar , vomit							
Nitrotoluene, o-	88-72-2			1.4E-01			4.7E-02	B2
Health Effects	anoxia , ataxia , cyan , dizz , dysp , head , lass , nau , tacar , vomit							
Nitrotoluene, p-	99-99-0			5.6E-02			1.9E-02	C
Health Effects	anoxia , ataxia , cyan , dizz , dysp , head , lass , nau , tacar , vomit							
Nonane	111-84-2			4.2E-02			1.4E-02	
Health Effects	chemical pneu (aspir liquid) , conf , dizz , drow , head , inco , irrit eyes , irrit nose , irrit skin , irrit throat , nau , tremor							
Norflurazon	27314-13-2			5.6E-01			1.9E-01	

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Appendix D. Military Exposure Guidelines For Water

All concentrations in mg/L (asbestos is in f/L)

Chemical Name	CASRN	5 L/day 7-day Negligible	5 L/day 14-day Negligible	5 L/day 1-year Negligible	15 L/day 7-day Negligible	15 L/day 14-day Negligible	15 L/day 1-year Negligible	Cancer Class
NuStar	85509-19-9			9.8E-03			3.3E-03	
Octabromodiphenyl ether	32536-52-0			4.2E-01			1.4E-01	D
Octamethylpyrophosphoramide	152-16-9			2.8E-02			9.3E-03	
Oryzalin	19044-88-3			7.0E-01			2.3E-01	C
Oxadiazon	19666-30-9			7.0E-02			2.3E-02	
Oxamyl	23135-22-0		3.5E-01	3.5E-01		2.0E-01	2.0E-01	
Oxyfluorfen	42874-03-3			4.2E-02			1.4E-02	
Paclobutrazol	76738-62-0			1.8E+00			6.1E-01	
Paraquat dichloride	1910-42-5	1.4E-01	1.4E-01	6.3E-02	4.7E-02	4.7E-02	2.1E-02	C
Health Effects	derm , epis , fingernail damage , heart damage , irrit eyes , irrit GI tract , irrit nose , irrit resp sys , irrit skin , irrit throat , kidney damage , liver damage							
Target Organs	Conceptuses/Fetuses, Female reproduction - unspecified							
Parathion	56-38-2			8.4E-02			2.8E-02	C
Health Effects	abdom cramps , anor , ataxia , card irreg , chest tight , coma , conf , convuls , cyan , diarr , dizz , head , irrit eyes , irrit resp sys , irrit skin , lar spasm , lass , low BP , miosis , musc fasc , nau , para , rhin , salv , sweat , vomit , wheez							
Pebulate	1114-71-2			7.0E-01			2.3E-01	
Pendimethalin	40487-42-1			5.6E-01			1.9E-01	
Pentabromo-6-chlorocyclohexane, 1,2,3,4,5-	87-84-3			4.3E+00			1.4E+00	C
Pentabromodiphenyl ether	32534-81-9			2.8E-01			9.3E-02	D
Pentachlorobenzene	608-93-5			1.1E-01			3.7E-02	D
Pentachloroethane	76-01-7			1.1E+00			3.6E-01	3
Health Effects	in animals: irreg respiration , in animals: irrit eyes , in animals: irrit skin , in animals: kidney changes , in animals: lass , in animals: liver changes , in animals: lung changes , in animals: musc inco , in animals: restless							
Pentachloronitrobenzene	82-68-8			4.2E-02			1.4E-02	C
Pentachlorophenol	87-86-5	1.4E+00	4.2E-01	1.4E-02	4.7E-01	1.4E-01	4.7E-03	B2
Health Effects	anor , chest pain , cough , derm , dizz , dysp , head , high fever , irrit eyes , irrit nose , irrit throat , lass , low weight , nau , sneez , sweat , vomit							
Target Organs	Developmental - generic, Hormones - unspecified, Kidneys, Liver, Reproductive - unspecified by gender							
Perchloroethylene	127-18-4	2.8E+00	2.8E+00	1.4E+00	9.3E-01	9.3E-01	4.7E-01	2A
Health Effects	carc , dizz , drow , flush face , flush neck , head , inco , irrit eyes , irrit nose , irrit resp sys , irrit skin , irrit throat , liver damage , nau , skin eryt							
Target Organs	Developmental - generic, Liver							
Permethrin	52645-53-1	4.2E+00	4.2E+00	2.8E+00	1.4E+00	1.4E+00	9.3E-01	3
Phenmedipham	13684-63-4			3.5E+00			1.2E+00	
Phenol	108-95-2	8.4E+00	8.4E+00	8.4E+00	2.8E+00	2.8E+00	2.8E+00	D
Health Effects	anor , convuls , cyan , dark urine , derm , irrit eyes , irrit nose , irrit throat , kidney damage , lass , liver damage , low weight , musc ache , musc pain , ochronosis , skin burns , tremor , twitch							
Target Organs	Whole body							

Appendix D. Military Exposure Guidelines For Water

All concentrations in mg/L (asbestos is in f/L)

Chemical Name	CASRN	5 L/day 7-day Negligible	5 L/day 14-day Negligible	5 L/day 1-year Negligible	15 L/day 7-day Negligible	15 L/day 14-day Negligible	15 L/day 1-year Negligible	Cancer Class
Phenyl isothiocyanate	103-72-0			2.8E-02			9.3E-03	
Phenylenediamine, m-	108-45-2			8.4E-01			2.8E-01	3
Phenylenediamine, o-	95-54-5			2.1E+00			7.0E-01	B2
Phenylenediamine, p-	106-50-3			2.7E+00			8.9E-01	3
Health Effects	bronchial asthma , irrit larynx , irrit pharynx , sens derm							
Phenylmercuric acetate	62-38-4			1.1E-03			3.7E-04	
Phenylphenol, 2-	90-43-7			5.1E+01			1.7E+01	C
Phorate	298-02-2			2.8E-03			9.3E-04	
Health Effects	abdom cramps , anor , ataxia , card irreg , chest tight , coma , conf , convuls , cyan , diarr , dizz , head , irrit eyes , irrit resp sys , irrit skin , lar spasm , lass , low BP , miosis , musc fasc , nau , para , rhin , salv , sweat , vomit , wheez							
Phosmet	732-11-6			2.8E-01			9.3E-02	
Phosphine	7803-51-2			4.2E-03			1.4E-03	D
Health Effects	abdom pain , chest tight , chills , diarr , dysp , liquid: frostbite , musc pain , nau , pulm edema , stupor or syncope , thirst , vomit							
Phosphorus, white	12185-10-3			2.8E-03			9.3E-04	
Phthalic anhydride	85-44-9			2.8E+01			9.3E+00	
Health Effects	bron , bronchial asthma , conj , derm , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit skin , irrit upper resp sys , nasal ulcer bleeding							
Picloram	1918-02-1	2.8E+01	2.8E+01	9.8E-01	9.3E+00	9.3E+00	5.0E-01	3
Health Effects	in animals: kidney changes , in animals: liver changes , irrit eyes , irrit resp sys , irrit skin , nau							
Target Organs	Liver							
Pirimiphos-methyl	29232-93-7			1.4E-01			4.7E-02	
Polybrominated biphenyl	36355-01-8			9.8E-04			3.3E-04	B2
Polybrominated biphenyl mixture	67774-32-7	1.4E-01	1.4E-01		4.7E-02	4.7E-02		2B
Polychlorinated biphenyl (Aroclor 1016/1242): (Chl	z-0042			2.9E-03			9.8E-04	
Polychlorinated biphenyls	1336-36-3			8.4E-04			5.0E-04	B2
Potassium cyanide	151-50-8			7.0E-01			2.3E-01	
Health Effects	asphy , blood changes , conf , head , incr rate resp , irrit eyes , irrit skin , irrit upper resp sys , lass , nau , slow gasping resp , thyroid changes , vomit							
Potassium perchlorate	7778-74-7			9.8E-03			3.3E-03	NO
Potassium silver cyanide	506-61-6			2.8E+00			9.3E-01	
Praseodymium chloride, stable, nonradioactive	10361-79-2			1.1E+01			3.7E+00	
Prochloraz	67747-09-5			1.3E-01			4.2E-02	C
Profluralin	26399-36-0			8.4E-02			2.8E-02	
Prometon	1610-18-0			2.1E+00			7.0E-01	
Prometryn	7287-19-6			5.6E-02			1.9E-02	
Pronamide	23950-58-5	1.1E+00	1.1E+00	1.1E+00	3.7E-01	3.7E-01	3.5E-01	

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Appendix D. Military Exposure Guidelines For Water

All concentrations in mg/L (asbestos is in f/L)

Chemical Name	CASRN	5 L/day 7-day Negligible	5 L/day 14-day Negligible	5 L/day 1-year Negligible	15 L/day 7-day Negligible	15 L/day 14-day Negligible	15 L/day 1-year Negligible	Cancer Class
Propachlor	1918-16-7			1.8E+00			6.1E-01	
Propanil	709-98-8			7.0E-02			2.3E-02	
Propargite	2312-35-8			2.8E-01			9.3E-02	
Propargyl alcohol	107-19-7			2.8E-01			9.3E-02	
Health Effects	CNS depres , in animals: kidney damage , in animals: liver damage , irrit muc memb , irrit skin							
Propazine	139-40-2			2.8E-01			9.3E-02	
Propham	122-42-9	7.0E+00	7.0E+00	2.8E+00	2.3E+00	2.3E+00	9.3E-01	3
Propiconazole	60207-90-1			1.8E-01			6.1E-02	
Propylene glycol	57-55-6			2.8E+02			9.3E+01	E
Propylene glycol monoethyl ether	1569-02-4			9.8E+01			3.3E+01	
Propylene glycol monomethyl ether	107-98-2			9.8E+01			3.3E+01	
Health Effects	diarr , dizz , drow , head , inco , irrit eyes , irrit nose , irrit skin , irrit throat , nau , vomit							
Propylene oxide	75-56-9			4.1E-01			1.4E-01	B2
Health Effects	carc , irrit eyes , irrit resp sys , irrit skin , skin blisters , skin burns							
Target Organs	Stomach							
Pursuit	81335-77-5			3.5E+00			1.2E+00	
Pydrin	51630-58-1			3.5E-01			1.2E-01	3
Pyrene	129-00-0			4.2E+00			1.4E+00	D
Pyridine	110-86-1			1.4E-01			4.7E-02	3
Health Effects	anor , anxi , derm , dizz , head , insom , irrit eyes , kidney damage , liver damage , nau							
Quinalphos	13593-03-8			7.0E-03			2.3E-03	
Quinoline	91-22-5			3.3E-02			1.1E-02	B2
RDX	121-82-4			4.2E-01			1.4E-01	C
Health Effects	convuls , dizz , head , insom , irrit eyes , irrit skin , irrity , lass , nau , tremor , vomit							
Target Organs	Liver, Nervous system - unspecified, Reproductive - unspecified by gender							
Resmethrin	10453-86-8			4.2E-01			1.4E-01	
Ronnel	299-84-3			7.0E-01			2.3E-01	
Health Effects	chol inhibition , in animals: irrit eyes , kidney damage , liver damage							
Rotenone	83-79-4			5.6E-02			1.9E-02	
Health Effects	abdom pain , clonic convuls , inco , irrit eyes , irrit resp sys , irrit skin , musc tremor , nau , numb muc memb , stupor , vomit							
Samarium chloride, stable, nonradioactive	10361-82-7			1.3E+01			4.2E+00	
Savey	78587-05-0			3.5E-01			1.2E-01	
Selenious acid	7783-00-8			7.0E-02			2.3E-02	D
Selenium	7782-49-2			7.0E-02			5.0E-02	D
Health Effects	bron , chills , cirr , derm , dysp , eye burns , fever , garlic breath , GI dist , head , in animals: anemia , irrit eyes , irrit nose , irrit skin , irrit throat , kidney damage , liver nec , metallic taste , skin burns , spleen damage , vis dist							
Target Organs	Liver, Skin							

Appendix D. Military Exposure Guidelines For Water

All concentrations in mg/L (asbestos is in f/L)

Chemical Name	CASRN	5 L/day 7-day Negligible	5 L/day 14-day Negligible	5 L/day 1-year Negligible	15 L/day 7-day Negligible	15 L/day 14-day Negligible	15 L/day 1-year Negligible	Cancer Class
Selenourea	630-10-4			7.0E-02			2.3E-02	
Sethoxydim	74051-80-2			1.3E+00			4.2E-01	
Silver	7440-22-4	2.8E-01	2.8E-01	1.0E-01	1.0E-01	1.0E-01	1.0E-01	D
Health Effects	blue-gray eyes , blue-gray nasal septum , blue-gray skin , blue-gray throat , GI dist , irrit skin , ulceration skin							
Target Organs	Skin							
Silver cyanide	506-64-9			1.4E+00			4.7E-01	
Silvex	93-72-1	2.8E-01	2.8E-01	1.1E-01	9.3E-02	9.3E-02	5.0E-02	D
Simazine	122-34-9			7.0E-02			2.3E-02	C
Sodium azide	26628-22-8			5.6E-01			1.9E-01	
Health Effects	blurred vision , bradycardia , dizz , head , irrit eyes , irrit skin , kidney changes , lass , low BP							
Sodium bromate	7789-38-0	2.8E-01			9.3E-02			
Sodium cyanide	143-33-9			7.0E-01			2.3E-01	
Health Effects	asphy , blood changes , conf , head , incr resp rate , irrit eyes , irrit skin , lass , nau , slow gasping respiration , thyroid changes , vomit							
Target Organs	Nervous system - unspecified, Reproductive - unspecified by gender, Thyroid, Whole body							
Sodium diethydithiocarbamate	148-18-5			3.6E-01			1.2E-01	C
Sodium fluoroacetate	62-74-8			2.8E-03			9.3E-04	
Health Effects	anxi , auditory halu , card arrhy , convuls , ectopic heartbeat , facial pares , kidney damage , liver damage , nystagmus , pulm edema , pulsus altenans , tacar , twitch face musc , vomit							
Sodium metavanadate	13718-26-8			1.4E-01			4.7E-02	
Sodium perchlorate	7601-89-0			9.8E-03			3.3E-03	NO
Strontium, stable	7440-24-6	3.5E+01	3.5E+01	2.8E+01	1.2E+01	1.2E+01	9.3E+00	
Strychnine	57-24-9			4.2E-02			1.4E-02	
Health Effects	anxi , cyan , incr acuity of perception , incr reflex excitability , restless , stiff facial musc , stiff neck , tetanic convuls with opisthotonos							
Styrene	100-42-5	1.4E+00	1.4E+00		4.7E-01	4.7E-01		2B
Health Effects	conf , defatting derm , dizz , drow , head , irrit eyes , irrit nose , irrit resp sys , lass , mal , narco , possible liver inj , repro effects , unsteady gait							
Target Organs	Liver							
Sulfate	14808-79-8	3.0E+02	3.0E+02		2.5E+02	2.5E+02		
Health Effects	apathy , delirium , heat stroke , impaired coord , laxative effects , weariness							
Sulfonylbis(4-chlorobenzene),1,1'-	80-07-9			5.6E-02			1.9E-02	E
Systhane	88671-89-0			3.5E-01			1.2E-01	
TCDD, 2,3,7,8-	1746-01-6	1.4E-06		2.8E-07	4.7E-07		9.3E-08	B2
Health Effects	allergic derm , chloracne , GI dist , in animals: carc , in animals: hemorr , in animals: kidney damage , in animals: liver damage , irrit eyes , porphyria , possible repro effects , possible terato effects							
Target Organs	Developmental - generic, IMM system - unspecified, Liver, LYMP system - unspecified, Respiration - unspecified							
Tebuthiuron	34014-18-1	4.2E+00	4.2E+00	9.8E-01	1.4E+00	1.4E+00	3.3E-01	
Temephos	3383-96-8			2.8E+00			9.3E-01	
Health Effects	abdom cramps , blurred vision , diarr , dizz , dysp , irrit eyes , nau , salv , vomit							
Terbacil	5902-51-2	4.2E-01	4.2E-01	1.8E-01	1.4E-01	1.4E-01	6.1E-02	

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Appendix D. Military Exposure Guidelines For Water

All concentrations in mg/L (asbestos is in f/L)

Chemical Name	CASRN	5 L/day 7-day Negligible	5 L/day 14-day Negligible	5 L/day 1-year Negligible	15 L/day 7-day Negligible	15 L/day 14-day Negligible	15 L/day 1-year Negligible	Cancer Class
Terbufos	13071-79-9	7.0E-03	7.0E-03	3.5E-04	2.3E-03	2.3E-03	1.2E-04	
Terbutryn	886-50-0			1.4E-02			4.7E-03	
Tetrachlorobenzene, 1,2,4,5-	95-94-3			2.8E-02			9.3E-03	
Tetrachloroethane, 1,1,1,2-	630-20-6	2.8E+00	2.8E+00	1.3E+00	9.3E-01	9.3E-01	4.2E-01	C
Health Effects	in animals: liver changes , irreg respiration , irrit eyes , irrit skin , lass , musc inco , restless							
Target Organs	Kidneys, Liver							
Tetrachloroethane, 1,1,2,2-	79-34-5	4.2E+00	4.2E+00	1.4E-01	1.4E+00	1.4E+00	4.7E-02	C
Health Effects	abdom pain , carc , derm , hepatitis , jaun , kidney damage , leucyt , liver tend , nau , tremor fingers , vomit							
Target Organs	Liver							
Tetrachlorophenol, 2,3,4,6-	58-90-2			4.2E+00			1.4E+00	
Tetrachlorotoluene, para, alpha, alpha, alpha-	5216-25-1			4.9E-03			1.6E-03	B2
Tetrachlorovinphos	961-11-5			4.2E-01			1.4E-01	C
Tetraethyl dithiopyrophosphate	3689-24-5			7.0E-02			2.3E-02	
Health Effects	anor , blurred vision , card irreg , Cheyne-Stokes respiration , convuls , cyan , diarr , eye pain , head , irrit eyes , irrit skin , lac , lass , local sweat , low BP , nau , para , rhin , twitch , vomit							
Tetraethyl lead	78-00-2			1.4E-05			4.7E-06	
Health Effects	anor , anxi , bradycardia , coma , conf , convuls , halu , hyper-reflexia , hypotension , hypothermia , insom , irrit eyes , lass , low weight , mania , nau , pallor , psychosis , spasticity , tremor							
Tetramethylcyclohexane	30501-43-0			4.2E+01			1.4E+01	
Thallium	7440-28-0	9.8E-03	9.8E-03		3.3E-03	3.3E-03		
Health Effects	abdom pain , alopecia , chest pain , chorea , convuls , diarr , kidney damage , liver damage , nau , pares legs , peri neuritis , psychosis , ptosis , pulm edema , retster tight , strabismus , tremor , vomit							
Target Organs	Testes							
Thallium (I) acetate	563-68-8			1.3E-02			4.2E-03	D
Thallium (I) carbonate	6533-73-9			1.1E-02			3.7E-03	D
Thallium (I) chloride	7791-12-0			1.1E-02			3.7E-03	D
Thallium (I) sulfate	7446-18-6			1.1E-02			3.7E-03	D
Thiobencarb	28249-77-6			1.4E-01			4.7E-02	
Thiocyanates	463-56-9			8.4E-03			2.8E-03	
Thiodiglycol	111-48-8			7.0E+00			2.3E+00	
Thiofanox	39196-18-4			4.2E-03			1.4E-03	
Thiophanate-methyl	23564-05-8			1.1E+00			3.7E-01	
Thiram	137-26-8			8.4E-02			2.8E-02	3
Health Effects	antabuse-like effects , derm , irrit eyes , irrit muc memb , irrit skin							
Tin, inorganic	7440-31-5			4.2E+00			1.4E+00	
Health Effects	in animals: diarr , in animals: para with musc twitch , in animals: vomit , irrit eyes , irrit resp sys , irrit skin							
Target Organs	Blood							
Toluene	108-88-3	2.8E+01		1.1E+01	9.3E+00		3.7E+00	D
Health Effects	anxi , conf , derm , dilated pupils , dizz , euph , head , insom , irrit eyes , irrit nose , kidney damage , lac , lass , liver damage , musc ftg , pares							

Appendix D. Military Exposure Guidelines For Water

All concentrations in mg/L (asbestos is in f/L)

Chemical Name	CASRN	5 L/day 7-day Negligible	5 L/day 14-day Negligible	5 L/day 1-year Negligible	15 L/day 7-day Negligible	15 L/day 14-day Negligible	15 L/day 1-year Negligible	Cancer Class
Target Organs	Nervous system - unspecified							
Toluene-2,4-diamine	95-80-7			3.1E-02			1.0E-02	B2
Health Effects	ataxia , bluish skin , carc , convuls , cyan , derm , dizz , head , irrit eyes , irrit nose , irrit skin , irrit throat , lass , liver inj , methemo , nau , resp depres , tacar , vomit							
Target Organs	Breasts							
Toluene-2,5-diamine	95-70-5			8.4E+00			2.8E+00	3
Toluene-2,6-diamine	823-40-5			8.4E-01			2.8E-01	
Toluidine, p-	106-49-0			5.2E-01			1.7E-01	C
Health Effects	anemia , carc , convuls , cyan , derm , hema , irrit eyes , irrit skin , lass , low BP , methemo , nau , vomit							
Target Organs	Liver							
Toxaphene	8001-35-2			1.4E-02			4.7E-03	B2
Health Effects	agitation , carc , conf , convuls , dry skin , nau , reddening skin , tremor , uncon							
Target Organs	Liver							
Tralomethrin	66841-25-6			1.1E-01			3.5E-02	
Tri(2-butoxyethyl) phosphate	78-51-3	6.7E+01	6.7E+01	2.8E+00	2.2E+01	2.2E+01	9.3E-01	
Triallate	2303-17-5			1.8E-01			6.1E-02	
Triasulfuron	82097-50-5			1.4E-01			4.7E-02	
Tribromobenzene, 1,2,4-	615-54-3			7.0E-01			2.3E-01	
Tributyl phosphate	126-73-8	1.5E+01	1.5E+01	2.8E-01	5.1E+00	5.1E+00	9.3E-02	B2
Health Effects	head , irrit eyes , irrit resp sys , irrit skin , nau							
Tributyltin compounds	z-303			4.2E-03			1.4E-03	
Tributyltin oxide	56-35-9			4.2E-03			1.4E-03	D
Trichloro-1,2,2-trifluoroethane, 1,1,2-	76-13-1			4.2E+01			1.4E+01	
Health Effects	CNS depres , derm , drow , in animals: card arrhy , in animals: narco , irrit skin , irrit throat							
Trichloroacetic acid	76-03-9	4.2E+00	4.2E+00		1.4E+00	1.4E+00		C
Health Effects	cough , delayed pulm edema , derm , diarr , dysp , eye burns , irrit eyes , irrit nose , irrit resp sys , irrit skin , irrit throat , salv , skin burns , vomit							
Trichloroaniline hydrochloride, 2,4,6-	33663-50-2			3.4E+00			1.1E+00	C
Trichloroaniline, 2,4,6-	634-93-5			2.9E+00			9.6E-01	C
Trichlorobenzene, 1,2,3-	87-61-6			1.1E-01			3.7E-02	
Trichlorobenzene, 1,2,4-	120-82-1		7.0E-02	7.0E-02		7.0E-02	7.0E-02	D
Health Effects	in animals: kidney damage , in animals: liver damage , in animals: possible terato effects , irrit eyes , irrit muc memb , irrit skin							
Target Organs	Adrenal glands, Kidneys, Liver, None							
Trichlorobenzene, 1,3,5-	108-70-3	8.4E-01	8.4E-01		2.8E-01	2.8E-01		
Trichloroethane, 1,1,1-	71-55-6	1.4E+02	8.4E+01	8.4E+01	4.7E+01	2.8E+01	2.8E+01	D
Health Effects	card arrhy , CNS depres , derm , head , irrit eyes , irrit skin , lass , liver damage , poor equi							
Target Organs	Whole body							
Trichloroethane, 1,1,2-	79-00-5	8.4E-01	5.6E-01	5.5E-02	2.8E-01	1.9E-01	1.8E-02	C

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Appendix D. Military Exposure Guidelines For Water

All concentrations in mg/L (asbestos is in f/L)

Chemical Name	CASRN	5 L/day 7-day Negligible	5 L/day 14-day Negligible	5 L/day 1-year Negligible	15 L/day 7-day Negligible	15 L/day 14-day Negligible	15 L/day 1-year Negligible	Cancer Class
Health Effects	carc , CNS depres , derm , irrit eyes , irrit nose , kidney damage , liver damage							
Target Organs	Liver, Nervous system - unspecified, None							
Trichloroethylene	79-01-6	2.8E+00	2.8E+00		9.3E-01	9.3E-01		2A
Health Effects	carc , card arrhy , derm , dizz , drow , head , irrit eyes , irrit skin , lass , liver inj , nau , pares , tremor , vis dist , vomit							
Target Organs	Developmental - generic, Kidneys, Liver							
Trichlorofluoromethane	75-69-4	9.8E+00	9.8E+00	9.8E+00	3.3E+00	3.3E+00	3.3E+00	
Health Effects	asphy , card arrest , card arrhy , derm , inco , liquid: frostbite , tremor							
Target Organs	Liver, Whole body							
Trichlorophenol, 2,4,5-	95-95-4			4.2E+00			1.4E+00	
Trichlorophenol, 2,4,6-	88-06-2	4.2E-02	4.2E-02	1.4E-02	1.4E-02	1.4E-02	4.7E-03	B2
Trichlorophenoxyacetic acid	93-76-5			1.4E+00			4.7E-01	
Health Effects	acne-like rash , in animals: ataxia , irrit skin , liver damage							
Target Organs	Developmental - generic, Kidneys, Liver, Lungs							
Trichloropropane, 1,1,2-	598-77-6			7.0E-01			2.3E-01	
Trichloropropane, 1,2,3-	96-18-4	8.4E-01	8.4E-01	3.3E-03	2.8E-01	2.8E-01	1.1E-03	B2
Health Effects	carc , CNS depres , in animals: kidney inj , in animals: liver inj , irrit eyes , irrit nose , irrit throat							
Target Organs	Liver, Multiple sites, Whole body							
Trichloropropene, 1,2,3-	96-19-5			4.2E-01			1.4E-01	D
Trichlorotoluene, 2,3,6-	2077-46-5			7.0E-04			2.3E-04	
Trichlorotoluene, alpha, 2,6-	2014-83-7			7.0E-04			2.3E-04	
Triclosan	3380-34-5			5.6E+01			1.9E+01	
Tridiphane	58138-08-2			4.2E-02			1.4E-02	
Trifluralin	1582-09-8	1.1E-01	1.1E-01	1.1E-01	3.7E-02	3.7E-02	3.5E-02	C
Trimethyl phosphate	512-56-1			2.6E+00			8.8E-01	B2
Trimethylbenzene, 1,3,5-	108-67-8	1.4E+01			4.7E+00			
Trimethylbenzene, 1,3,5-	108-67-8	1.4E+01			4.7E+00			D
Health Effects	bron , chemical pneu (aspir liquid) , conf , dizz , drow , head , hypochromic anemia , inco , irrit eyes , irrit nose , irrit resp sys , irrit skin , irrit throat , lass , nau , vomit							
Trinitrobenzene, 1,3,5-	99-35-4			7.0E-03			2.3E-03	
Trinitrophenylmethylnitramine	479-45-8			1.4E-01			4.7E-02	IN
Health Effects	anemia , coryza , cough , edema on cheeks , edema on nasal folds , edema on neck , eryt , head , insom , irrity , itch , kera , kidney damage , lass , liver damage , mal , nau , sens derm , sneez , vomit							
Trinitrotoluene, 2,4,6-	118-96-7	2.8E-02	2.8E-02	2.1E-02	9.3E-03	9.3E-03	7.0E-03	C
Health Effects	anemia , card irreg , cataract , cough , cyan , irrit muc memb , irrit skin , jaun , kidney damage , leucyt , liver damage , musc pain , peri neur , sens derm , sneez , sore throat							
Target Organs	Bladder, Liver							
Triphenylphosphine oxide	791-28-6			2.8E-01			9.3E-02	D
Tris(1,3-dichloro-2-propyl) phophate (TDCP)	13674-87-8			7.0E-01			2.3E-01	
Tris(2-chloroethyl)phosphate	115-96-8			2.8E-01			9.3E-02	C

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Appendix D. Military Exposure Guidelines For Water

All concentrations in mg/L (asbestos is in f/L)

Chemical Name	CASRN	5 L/day 7-day Negligible	5 L/day 14-day Negligible	5 L/day 1-year Negligible	15 L/day 7-day Negligible	15 L/day 14-day Negligible	15 L/day 1-year Negligible	Cancer Class
Tris(2-ethylhexyl)phosphate	78-42-2			1.4E+00			4.7E-01	C
Uranium, highly soluble salts	HZ1800-90-T			3.0E-02			3.0E-02	
Health Effects	carc. Potential for cancer is a result of alpha-emitting properties & radioactive decay products (e.g. radon) , casts in urine , chest rales , conj , cough , high BUN , lac , nau , prot , RBC in urine , short breath , skin burns , vomit							
Target Organs	Kidneys							
Vanadium	7440-62-2			9.8E-02			3.3E-02	
Vanadium and soluble, inorganic compounds (other than Vanadium Pentoxide)	z-365			9.8E-03			3.3E-03	
Vanadium pentoxide	1314-62-1			1.3E-01			4.2E-02	2B
Health Effects	bron , cough , drow , dysp , eczema , fine rales , green tongue , irrit eyes , irrit skin , irrit throat , metallic taste , wheez							
Vanadium sulfate	16785-81-2			2.8E-01			9.3E-02	
Vernam	1929-77-7			1.4E-01			4.7E-02	
Vinclozolin	50471-44-8			3.5E-01			1.2E-01	
Vinyl acetate	108-05-4			1.4E+01			4.7E+00	2B
Health Effects	cough , eye burns , hoarseness , irrit eyes , irrit nose , irrit skin , irrit throat , loss of smell , skin blisters							
Vinyl chloride	75-01-4	4.2E+00	4.2E+00	4.2E-02	1.4E+00	1.4E+00	1.4E-02	A
Health Effects	abdom pain , carc , enlarged liver , GI bleeding , lass , liquid: frostbite , pallor or cyan of extremities							
Target Organs	Liver, Lungs							
Vinyl toluene	25013-15-4			8.4E-02			2.8E-02	3
Health Effects	drow , in animals: narco , irrit eyes , irrit skin , irrit upper resp sys							
VX	50782-69-9	1.5E-02			5.0E-03			
Health Effects	abdom , abdom cramps , decr RBC-ChE, diarr , dizz , GI , head , head , irrity , lass , nau , resp , resp distress , tight chest, vomit , vomit							
Warfarin	81-81-2			4.2E-03			1.4E-03	
Health Effects	abdom pain , abnor hematologic indices , back pain , bleeding lips , epis , fecal blood , hema , hematoma arms , hematoma legs , muc memb hemorr , petechial rash , vomit							
Xylene, m-	108-38-3			2.8E+01			9.3E+00	
Health Effects	abdom pain , anor , corn vacuolization , derm , dizz , drow , excitement , inco , irrit eyes , irrit nose , irrit skin , irrit throat , nau , staggering gait , vomit							
Target Organs	Liver							
Xylene, o-	95-47-6			2.8E+01			9.3E+00	
Health Effects	abdom pain , anor , corn vacuolization , derm , dizz , drow , excitement , inco , irrit eyes , irrit nose , irrit skin , irrit throat , nau , staggering gait , vomit							
Xylenes, total	1330-20-7	5.6E+01	5.6E+01	5.6E+00	1.9E+01	1.9E+01	1.9E+00	IN
Zinc cyanide	557-21-1			7.0E-01			2.3E-01	
Zinc phosphide	1314-84-7			4.2E-02			1.4E-02	
Zinc, metallic	7440-66-6	8.4E+00	8.4E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	D
Zineb	12122-67-7			7.0E-01			2.3E-01	3

Appendix D. Military Exposure Guidelines For Water

All concentrations in mg/L (asbestos is in f/L)

Chemical Name	CASRN	5 L/day 7-day Negligible	5 L/day 14-day Negligible	5 L/day 1-year Negligible	15 L/day 7-day Negligible	15 L/day 14-day Negligible	15 L/day 1-year Negligible	Cancer Class

CASRN = Chemical Abstract Service Registry Number
MEG = Military Exposure Guideline
mg/L = milligrams per liter (all water MEGs are provided in mg/L with the exception of asbestos which is in f/L [fibers per liter]).

Cancer Classes were obtained from the U.S. Environmental Protection Agency (EPA) when available. If EPA did not list a chemical, the International Agency for Research on Cancer (IARC) was consulted. Class descriptions are provided below. Please see RD 230 for additional information.

EPA's Previous Weight-of-Evidence Classifications (EPA 1986a):
- A - Human carcinogen
- B - Probable human carcinogen
- C - Possible human carcinogen
- D - Not classifiable
- E - No evidence of human carcinogenicity

EPA's Current Weight-of-Evidence Classifications (EPA 2005b):
- CA - Carcinogenic to humans
- LI - Likely to be carcinogenic to humans
- SU - Suggestive evidence of carcinogenic potential
- IN - Inadequate information to assess carcinogenic potential
- NO - Not likely to be carcinogenic to humans

IARC's Classifications (IARC 2006):
- 1 - Carcinogenic to humans
- 2A - Probably carcinogenic to humans
- 2B - Possibly carcinogenic to humans
- 3 - Not classifiable as to carcinogenicity in humans
- 4 - Probably not carcinogenic to humans

Potential Health Effects: please see Appendix B for acronyms and definitions. Health effects information was obtained from the following sources:

1) CDC 2004b. Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health (NIOSH) Pocket Guide to Chemical Hazards, 97-140, Feb 2004.

2) NRC/COT 2003. National Research Council, Committee on Toxicology. Acute Exposure Guideline Levels for Selected Airborne Chemicals, Volume 3. Committee on Toxicology, Subcommittee on Acute Exposure Guideline Levels. National Academy Press, Washington, DC.

Target organs were identified using the sources providing the health criteria used to develop the Water-MEGs. Please see RD 230 for sources.

Odor and taste threshold data were obtained from the following sources:

1) AIHA 1989. Odor Thresholds for Chemicals with Established Occupational Health Standards. Akron, OH: American Industrial Hygiene Association. (90 pages).

2) NLM 2006. National Library of Medicine's Hazardous Substances Data Base (HSDB), http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB, accessed August 2006.

3) Ruth, J.H. 1986. Odor Thresholds and Irritation Levels of Several Chemical Substances: A Review. American Industrial Hygiene Association Journal (47), p. A-142-151.

4) EPA 1987a. Health Advisories for 25 Organics. Washington, DC. (397 pages).

5) EPA 1987b. Health Advisories for 16 Pesticides. Washington, DC. (262 pages).

6) EPA 1988. Health Advisories for 50 Pesticides. Washington, DC. (447 pages).

7) ATSDR 2006b. Toxicological Profiles, http://www.atsdr.cdc.gov/toxpro2.html, accessed August 2006.

APPENDIX E

MILITARY EXPOSURE GUIDELINES FOR SOIL

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Appendix E. Military Exposure Guidelines For Soil

All concentrations in mg/kg

Chemical Name	CASRN	1-year Negligible	Cancer Class
Acenaphthene	83-32-9	1.0E+05	
Acephate	30560-19-1	8.5E+02	C
Acetaldehyde	75-07-0	1.6E+02	B2
Health Effects	carc , CNS depres , conj , cough , delayed pulm edema , derm , eye burns , in animals: kidney effects , in animals: repro effects , in animals: terato effects , irrit eyes , irrit nose , irrit throat , skin burns		
Target Organs	Nose		
Acetochlor	34256-82-1	4.2E+03	
Acetone	67-64-1	5.0E+04	IN
Health Effects	CNS depres , derm , dizz , head , irrit eyes , irrit nose , irrit throat		
Target Organs	Blood, Kidneys, Liver, Nervous system - unspecified		
Acetone cyanohydrin	75-86-5	6.4E+03	IN
Health Effects	asphy , conf , convuls , dizz , head , irrit eyes , irrit resp sys , irrit skin , kidney inj , lass , liver inj , pulm edema		
Target Organs	CNS - unspecified		
Acetonitrile	75-05-8	1.9E+02	D
Health Effects	asphy , chest pain , convuls , in animals: kidney damage , in animals: liver damage , irrit nose , irrit throat , lass , nau , stupor , vomit		
Target Organs	Blood, Liver, Lungs, RBC, Whole body		
Acetophenone	98-86-2	2.1E+05	D
Acifluorfen-sodium	62476-59-9	2.8E+03	
Acrolein	107-02-8	3.2E-01	IN
Health Effects	chronic resp disease , decr pulm func , delayed pulm edema , irrit eyes , irrit muc memb , irrit skin		
Target Organs	GI tract - unspecified, Lungs, Nose, Respiration - unspecified, Whole body		
Acrylamide	79-06-1	3.5E+02	B2
Health Effects	absent deep tendon reflex , ataxia , carc , drow , hand sweat , irrit eyes , irrit skin , lass , musc weak , numb limbs , pares , repro effects		
Target Organs	Breasts, CNS - unspecified, Mouth/palate, Nerves, Skin, Thyroid, Thyroid glands, Uterus		
Acrylic acid	79-10-7	8.6E+04	3
Health Effects	eye burns , in animals: kidney inj , in animals: liver inj , in animals: lung inj , irrit eyes , irrit resp sys , irrit skin , skin burns , skin sens		
Target Organs	Developmental - generic, Nasal-pharynx, Nose, Reproductive - unspecified by gender, Whole body		
Acrylonitrile	107-13-1	1.2E+02	B1
Health Effects	asphy , carc , dizz , head , irrit eyes , irrit skin , lass , nau , scaling derm , skin vesic , sneez , vomit		
Target Organs	Blood, Brain, Developmental - generic, Lungs, Nervous system - unspecified, Nose, Other ducted glands, Reproductive - unspecified by gender, Respiration - unspecified, Spinal cord, Stomach, Testes		
Adipic acid	124-04-9	4.2E+05	
Adiponitrile	111-69-3	5.6E+07	D
Health Effects	abdom pain , blurred vision , conf , convuls , dizz , dysp , head , irrit eyes , irrit resp sys , irrit skin , lass , nau , vomit		
Target Organs	Blood, Lungs		
Alachlor	15972-60-8	2.1E+03	B2
Alar	1596-84-5	3.2E+04	
Aldicarb	116-06-3	2.1E+02	D
Aldicarb sulfone	1646-88-4	2.1E+02	
Aldrin	309-00-2	7.1E+00	B2
Health Effects	azotemia , carc , clonic convuls , coma , dizz , head , hema , mal , myoclonic jerks of limbs , nau , tonic		

Appendix E. Military Exposure Guidelines For Soil

All concentrations in mg/kg

Chemical Name	CASRN	1-year Negligible	Cancer Class
	convuls , vomit		
Target Organs	Developmental - generic, Kidneys, Liver		
Ally	74223-64-6	5.3E+04	
Allyl alcohol	107-18-6	8.5E+02	
Health Effects	irrit eyes , irrit skin , irrit upper resp sys , pulm edema , tissue damage		
Target Organs	Kidneys, Liver		
Allyl chloride	107-05-1	3.3E-01	C
Health Effects	in animals: kidney inj , in animals: liver inj , irrit eyes , irrit muc memb , irrit nose , irrit skin , pulm edema		
Target Organs	Liver, Nervous system - unspecified		
Aluminum phosphide	20859-73-8	8.5E+01	
Aluminum, elemental	7429-90-5	4.7E+06	D
Health Effects	irrit eyes , irrit resp sys , irrit skin		
Target Organs	Nervous system - unspecified		
Amdro	67485-29-4	6.4E+02	
Ametryn	834-12-8	1.9E+04	
Aminophenol, 3-	591-27-5	6.4E+04	
Aminophenol, 4-	123-30-8	4.2E+04	
Aminopyridine, 4-	504-24-5	4.2E+01	D
Amitraz	33089-61-1	5.3E+02	
Ammonia	7664-41-7	9.3E+07	IN
Health Effects	chest pain , cough Respiration - unspecified, discomfort Eyes, dizz Whole body, dysp , head None, hyperpnea Respiration - unspecified, incr Nasal-pharynx, inebri Whole body, irrit Throat, irrit Eyes, irrit Nose, irrit Respiration - unspecified, irrit eyes		
Target Organs	Eyes, Lungs, Respiration - unspecified, Whole body		
Ammonium perchlorate	7790-98-9	1.5E+02	NO
Ammonium sulfamate	7773-06-0	4.2E+05	
Health Effects	cough , dysp , irrit eyes , irrit nose , irrit throat		
Target Organs	Blood, Whole body		
Aniline	62-53-3	2.2E+05	B2
Health Effects	anxi , ataxia , carc , cirr , cyan , cyan , dizz , dizz , dysp , dysp on effort , ftg , head , head , hypox , hypox Heart, irrit eyes , lass , methemo , syncope , tacar , tacar , weak		
Target Organs	Blood, Spleen		
Anthracene	120-12-7	1.7E+05	D
Antimony pentoxide	1314-60-9	1.1E+02	
Antimony potassium tartrate	28300-74-5	1.9E+02	
Antimony tetroxide	1332-81-6	8.5E+01	
Antimony trioxide	1309-64-4	6.8E+04	2B
Antimony, elemental	7440-36-0	8.5E+01	
Health Effects	anor , cough , diarr , dizz , head , insom , irrit eyes , irrit mouth , irrit nose , irrit skin , irrit throat , nau , stomach cramps , unable to smell properly , vomit		
Target Organs	Blood, CVS - unspecified, Lungs, Whole body		
Apollo	74115-24-5	2.8E+03	C
Aramite	140-57-8	2.1E+04	B2
Aroclor 1016	12674-11-2	3.5E+01	

Appendix E. Military Exposure Guidelines For Soil

All concentrations in mg/kg

Chemical Name	CASRN	1-year Negligible	Cancer Class
Aroclor 1254	11097-69-1	9.9E+00	
Health Effects	carc , chloracne , irrit eyes , liver damage , repro effects		
Target Organs	Eyes, IMM system - unspecified, Liver, Nails, Nervous system - unspecified, Other ducted glands		
Arsenic, elemental	7440-38-2	6.0E+01	A
Health Effects	abdom pain , carc , derm , edema , GI dist , GI problems , head , hyperpig of skin , nau , neurological changes , peri neur , peripheral vascular disease , resp irrit , skin effects , ulceration of nasal septum , vomit		
Target Organs	GI tract - unspecified, Lungs, Skin		
Arsine	7784-42-1	4.7E+04	
Health Effects	abdom pain , back pain , bronze skin , carc , dizz , dysp , head , hema , jaun , lass , liquid: frostbite , mal , nau , peri neur , vomit		
Target Organs	Blood, Kidneys, Spleen		
Assure	76578-14-8	1.9E+03	D
Asulam	3337-71-1	1.1E+04	
Atrazine	1912-24-9	6.4E+02	C
Health Effects	derm , dysp , hypothermia , inco , irrit eyes , irrit skin , lass , liver inj , salv , sens skin		
Target Organs	Blood, Breasts, CVS - unspecified, Developmental - generic, Reproductive - unspecified by gender, Whole body		
Avermectin B1	65195-55-3	8.5E+01	
Azinphos methyl	86-50-0	6.4E+02	
Health Effects	aching eyes , anor , blurred vision , card irreg , chest tight , convuls , cyan , diarr , head , lac , lar spasm , low BP , miosis , nau , para , rhin , salv , sweat , twitch , vomit , wheez		
Target Organs	Nervous system - unspecified		
Azobenzene	103-33-3	1.3E+04	B2
Barium, elemental	7440-39-3	1.5E+04	D
Baygon	114-26-1	8.5E+02	
Health Effects	abdom cramps , blurred vision , diarr , head , lass , miosis , musc twitch , nau , salv , sweat , vomit		
Target Organs	RBC		
Bayleton	43121-43-3	6.4E+03	
Baythroid	68359-37-5	5.3E+03	
Benefin	1861-40-1	6.4E+04	
Benomyl	17804-35-2	1.1E+04	
Health Effects	irrit eyes , irrit skin , irrit upper resp sys , possible repro effects , possible terato effects , skin sens		
Target Organs	Developmental - generic, Reproductive - unspecified by gender, Skin		
Bentazon	25057-89-0	6.4E+03	E
Benzene	71-43-2	3.0E+01	A
Health Effects	anor , bone marrow depres , carc , derm , dizz , head , irrit eyes , irrit nose , irrit resp sys , irrit skin , lass , nau , staggered gait		
Target Organs	Blood, IMM system - unspecified, WBC		
Benzenethiol	108-98-5	2.1E+01	
Health Effects	CNS depres , cough , cyan , derm , dizz , dysp , head , irrit eyes , irrit resp sys , irrit skin , kidney damage , liver damage , nau , pneu , pulm edema , spleen damage , vomit , wheez		
Target Organs	CNS - unspecified, Eyes, Liver, Skin		
Benzidine	92-87-5	5.4E+00	A
Health Effects	acute cystitis , acute liver disorders , carc , derm , hema , irreg urination , painful urination , secondary anemia from hemolysis		
Target Organs	Bladder, Brain, Liver		

Appendix E. Military Exposure Guidelines For Soil

All concentrations in mg/kg

Chemical Name	CASRN	1-year Negligible	Cancer Class
Benzo(a)anthracene	56-55-3	7.4E+07	B2
Benzo(a)pyrene	50-32-8	1.6E+02	B2
Benzo(b)fluoranthene	205-99-2	7.4E+07	B2
Benzo(k)fluoranthene	207-08-9	7.4E+08	B2
Benzoic acid	65-85-0	5.8E+05	D
Benzotrichloride	98-07-7	1.1E+02	B2
Beryllium, elemental	7440-41-7	1.0E+03	B1
Health Effects	berylliosis (chronic exposure): anor , berylliosis (chronic exposure): chest pain , berylliosis (chronic exposure): clubbing of fingers , berylliosis (chronic exposure): cough , berylliosis (chronic exposure): cyan , berylliosis (chronic exposure): lass ,		
Target Organs	GI tract - unspecified, Lungs, Small intestine		
Bidrin	141-66-2	2.1E+01	
Health Effects	abdom cramps , anor , anxi , diarr , dizz , head , inco , lac , lass , mal , musc twitch , nau , restless , rhinitis , salv , sweat , tremor , vomit		
Target Organs	Developmental - generic		
Bifenox	42576-02-3	2.1E+05	
Biphenthrin	82657-04-3	3.2E+03	
Biphenyl, 1,1-	92-52-4	1.1E+04	D
Health Effects	head , irrit eyes , irrit throat , lass , liver damage , nau , numb limbs		
Target Organs	Kidneys, Lungs		
Bis(2-chloro-1-methylethyl) ether	108-60-1	2.0E+03	C
Bis(2-chloroethoxy)methane	111-91-1	6.4E+03	D
Bis(2-chloroethyl) ether	111-44-4	1.5E+02	B2
Health Effects	carc , cough , in animals: pulm edema , irrit nose , irrit resp sys , irrit throat , lac , liver damage , nau , vomit		
Target Organs	Liver, Lungs, Whole body		
Bis(2-chloroisopropyl) ether	39638-32-9	8.5E+03	
Bis(2-ethylhexyl) phthalate	117-81-7	3.5E+04	B2
Health Effects	carc , in animals: liver damage , irrit eyes , irrit muc memb , terato effects		
Target Organs	Liver, Reproductive - unspecified by gender		
Bis(chloromethyl) ether	542-88-1	1.0E-01	A
Health Effects	blood-stained sputum , bronchial secretions , carc , corn damage , cough , decr pulm function , dysp , edema , irrit eyes , irrit muc memb , irrit resp sys , irrit skin , nec , pulm congestion , wheez		
Target Organs	Lungs, Respiration - unspecified		
Bisphenol A	80-05-7	1.1E+05	
Boron	7440-42-8	4.2E+04	IN
Boron trifluoride	7637-07-2	6.5E+06	
Health Effects	epis , eye burns , in animals: kidney damage , in animals: pneu , irrit eyes , irrit nose , irrit resp sys , irrit skin , skin burns		
Target Organs	Kidneys		
Bromate	15541-45-4	8.5E+02	B2
Bromobenzene	108-86-1	1.7E+02	
Bromodichloromethane	75-27-4	2.3E+01	B2

Appendix E. Military Exposure Guidelines For Soil

All concentrations in mg/kg

Chemical Name	CASRN	1-year Negligible	Cancer Class
Bromoethene	593-60-2	1.4E+00	B2
Health Effects	carc , conf , dizz , inco , irrit eyes , irrit skin , liquid: frostbite , narco , nau , vomit		
Target Organs	CNS - unspecified, Liver, Lungs		
Bromoform	75-25-2	5.3E+03	B2
Health Effects	CNS depres , irrit eyes , irrit resp sys , irrit skin , kidney damage , liver damage		
Target Organs	Large intestine, Liver, Lungs		
Bromophos	2104-96-3	1.1E+04	
Bromoxynil	1689-84-5	4.2E+03	
Bromoxynil octanoate	1689-99-2	4.2E+03	
Busan	21564-17-0	6.4E+04	
Butadiene, 1,3-	106-99-0	2.7E-01	CA
Health Effects	carc , dizz , drow , irrit eyes , irrit nose , irrit throat , liquid: frostbite , repro effects , terato effects		
Target Organs	Blood, Multiple sites, Ovaries		
Butanol, 1-	71-36-3	1.8E+05	D
Health Effects	blurred vision , CNS depres , corn inflamm , derm , dizz , drow , head , hearing loss , irrit eyes , irrit nose , irrit throat , lac , photo , possible auditory nerve damage		
Target Organs	CNS - unspecified, Whole body		
Butyl benzyl phthalate	85-68-7	4.2E+05	C
Butyl glycolyl butyl phthalate	85-70-1	2.1E+05	
Butylate	2008-41-5	1.1E+04	
Cacodylic acid	75-60-5	4.2E+03	D
Cadmium, elemental	7440-43-9	1.0E+02	B1
Health Effects	anos , carc , chest tight , chills , cough , diarr , dysp , emphy , head , mild anemia , musc ache , nau , prot , pulm edema , subs pain , vomit		
Target Organs	Bronchi, Kidneys, Lungs, Trachea		
Calcium cyanide	592-01-8	8.5E+03	
Caprolactam	105-60-2	1.1E+05	4
Health Effects	abdom cramps , asthma , conf , derm , diarr , dizz , epis , head , irrit eyes , irrit resp sys , irrit skin , irrity , kidney inj , liver inj , nau , skin sens , vomit		
Target Organs	Developmental - generic, Kidneys		
Captafol	2425-06-1	4.2E+02	C
Health Effects	bron , conj , derm , diarr , high BP , in animals: carc , in animals: terato effects , irrit eyes , irrit resp sys , irrit skin , kidney inj , liver inj , skin sens , vomit , wheez		
Target Organs	Bladder, Kidneys, LYMP system - unspecified, Skin		
Captan	133-06-2	2.8E+04	B2
Health Effects	blurred vision , carc , derm , diarr , dysp , irrit eyes , irrit skin , irrit upper resp sys , skin sens , vomit		
Target Organs	Whole body		
Carbaryl	63-25-2	2.1E+04	3
Health Effects	abdom cramps , blurred vision , convuls , cyan , diarr , irrit skin , lac , miosis , nau , possible repro effects , rhin , salv , sweat , tremor , vomit		
Target Organs	Kidneys, Liver, None, RBC		
Carbazole	86-74-8	5.9E+04	B2
Carbofuran	1563-66-2	1.1E+03	
Health Effects	abdom cramps , blurred vision , convuls , diarr , head , inco , lass , miosis , musc twitch , nau , salv , sweat , vomit		
Target Organs	Blood, Nervous system - unspecified, RBC, Testes, Uterus		

Appendix E. Military Exposure Guidelines For Soil

All concentrations in mg/kg

Chemical Name	CASRN	1-year Negligible	Cancer Class
Carbon disulfide	75-15-0	1.2E+02	
Health Effects	anor , anxi , coronary heart disease , derm , dizz , eye burns , gastritis , head , kidney inj , lass , liver inj , low weight , ocular changes , Parkinson-like syndrome , polyneur , poor sleep , psychosis , repro effects , skin burns		
Target Organs	Developmental - generic, Female reproduction - unspecified, Liver, Nervous system - unspecified, PNS - unspecified		
Carbon tetrachloride	56-23-5	5.4E+01	B2
Health Effects	carc , CNS depres , dizz , drow , inco , irrit eyes , irrit skin , kidney inj , liver inj , nau , vomit		
Target Organs	Liver		
Carbosulfan	55285-14-8	2.1E+03	
Carboxin	5234-68-4	2.1E+04	
Chloral	75-87-6	4.2E+03	3
Chloral hydrate	302-17-0	2.1E+04	C
Chloramben	133-90-4	3.2E+03	
Chloranil	118-75-2	3.7E+03	C
Chlordane	57-74-9	1.2E+02	B2
Health Effects	abdom pain , anuria , ataxia , blurred vision , carc , conf , convuls , cough , delirium , diarr , in animals: kidney damage , in animals: liver damage , in animals: lung damage , irrity , nau , tremor , vomit		
Target Organs	CNS-unspecified, Developmental - generic, Liver		
Chlordecone	143-50-0	1.1E+02	B2
Health Effects	anxi , ataxia , carc , chest pain , head , kidney damage , liver damage , low sperm count , skin eryt , testicular atrophy , tremor , vis dist		
Target Organs	Kidneys, Liver, Nervous system - unspecified		
Chlorfenvinphos	470-90-6	4.2E+02	
Chlorimuron-ethyl	90982-32-4	4.2E+03	
Chlorine	7782-50-5	2.1E+04	
Health Effects	burning mouth , burning nose , burning of eyes , choking , cough , derm , dizz , head , hypox , irrit Throat, irrit Nose, irrit Eyes, lac , liquid: frostbite , nau , pneu , pulm edema , rhin , subs pain , syncope , vomit		
Target Organs	Eyes, Lungs, None, Nose, Stomach, Whole body		
Chlorite (sodium chlorite)	7758-19-2	2.1E+04	D
Chloro-1,3-butadiene	126-99-8	1.1E+01	2B
Health Effects	alopecia , anxi , carc , derm , irrit eyes , irrit resp sys , irrit skin , irrity , repro effects		
Target Organs	Liver, Nose, Reproductive - unspecified by gender		
Chloro-2-methylaniline hydrochloride, 4-	3165-93-3	3.2E+03	B2
Chloro-2-methylaniline, 4-	95-69-2	2.6E+03	B2
Chloroacetic acid	79-11-8	4.2E+03	IN
Chloroacetophenone, 2-	532-27-4	1.1E-02	
Health Effects	irrit eyes , irrit resp sys , irrit skin , pulm edema		
Target Organs	Nose		
Chloroaniline, 4-	106-47-8	1.1E+02	2B
Chlorobenzene	108-90-7	4.3E+02	D
Health Effects	CNS depres , drow , in animals: kidney inj , in animals: liver inj , in animals: lung inj , inco , irrit eyes , irrit nose , irrit skin		
Target Organs	Kidneys, Liver		

Appendix E. Military Exposure Guidelines For Soil

All concentrations in mg/kg

Chemical Name	CASRN	1-year Negligible	Cancer Class
Chlorobenzilate	510-15-6	3.5E+03	B2
Chlorobenzotrifluoride, 4-	98-56-6	6.4E+03	
Chlorobutane, 1-	109-69-3	1.5E+04	D
Chlorodifluoromethane	75-45-6	7.4E+03	3
Health Effects	asphy , card arrhy , conf , drow , heart palp , irrit resp sys , kidney inj , liquid: frostbite , liver inj , ringing in ears , spleen inj		
Target Organs	Adrenal glands, CVS - unspecified, Kidneys, Pituitary glands		
Chloroform	67-66-3	9.1E+01	B2
Health Effects	anes , carc , conf , dizz , enlarged liver , head , irrit eyes , irrit skin , lass , mental dullness , nau		
Target Organs	Liver, Reproductive - unspecified by gender		
Chloronaphthalene, beta-	91-58-7	4.2E+04	
Chloronitrobenzene, o-	88-73-3	6.2E-01	C
Chlorophenol, 2-	95-57-8	1.7E+03	
Chloropropane, 2-	75-29-6	5.8E+02	
Chlorothalonil	1897-45-6	2.7E+03	B2
Chlorotoluene, o-	95-49-8	4.2E+04	
Health Effects	anes , cough , derm , drow , inco , irrit eyes , irrit muc memb , irrit skin , kidney inj , liver inj		
Target Organs	None, Whole body		
Chlorotoluene, p-	106-43-4	1.5E+05	IN
Chlorpropham	101-21-3	4.2E+04	3
Chlorpyrifos	2921-88-2	6.4E+02	
Health Effects	abdom cramps , bluish lips , bluish skin , blurred vision , diarr , lar spasm , miosis , nau , salv , vomit , wheez		
Target Organs	Blood, Nervous system - unspecified		
Chlorpyrifos methyl	5598-13-0	2.1E+03	
Chlorsulfuron	64902-72-3	1.1E+04	
Chlorthiophos	60238-56-4	1.7E+02	
Chromium (III)	16065-83-1	3.0E+05	D
Health Effects	irrit eyes , sens derm		
Target Organs	None		
Chromium (VI)	18540-29-9	1.9E+03	A
Chrysene	218-01-9	7.4E+09	B2
Cobalt	7440-48-4	6.2E+02	B1
Health Effects	asthma , cough , decr pulm func , derm , diffuse nodular fib , dysp , low weight , resp hypersensitivity , wheez		
Target Organs	Blood, CVS - unspecified, Respiration - generic, Respiration - unspecified		
Coke oven emissions	8007-45-2	1.1E+07	A
Health Effects	carc , cough , dysp , irrit eyes , irrit resp sys , wheez		
Target Organs	Lungs, Respiration - unspecified		
Copper cyanide	544-92-3	1.1E+04	
Cresol, m-	108-39-4	1.1E+05	C
Health Effects	CNS effects: conf , CNS effects: depres , CNS effects: resp fail , derm , dysp , eye burns , irreg rapid resp , irrit eyes , irrit muc memb , irrit skin , kidney damage , liver damage , lung damage , pancreas damage , skin burns , weak pulse		
Target Organs	CNS - unspecified, Nervous system - unspecified, Respiration - unspecified, Skin, Whole body		

Appendix E. Military Exposure Guidelines For Soil

All concentrations in mg/kg

Chemical Name	CASRN	1-year Negligible	Cancer Class
Cresol, o-	95-48-7	1.1E+05	C
Health Effects	CNS effects: conf , CNS effects: depres , CNS effects: resp fail , derm , dysp , eye burns , irreg rapid resp , irrit eyes , irrit muc memb , irrit skin , kidney damage , liver damage , lung damage , pancreas damage , skin burns , weak pulse		
Target Organs	CNS - unspecified, Nervous system - unspecified, Skin, Whole body		
Cresol, p-	106-44-5	1.1E+03	C
Health Effects	CNS effects: conf , CNS effects: depres , CNS effects: resp fail , derm , dysp , eye burns , irreg rapid resp , irrit eyes , irrit muc memb , irrit skin , kidney damage , liver damage , lung damage , pancreas damage , skin burns , weak pulse		
Target Organs	CNS - unspecified, Nervous system - unspecified, Respiration - unspecified, Skin, Whole body		
Crotonaldehyde, trans-	123-73-9	7.8E+02	C
Health Effects	irrit Respiration - unspecified, irrit Nose, irrit Eyes, lac Eyes, pares Eyes		
Target Organs	Eyes, Liver, Lungs, Whole body		
Cumene	98-82-8	2.0E+03	D
Health Effects	coma , derm , head , irrit eyes , irrit muc memb , irrit skin , narco		
Target Organs	Adrenal glands, CNS - unspecified, Kidneys, Nose		
Cyanazine	21725-46-2	4.2E+02	C
Cyanide	57-12-5	4.2E+03	D
Health Effects	giddiness , head , nau , palp , tremors , weak		
Target Organs	Nerves, Thyroid, Whole body		
Cyanogen	460-19-5	8.5E+03	
Health Effects	bradycardia , cherry red lips , convuls , dizz , head , hypernea , irrit eyes , irrit nose , irrit upper resp sys , lac , liquid: frostbite , loss of appetite , low weight , tachypnea		
Target Organs	Nerves, None, Thyroid, Whole body		
Cyanogen bromide	506-68-3	1.9E+04	
Cyanogen chloride	506-77-4	1.1E+04	
Health Effects	conf , cough , delayed pulm edema , dizz , head , irreg heartbeat , irrit eyes , irrit skin (liquid) , irrit upper resp sys , lass , nau , vomit		
Target Organs	Lungs, Nerves, Thyroid, Whole body		
Cyclohexane	110-82-7	9.2E+02	IN
Health Effects	coma , derm , drow , irrit eyes , irrit resp sys , irrit skin , narco		
Target Organs	CNS - unspecified, Developmental - generic		
Cyclohexanone	108-94-1	1.1E+06	3
Health Effects	coma , derm , head , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit muc memb , irrit skin , narco		
Target Organs	CNS - unspecified, Kidneys, Liver, Whole body		
Cyclohexylamine	108-91-8	6.4E+04	
Health Effects	cough , diarr , dizz , drow , eye burns , irrit eyes , irrit muc memb , irrit resp sys , irrit skin , nau , pulm edema , skin burns , skin sens , vomit		
Target Organs	Eyes, Respiration - unspecified, Testes, Whole body		
Cyclopentadiene	542-92-7	2.8E+09	
Health Effects	irrit eyes , irrit nose		
Cyhalothrin	68085-85-8	2.1E+03	
Cypermethrin	52315-07-8	2.1E+03	
Cyromazine	66215-27-8	1.6E+03	
Dacthal	1861-32-1	2.1E+03	

Appendix E. Military Exposure Guidelines For Soil

All concentrations in mg/kg

Chemical Name	CASRN	1-year Negligible	Cancer Class
Dalapon	75-99-0	6.4E+03	
Health Effects	CNS depres , diarr , irrit eyes , irrit skin , irrit upper resp sys , lass , loss of appetite , skin burns , slowing of pulse , vomit		
Target Organs	Female reproduction - unspecified, Kidneys		
Danitol	39515-41-8	5.3E+03	
DDD	72-54-8	5.2E+03	B2
DDE	72-55-9	3.6E+03	B2
DDT	50-29-3	1.0E+02	B2
Health Effects	anxi , carc , conf , convuls , dizz , head , irrit eyes , irrit skin , lass , mal , pares face , pares lips , pares tongue , paresis hands , tremor , vomit		
Target Organs	Developmental - generic, Liver		
Decabromodiphenyl ether	1163-19-5	4.5E+03	C
Demeton	8065-48-3	8.5E+00	
Health Effects	abdom cramps , aching eyes , anor , ataxia , card irreg , chest tight , coma , conf , convuls , cyan , diarr , dizz , head , irrit eyes , irrit skin , lar spasm , lass , local sweat , low BP , miosis , musc fasc , nau , para , rhin , salv , vomit , wheez		
Target Organs	Nerves		
Di(2-ethylhexyl)adipate	103-23-1	1.1E+05	C
Diallate	2303-16-4	2.0E+04	B2
Diazinon	333-41-5	4.2E+02	
Health Effects	abdom cramps , blurred vision , conf , convuls , dizz , dysp , irrit eyes , lass , miosis , nau , salv , vomit		
Target Organs	Blood, Nervous system - unspecified		
Dibenz(a,h)anthracene	53-70-3	7.4E+06	B2
Dibenzofuran	132-64-9	6.7E+02	D
Dibromo-3-chloropropane, 1,2-	96-12-8	3.5E+02	B2
Health Effects	carc , drow , irrit eyes , irrit nose , irrit skin , irrit throat , kidney inj , liver inj , nau , pulm edema , sterility , vomit		
Target Organs	Kidneys, Liver, Male reproduction - unspecified, Nasal - pharynx, Reproductive - unspecified by gender, Stomach, Testes		
Dibromobenzene, 1,4-	106-37-6	2.1E+04	
Dibromochloromethane	124-48-1	1.2E+04	C
Dibromoethane, 1,2-	106-93-4	2.6E+00	LI
Health Effects	carc , derm with vesic , heart damage , irrit eyes , irrit resp sys , irrit skin , kidney damage , liver damage , repro effects , spleen damage		
Target Organs	Adrenal glands, Kidneys, Liver, Nasal - pharynx, Nose, Sperm, Stomach, Testes, Thyroid		
Dibromomethane	74-95-3	1.9E+03	
Dibutyl phthalate	84-74-2	2.1E+05	D
Health Effects	irrit eyes , irrit stomach , irrit upper resp sys		
Target Organs	Developmental - generic, Reproductive - unspecified by gender, Whole body		
Dibutyl tin dichloride	683-18-1	1.1E+03	
Dicamba	1918-00-9	6.4E+03	
Dichloro-2-butene, 1,4-	764-41-0	2.9E+00	B2
Dichloroacetic acid	79-43-6	2.5E+03	LI

Appendix E. Military Exposure Guidelines For Soil

All concentrations in mg/kg

Chemical Name	CASRN	1-year Negligible	Cancer Class
Dichlorobenzene, 1,2-	95-50-1	4.0E+03	D
Health Effects	irrit eyes , irrit nose , kidney damage , liver damage , skin blisters		
Target Organs	Kidneys, Liver, None		
Dichlorobenzene, 1,3-	541-73-1	1.6E+01	D
Dichlorobenzene, 1,4-	106-46-7	3.4E+03	C
Health Effects	anor , cirr , head , in animals: carc , in animals: kidney inj , in animals: liver inj , irrit eyes , jaun , low weight , nau , profuse rhinitis , swell periorb , vomit		
Target Organs	Eyes, Kidneys, Liver, Respiration - unspecified		
Dichlorobenzidine, 3,3'-	91-94-1	2.7E+03	B2
Health Effects	carc , caustic burns , dizz , dysuria , frequent urination , GI upset , head , hema , skin derm , skin sens , upper resp infection		
Target Organs	Breasts, Skin		
Dichlorodifluoromethane	75-71-8	3.0E+02	
Health Effects	asphy , card arrest , card arrhy , dizz , liquid: frostbite , tremor , uncon		
Target Organs	CVS - unspecified, None, Whole body		
Dichloroethane, 1,1-	75-34-3	4.2E+05	C
Health Effects	CNS depres , irrit skin , kidney damage , liver damage , lung damage		
Target Organs	Kidneys, Liver		
Dichloroethane, 1,2-	107-06-2	2.7E+00	B2
Health Effects	carc , CNS depres , corn opac , CVS damage , derm , irrit eyes , kidney damage , liver damage , nau , vomit		
Target Organs	Blood vessels, Kidneys, Liver		
Dichloroethylene, 1,1-	75-35-4	4.1E+00	C
Health Effects	carc , dizz , dysp , head , irrit eyes , irrit skin , irrit throat , kidney dist , liver dist , nau , pneu		
Target Organs	CNS - unspecified, Kidneys, Liver		
Dichloroethylene, 1,2-	540-59-0	1.9E+03	
Health Effects	CNS depres , irrit eyes , irrit resp sys		
Target Organs	Liver		
Dichloroethylene, cis-1,2-	156-59-2	2.1E+04	D
Dichloroethylene, trans-	156-60-5	2.6E+02	
Dichlorophenol, 2,4-	120-83-2	3.5E+03	
Dichlorophenoxy acetic acid, 2,4-	94-75-7	1.9E+03	
Health Effects	convuls , derm , hyporeflexia , in animals: kidney inj , in animals: liver inj , lass , musc twitch , stupor		
Target Organs	Blood, Kidneys, Liver, None		
Dichlorophenoxybutyric acid, 2,4-	94-82-6	1.7E+04	
Dichloropropane, 1,2-	78-87-5	6.0E+00	B2
Health Effects	carc , dizz , drow , in animals: CNS depres , irrit eyes , irrit resp sys , irrit skin , kidney damage , liver damage		
Target Organs	Blood, Liver, Nasal - pharynx, Nervous system - unspecified, Nose, Respiration - unspecified		
Dichloropropane, 1,3-	142-28-9	4.2E+04	D
Dichloropropanol, 2,3-	616-23-9	6.4E+02	
Dichloropropene, 1,3-	542-75-6	9.4E+00	B2
Health Effects	carc , dizz , eye burns , head , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit resp sys , irrit skin , lac , liver damage , skin burns		

Appendix E. Military Exposure Guidelines For Soil

All concentrations in mg/kg

Chemical Name	CASRN	1-year Negligible	Cancer Class
Target Organs	Bladder, Bronchi, GI tract - unspecified, Kidneys, Liver, Lungs, Nasal - pharynx, Nose, Respiration - unspecified, Whole body		
Dichlorvos	62-73-7	6.4E+02	B2
Health Effects	aching eyes , anor , ataxia , card irreg , chest tight , convuls , cyan , diarr , dizz , head , irrit eyes , irrit skin , lar spasm , low BP , miosis , musc fasc , nau , para , rhin , salv , sweat , vomit , wheez		
Target Organs	Blood, Brain, Nervous system - unspecified, Pancreas, Stomach		
Dicyclopentadiene	77-73-6	1.7E+01	IN
Health Effects	cough , head , in animals: kidney damage , in animals: lung damage , inco , irrit eyes , irrit nose , irrit skin , irrit throat , skin blisters , sneez		
Target Organs	Liver, Reproductive - unspecified by gender		
Dieldrin	60-57-1	1.8E+01	B2
Health Effects	carc , clonic convuls , coma , dizz , head , in animals: kidney damage , in animals: liver damage , mal , myoclonic limb jerks , nau , sweat , tonic convuls , vomit		
Target Organs	CNS - unspecified, Liver, Nervous system - unspecified		
Diesel engine exhaust	Diesel	4.7E+06	LI
Health Effects	carc , irrit eyes , pulm func changes		
Target Organs	Lungs		
Diethyl phthalate	84-66-2	1.7E+06	D
Health Effects	dizz , head , in animals: repro effects , irrit eyes , irrit nose , irrit skin , irrit throat , lac , lass in arms & legs , nau , numb in arms & legs , pain in arms & legs , possible polyneur dysfunc , possible vestibular dist , spasms in arms & legs		
Target Organs	Liver, Reproductive - unspecified by gender, Whole body		
Diethylene glycol monobutyl ether	112-34-5	6.0E+04	D
Diethylene glycol monoethyl ether	111-90-0	1.0E+05	D
Diethylformamide	617-84-5	2.1E+02	D
Diethylstilbestrol	56-53-1	2.6E+05	A
Difenzoquat	43222-48-6	1.7E+04	
Diflubenzuron	35367-38-5	4.2E+03	
Difluoroethane, 1,1-	75-37-6	3.7E+10	
Diisopropyl ether	108-20-3	3.7E+09	D
Health Effects	derm , in animals: dizz , in animals: drow , in animals: narco , in animals: uncon , irrit eyes , irrit nose , irrit skin , resp discomfort		
Target Organs	Liver		
Diisopropyl methylphosphonate	1445-75-6	1.7E+05	D
Dimethipin	55290-64-7	4.2E+03	C
Dimethoate	60-51-5	4.2E+01	
Dimethoxybenzidine, 3,3'-	119-90-4	8.8E+04	B2
Health Effects	in animals: carc , in animals: kidney damage , in animals: liver damage , in animals: spleen changes , in animals: thyroid changes , irrit skin		
Target Organs	Stomach		
Dimethyl methylphosphonate	756-79-6	1.3E+04	
Dimethyl terephthalate	120-61-6	2.1E+04	
Dimethylaniline hydrochloride,	21436-96-4	2.6E+03	C

Appendix E. Military Exposure Guidelines For Soil

All concentrations in mg/kg

Chemical Name	CASRN	1-year Negligible	Cancer Class
2,4-			
Dimethylaniline, 2,4-	95-68-1	2.0E+03	C
Dimethylaniline, N,N-	121-69-7	4.2E+03	3
Health Effects	anoxia symptoms: ataxia , anoxia symptoms: cyan , anoxia symptoms: dizz , anoxia symptoms: lass , anoxia symptoms: methemo		
Target Organs	Spleen		
Dimethylbenzidine, 3,3'-	119-93-7	1.1E+02	B2
Health Effects	carc , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit nose		
Target Organs	Blood, Breasts, Kidneys, Liver, Whole body		
Dimethylformamide	68-12-2	6.4E+04	3
Health Effects	colic , derm , enlarged liver , face flush , high BP , in animals: heart damage , in animals: kidney damage , irrit eyes , irrit resp sys , irrit skin , liver damage , nau , vomit		
Target Organs	GI tract - unspecified, Liver, reproductive - unspecified by gender		
Dimethylhydrazine, 1,1-	57-14-7	7.5E+03	B2
Health Effects	anoxia , carc , chest pain , choking , convuls , drow , dysp , dysp , head , irrit Skin, irrit Respiration - unspecified, irrit Throat, irrit Nervous system - unspecified, irrit eyes , irrit skin , liver inj , nau , nau , tight Respiration - unspecified,		
Target Organs	Liver, Muscles (non-heart), Whole body		
Dimethylhydrazine, 1,2-	540-73-8	1.7E+02	B2
Health Effects	dysp , head , irrit Throat, irrit Skin, irrit Respiration - unspecified, irrit Nervous system - unspecified, nau , tight Respiration - unspecified, vomit , weak		
Target Organs	Liver, Muscles (non-heart), Whole body		
Dimethylphenol, 2,4-	105-67-9	1.1E+04	
Dimethylphenol, 2,6-	576-26-1	1.3E+03	
Dimethylphenol, 3,4-	95-65-8	2.1E+03	
Dinitrobenzene, 1,2-	528-29-0	2.1E+02	D
Health Effects	anemia , anoxia , bad taste , burning mouth , central scotomas , cyan , dry throat , liver damage , thirst , vis dist , yellowing eyes , yellowing hair , yellowing skin		
Target Organs	Spleen		
Dinitrobenzene, 1,3-	99-65-0	1.8E+02	D
Health Effects	anemia , anoxia , bad taste , burning mouth , central scotomas , cyan , dry throat , liver damage , thirst , vis dist , yellowing eyes , yellowing hair , yellowing skin		
Target Organs	Blood, Reproductive - unspecified by gender, Sperm, Spleen, Testes		
Dinitro-o-cresol, 4,6-	534-52-1	7.1E+02	D
Health Effects	coma , cough , excess thirst , fever , head , hyperpnea , lass , profuse sweat , sense of well being , short breath , tacar		
Target Organs	Nervous system - unspecified, Whole body		
Dinitro-o-cyclohexyl phenol, 4,6-	131-89-5	4.2E+03	
Dinitrophenol, 2,4-	51-28-5	4.2E+03	
Dinitrotoluene	25321-14-6	2.2E+03	B2
Health Effects	anemia , anoxia , carc , cyan , jaun , repro effects		
Target Organs	Breasts, CVS - unspecified, Liver, Reproductive - unspecified by gender		
Dinitrotoluene, 2,4-	121-14-2	3.5E+02	2B
Dinitrotoluene, 2,6-	606-20-2	1.8E+03	2B
Di-n-octyl phthalate	117-84-0	7.1E+04	D
Dinoseb	88-85-7	2.1E+02	D

Appendix E. Military Exposure Guidelines For Soil

All concentrations in mg/kg

Chemical Name	CASRN	1-year Negligible	Cancer Class
Dioxane, 1,4-	123-91-1	1.1E+05	B2
Health Effects	carc , drow , head , irrit eyes , irrit nose , irrit skin , irrit throat , kidney failure , liver damage , nau , vomit		
Target Organs	Eyes, Kidneys, Liver, Nose, Respiration - unspecified		
Diphenamid	957-51-7	6.4E+03	
Diphenylamine	122-39-4	5.3E+03	
Health Effects	bladder inj , cough , eczema , heart rate , hema , hypertension , in animals: terato effects , incr BP , irrit eyes , irrit muc memb , irrit skin , methemo , prot , sneez , tacar		
Target Organs	Blood, Kidneys, Liver, Spleen, Whole body		
Diphenylhydrazine, 1,2-	122-66-7	1.5E+03	B2
Diquat	85-00-7	4.7E+02	
Health Effects	chest pain , convuls , cough , delayed healing of wounds , diarr , dysp , epis , irrit eyes , irrit muc memb , irrit resp sys , irrit skin , kidney , liver inj , mal , nau , pulm edema , rhin , skin burns , tremor , vomit		
Target Organs	Eyes		
Direct black 38	1937-37-7	1.7E+02	A
Direct blue 6	2602-46-2	1.8E+02	A
Direct brown 95	16071-86-6	1.6E+02	A
Disulfoton	298-04-4	1.6E+01	
Health Effects	abdom cramps , blurred vision , card irreg , chest tight , diarr , dizz , dysp , eye burns , head , irrit eyes , irrit skin , lass , miosis , musc fasc , nau , rhin , salv , skin burns , vomit		
Target Organs	Blood, Developmental - generic, Eyes, Nerves, Nervous system - unspecified		
Dithiane, 1,4-	505-29-3	2.1E+04	D
Diuron	330-54-1	4.2E+02	
Health Effects	in animals: anemia , in animals: methemo , irrit eyes , irrit nose , irrit skin , irrit throat		
Target Organs	Blood, Developmental - generic, Whole body		
Dodine	2439-10-3	8.5E+02	
EA 2192	73207-98-4	1.3E-01	
EMPA	1832-53-7	5.3E+03	
Endosulfan	115-29-7	1.1E+03	
Health Effects	agitation , conf , convuls , decr testis weight , dry mouth , flushing , head , in animals: kidney inj , in animals: liver inj , irrit skin , nau , tremor		
Target Organs	Blood vessels, CNS - unspecified, IMM system - unspecified, Kidneys, Liver, Whole body		
Endothall	145-73-3	4.2E+03	
Endrin	72-20-8	4.2E+02	D
Health Effects	abdom discomfort , aggressiveness , anor , conf , dizz , drow , epilep convuls , head , in animals: liver damage , insom , lass , nau , stupor , vomit		
Target Organs	CNS - unspecified, Heart, Kidneys, Liver, Nervous system - unspecified, Whole body		
Epichlorohydrin	106-89-8	2.4E+01	B2
Health Effects	abdom pain , carc , cough , cyan , irrit eyes , irrit skin with deep pain , nau , repro effects , resp distress , vomit		
Target Organs	Kidneys, Liver, Nasal - pharynx, Nose, reproductive - unspecified by gender, Stomach		
Epoxybutane, 1,2-	106-88-7	1.9E+07	2B
EPTC	759-94-4	5.3E+03	
Ethephon	16672-87-0	1.1E+03	
Ethion	563-12-2	4.2E+02	
Health Effects	abdom cramps , blurred vision , card irreg , chest tight , diarr , dizz , dysp , head , irrit eyes , irrit skin , lass ,		

Appendix E. Military Exposure Guidelines For Soil

All concentrations in mg/kg

Chemical Name	CASRN	1-year Negligible	Cancer Class
	miosis , musc fasc , nau , rhin , salv , vomit		
Target Organs	Blood, Nervous system - unspecified		
Ethoxyethanol, 2-	110-80-5	8.8E+04	
Health Effects	in animals: blood changes , in animals: irrit eyes , in animals: irrit resp sys , in animals: kidney damage , in animals: liver damage , in animals: lung damage , in animals: repro effects , in animals: terato effects		
Target Organs	Blood, Conceptuses/Fetuses, Kidneys, RBC, Reproductive - unspecified by gender, Testes, Whole body		
Ethoxyethyl acetate, 2-	111-15-9	2.8E+08	
Health Effects	in animals: repro effects , in animals: terato effects , irrit eyes , irrit nose , kidney damage , para , vomit		
Target Organs	Reproductive - unspecified by gender		
Ethyl acetate	141-78-6	1.9E+06	
Health Effects	derm , irrit eyes , irrit nose , irrit skin , irrit throat , narco		
Target Organs	Whole body		
Ethyl acrylate	140-88-5	3.1E+04	B2
Health Effects	carc , irrit eyes , irrit resp sys , irrit skin		
Target Organs	Respiration - unspecified, Stomach		
Ethyl chloride	75-00-3	7.2E+02	3
Health Effects	abdom cramps , card arrest , card arrhy , inco , inebri , kidney damage , liver damage		
Target Organs	CNS - unspecified, Developmental - generic, Liver, Reproductive - unspecified by gender, Whole body		
Ethyl ether	60-29-7	1.4E+04	
Health Effects	dizz , drow , excited , head , irrit eyes , irrit skin , irrit upper resp sys , narco , nau , vomit		
Target Organs	Liver, Whole body		
Ethyl methacrylate	97-63-2	1.9E+04	
Ethyl p-nitrophenyl phenylphosphorothioate	2104-64-5	2.1E+01	
Health Effects	abdom cramps , anor , card irreg , chest tight , convuls , cyan , diarr , head , irrit eyes , irrit skin , lac , lar spasm , low BP , miosis , nau , para , rhin , salv , wheez		
Target Organs	Nervous system - unspecified		
Ethylbenzene	100-41-4	2.3E+03	D
Health Effects	coma , derm , head , irrit eyes , irrit muc memb , irrit skin , narco		
Target Organs	Bone, CNS - unspecified, Developmental - generic, Kidneys, Liver, Reproductive - unspecified by gender		
Ethylene cyanohydrin	109-78-4	2.1E+04	IN
Ethylene diamine	107-15-3	4.2E+04	D
Health Effects	asthma , asthma , cough , irrit Nose, irrit nose , irrit resp sys , kidney damage , liver damage , phlegm , resp , sens derm , wheez		
Target Organs	Kidneys, Liver, Lungs, Whole body		
Ethylene glycol	107-21-1	1.4E+05	
Health Effects	abdom pain , CNS depres , convuls , dizz , irrit eyes , irrit nose , irrit skin , irrit throat , lass , nau , skin sens , stupor , vomit		
Target Organs	Conceptuses/Fetuses, Developmental - generic, Kidneys		
Ethylene glycol monobutyl ether	111-76-2	1.2E+04	C
Health Effects	CNS depres , head , hema , hemolysis , irrit eyes , irrit nose , irrit skin , irrit throat , vomit		
Target Organs	Blood, CNS - unspecified, Liver, RBC		
Ethylene oxide	75-21-8	8.7E+01	B1
Health Effects	cyan , diarr , drow , dysp , EKG abnor , eye burns (liq or high vap conc) , head , in animals: carc , in animals: convuls , in animals: kidney damage , in animals: liver damage , inco , irrit eyes , irrit nose , irrit skin , irrit throat , lass , liquid:		
Target Organs	Blood, Brain, Kidneys, Reproductive - unspecified by gender, Stomach		

Appendix E. Military Exposure Guidelines For Soil

All concentrations in mg/kg

Chemical Name	CASRN	1-year Negligible	Cancer Class
Ethylene thiourea	96-45-7	1.4E+01	B2
Health Effects	in animals: carc , in animals: goiter , in animals: terato effects , in animals: thickening of the skin , irrit eyes		
Target Organs	Conceptuses/Fetuses, Female reproduction - unspecified, Liver, Thyroid		
Ethylphthalyl ethyl glycolate	84-72-0	6.4E+05	
Express	101200-48-0	1.7E+03	
Fenamiphos	22224-92-6	5.3E+01	
Health Effects	abdom cramps , blurred vision , card irreg , chest tight , diarr , dizz , dysp , head , lass , miosis , musc fasc , nau , rhin , salv , vomit		
Target Organs	Blood, Conceptuses/Fetuses, Female reproduction - unspecified, Nerves		
Fluometuron	2164-17-2	2.8E+03	3
Fluoranthene	206-44-0	6.7E+04	D
Fluorene	86-73-7	6.7E+04	D
Fluorine	7782-41-4	1.3E+04	
Health Effects	eye burns , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit nose , irrit resp sys , lar spasm , pulm edema , skin burns , wheez		
Target Organs	Respiration - unspecified, Teeth		
Fluridone	59756-60-4	1.7E+04	
Flurprimidol	56425-91-3	4.2E+03	
Flutolanil	66332-96-5	1.3E+04	
Fluvalinate	69409-94-5	2.1E+03	
Folpet	133-07-3	2.1E+04	B2
Fomesafen	72178-02-0	7.8E+03	C
Fonofos	944-22-9	4.2E+02	
Health Effects	abdom cramps , blurred vision , card irreg , chest tight , diarr , dizz , dysp , head , lass , miosis , musc fasc , nau , rhin , salv , vomit		
Target Organs	Blood, Liver, Nerves		
Formaldehyde	50-00-0	6.4E+04	B1
Health Effects	carc , cough , derm , irrit eyes , irrit nose , irrit resp sys , irrit throat , lac , wheez		
Target Organs	GI tract - unspecified, Nasal - pharynx, Respiration - unspecified, Skin, Whole body		
Fosetyl-aluminum	39148-24-8	6.4E+05	C
Furan	110-00-9	2.1E+03	2B
Furazolidone	67-45-8	3.9E+02	B2
Furfural	98-01-1	6.4E+03	3
Health Effects	derm , head , irrit eyes , irrit skin , irrit upper resp sys		
Target Organs	Liver		
Furium	531-82-8	3.0E+01	B2
Furmecyclox	60568-05-0	4.9E+04	B2
Glufosinate ammonium	77182-82-2	8.5E+02	
Glycidaldehyde	765-34-4	7.1E+02	B2
Glyphosate	1071-83-6	2.1E+04	D
Haloxyfop-methyl	69806-40-2	1.1E+01	
Harmony	79277-27-3	2.8E+03	

Appendix E. Military Exposure Guidelines For Soil

All concentrations in mg/kg

Chemical Name	CASRN	1-year Negligible	Cancer Class
HCFC-142b	75-68-3	7.4E+03	
HD	505-60-2	1.6E-01	1
Health Effects	blepharospasm , blisters Skin, burn Skin, cell damage/death Skin, conj Eyes, conjunctivitis Eyes, erythema Skin, eye reddening Eyes, head , irrit Eyes, itching rash Skin, lac Eyes, lar Larynx, photo Eyes, pulm Lungs, rhinitis , swell , swell Eyes, swellin		
Target Organs	Developmental - generic, Eyes, GI tract - unspecified, Whole body		
Heptachlor	76-44-8	1.8E+01	B2
Health Effects	in animals: carc , in animals: convuls , in animals: liver damage , in animals: tremor		
Target Organs	Blood, CNS - unspecified, IMM system - unspecified, Liver		
Heptachlor epoxide	1024-57-3	2.8E+00	B2
Hexabromobenzene	87-82-1	4.2E+03	
Hexachlorobenzene	118-74-1	1.8E+01	B2
Hexachlorobutadiene	87-68-3	2.1E+02	C
Health Effects	in animals: carc , in animals: irrit eyes , in animals: irrit resp sys , in animals: irrit skin , in animals: kidney damage		
Target Organs	Kidneys		
Hexachlorocyclohexane, alpha-	319-84-6	2.0E+02	B2
Hexachlorocyclohexane, beta-	319-85-7	1.3E+02	C
Hexachlorocyclohexane, technical	608-73-1	8.2E+02	B2
Hexachlorocyclopentadiene	77-47-4	3.2E+03	E
Health Effects	cough , diarr , dysp , eye burns , in animals: kidney inj , in animals: liver inj , irrit eyes , irrit resp sys , irrit skin , lac , nau , pulm edema , salv , skin burns , sneez , vomit		
Target Organs	Kidneys, Nasal - pharynx, Nose, Respiration - unspecified, Stomach, Whole body		
Hexachloroethane	67-72-1	1.8E+03	C
Health Effects	in animals: carc , in animals: kidney damage , irrit eyes , irrit muc memb , irrit skin		
Target Organs	Kidneys, Liver, Nervous system - unspecified		
Hexachlorophene	70-30-4	1.9E+02	3
Hexamethylene diisocyanate	822-06-0	1.9E+05	
Health Effects	asthma , bron , corn damage , cough , dysp , irrit eyes , irrit resp sys , irrit skin , pulm edema , skin blisters , wheez		
Target Organs	Nose, Respiration - unspecified		
Hexane, commercial	110-54-3	3.9E+02	
Health Effects	chemical pneu (aspir liquid) , derm , dizz , head , irrit eyes , irrit nose , nau , peri neur: musc weak , peri neur: numb extremities		
Target Organs	CNS - unspecified, Nervous system - unspecified, Testes, Whole body		
Hexazinone	51235-04-2	7.0E+03	
HFC-134A	811-97-2	7.5E+10	
HMX	2691-41-0	1.0E+05	D
Hydrazine	302-01-2	4.9E+02	B2
Health Effects	carc , convuls , derm , dizz , eye burns , in animals: bron , in animals: pulm edema , irrit eyes , irrit nose , irrit skin , irrit throat , kidney damage , liver damage , nau , skin burns , temporary blindness		
Target Organs	Liver, Nasal - pharynx, Nose		
Hydrogen chloride	7647-01-0	1.9E+07	3
Health Effects	choking , cough , derm , in animals: lar spasm , irrit Throat, irrit larynx , irrit nose , irrit throat , liquid: frostbite		

Appendix E. Military Exposure Guidelines For Soil

All concentrations in mg/kg

Chemical Name	CASRN	1-year Negligible	Cancer Class
	, pulm edema , solution: eye burns , solution: skin burns		
Target Organs	Larynx, Lungs, Nasal-pharynx, None, Nose, Trachea, Whole body		
Hydrogen cyanide	74-90-8	1.0E+01	
Health Effects	anor , asphy , blood changes , conf , dizz , ftg , giddiness , head , head , incr rate and depth of respiration or respiration slow and gasping , irrit Eyes, lass , nau , nau , nau , numb , palp , thyroid changes , tremors , tremors , vertigo , vomit , vo		
Target Organs	CNS - unspecified, Lungs, Nerves, Thyroid, Whole body		
Hydrogen sulfide	7783-06-4	6.4E+03	IN
Health Effects	apnea , coma , conj , convuls , corn vesic , dizz , eye pain , GI dist , head , insom , irrit eyes , irrit resp sys , irrity , lac , lass , liquid: frostbite , photo		
Target Organs	GI tract - unspecified, Nasal - pharynx, Nose, Respiration - unspecified		
Hydroquinone	123-31-9	2.5E+04	C
Health Effects	CNS excitement , collapse , colored urine , delirium , derm , dizz , irrit eyes: conj , irrit skin , kera , musc twitch , nau , rapid breath , sens , suffocation		
Target Organs	Blood, Kidneys		
Imazalil	35554-44-0	2.8E+03	
Imazaquin	81335-37-7	5.3E+04	
Indeno(1,2,3-cd)pyrene	193-39-5	7.4E+07	B2
Iodine	7553-56-2	2.1E+03	
Health Effects	chest tight , cutaneous hypersensitivity , head , irrit eyes , irrit nose , irrit skin , lac , rash , skin burns		
Target Organs	Hormones - unspecified		
Iprodione	36734-19-7	8.5E+03	
Iron	7439-89-6	1.5E+05	
Isobutyl alcohol	78-83-1	6.4E+05	
Health Effects	drow , head , in animals: narco , irrit eyes , irrit skin , irrit throat , skin cracking		
Target Organs	CNS - unspecified, Eyes, Muscles (non-heart)		
Isophorone	78-59-1	3.5E+05	C
Health Effects	derm , dizz , head , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit nose , irrit throat , lass , mal , narco , nau		
Target Organs	Kidneys, Liver, Male supporting structures, None, Other		
Isopropalin	33820-53-0	3.2E+04	
Isopropyl methyl phosphonic acid	1832-54-8	2.1E+05	D
Isoxaben	82558-50-7	1.1E+04	C
JP-4 jet fuel	50815-00-4	8.4E+09	3
Kerosene	8008-20-6	9.3E+06	
Health Effects	burning sensation in chest , chemical pneu (aspir liquid) , conf , derm , diarr , drow , head , inco , irrit eyes , irrit nose , irrit skin , irrit throat , lass , nau , restless , vomit		
Target Organs	CNS - unspecified, Liver, Skin		
Lactofen	77501-63-4	4.2E+02	
Lewisite oxide	3088-37-7	6.4E+01	
Lindane	58-89-9	5.9E+02	B2
Health Effects	aplastic anemia , clonic convuls , cyan , head , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit nose , irrit skin , irrit throat , musc spasm , nau , resp difficulty		
Target Organs	CNS - unspecified, Developmental - generic, IMM system - unspecified, Kidneys, Liver, Nerves		

Appendix E. Military Exposure Guidelines For Soil

All concentrations in mg/kg

Chemical Name	CASRN	1-year Negligible	Cancer Class
Linuron	330-55-2	4.2E+02	C
Lithium	7439-93-2	4.2E+02	
Londax	83055-99-6	4.2E+04	
Lutetium	7439-94-3	1.1E+05	
Malathion	121-75-5	3.5E+03	3
Health Effects	abdom cramps , aching eyes , anor , ataxia , blurred vision , chest tight , conf , diarr , dizz , head , irrit eyes , irrit skin , lac , lar spasm , miosis , nau , rhin , salv , vomit , wheez		
Target Organs	Blood, Nervous system - unspecified, RBC, Respiration - unspecified		
Maleic anhydride	108-31-6	2.1E+04	
Health Effects	bronchial asthma , conj , derm , double vision , irrit nose , irrit upper resp sys , photo vision		
Target Organs	Kidneys, None		
Maleic hydrazide	123-33-1	1.1E+05	3
Malononitrile	109-77-3	2.1E+02	D
Health Effects	abdom pain , conf , convuls , dizz , dysp , head , irrit eyes , irrit nose , irrit skin , irrit throat , lass , nau , vomit		
Target Organs	Liver		
Mancozeb	8018-01-7	6.4E+03	
Maneb	12427-38-2	1.1E+04	3
Manganese	7439-96-5	1.8E+04	D
Health Effects	asthenia , insom , kidney damage , lass , low-back pain , mal , mental conf , metal fume fever: chest tight , metal fume fever: cough , metal fume fever: dry throat , metal fume fever: dysp , metal fume fever: flu-like fever , metal fume fever: rales , Pa		
Target Organs	CNS - unspecified, Lungs, Nervous system - unspecified, None, Reproductive - unspecified by gender		
MCPA	94-74-6	1.1E+02	
MCPB	94-81-5	2.1E+04	
MCPP	93-65-2	2.1E+03	
Mephosfolan	950-10-7	1.9E+02	
Mepiquat chloride	24307-26-4	6.4E+04	
Mercuric chloride	7487-94-7	6.4E+02	C
Mercury, elemental	7439-97-6	9.8E+05	C
Health Effects	anor , bron , chest pain , cough , dysp , GI dist , head , indecision , insom , irrit eyes , irrit skin , irrity , lass , low weight , pneu , prot , salv , stomatitis , tremor		
Target Organs	CNS - unspecified, Kidneys, Nervous system - unspecified, Reproductive - unspecified by gender		
Merphos	150-50-5	6.4E+01	
Merphos oxide	78-48-8	6.4E+01	
Metalaxyl	57837-19-1	1.3E+04	
Methacrylonitrile	126-98-7	8.4E+00	
Health Effects	in animals: convuls , in animals: loss of motor control in hind limbs , irrit eyes , irrit skin , lac		
Target Organs	Blood, Brain, CNS - unspecified, Liver		
Methamidophos	10265-92-6	1.1E+01	
Methanol	67-56-1	1.1E+06	
Health Effects	derm , dizz , drow , head , irrit eyes , irrit skin , irrit upper resp sys , nau , optic nerve damage (blindness) , vis dist , vomit		
Target Organs	Blood, Brain, CNS - unspecified, Eyes, Liver		
Methidathion	950-37-8	2.1E+02	C

Appendix E. Military Exposure Guidelines For Soil

All concentrations in mg/kg

Chemical Name	CASRN	1-year Negligible	Cancer Class
Methomyl	16752-77-5	5.3E+03	
Health Effects	abdom cramps , blurred vision , dysp , irrit eyes , kidney damage , lass , liver damage , miosis , musc twitch , nau , salv , vomit		
Target Organs	Blood, Kidneys, Spleen		
Methoxy-5-nitroaniline, 2-	99-59-2	3.2E+04	B2
Methoxychlor	72-43-5	8.8E+02	D
Health Effects	in animals: carc , in animals: convuls , in animals: fasc , in animals: kidney damage , in animals: liver damage , in animals: trembling		
Target Organs	CNS - unspecified, Female reproduction - unspecified, Liver, None, Reproductive - unspecified by gender, Whole body		
Methoxyethanol, 2-	109-86-4	1.8E+03	
Health Effects	anemic pallor , ataxia , drow , head , in animals: repro effects , in animals: terato effects , irrit eyes , irrit nose , irrit throat , lass , tremor		
Target Organs	Blood, Reproductive - unspecified by gender, Testes		
Methoxyethyl acetate, 2-	110-49-6	4.2E+03	
Health Effects	brain damage , in animals: narco , irrit eyes , irrit nose , irrit throat , kidney damage , repro effects , terato effects		
Target Organs	Blood, Reproductive - unspecified by gender		
Methyl acetate	79-20-9	2.1E+06	
Health Effects	chest tight , drow , head , in animals: narco , irrit eyes , irrit nose , irrit skin , irrit throat , optic nerve atrophy		
Target Organs	Liver		
Methyl acrylate	96-33-3	6.4E+03	D
Health Effects	irrit eyes , irrit skin , irrit upper resp sys		
Methyl bromide	74-83-9	2.5E+01	D
Health Effects	carc , convuls , dizz , dysp , hand tremor , head , inco , irrit eyes , irrit resp sys , irrit skin , liquid: frostbite , mal , musc weak , nau , skin vesic , vis dist , vomit		
Target Organs	GI tract - unspecified, Nervous system - unspecified, Nose, Stomach		
Methyl chloride	74-87-3	1.5E+02	D
Health Effects	carc , coma , convuls , dizz , kidney damage , liquid: frostbite , liver damage , nau , repro effects , slurred speech , stagger , terato effects , vis dist , vomit		
Target Organs	Brain, CNS - unspecified, Kidneys, Liver, Nervous system - unspecified, Reproductive - unspecified by gender		
Methyl ethyl ketone	78-93-3	2.7E+03	IN
Health Effects	derm , dizz , head , irrit eyes , irrit nose , irrit skin , vomit		
Target Organs	CNS - unspecified, Conceptuses/Fetuses, Developmental - generic		
Methyl isobutyl ketone	108-10-1	2.8E+03	IN
Health Effects	coma , derm , head , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit muc memb , irrit skin , narco		
Target Organs	Bone, Developmental - generic, Kidneys, Liver, Whole body		
Methyl mercaptan	74-93-1	1.9E+06	IN
Health Effects	convuls , cyan , irrit eyes , irrit resp sys , irrit skin , liquid: frostbite , narco		
Target Organs	Liver, Whole body		
Methyl methacrylate	80-62-6	6.7E+02	E
Health Effects	derm , irrit eyes , irrit nose , irrit skin , irrit throat		
Target Organs	Kidneys, None, Nose, Skin		
Methyl parathion	298-00-0	1.2E+02	3
Health Effects	abdom cramps , blurred vision , card irreg , chest tight , diarr , dizz , dysp , head , irrit eyes , irrit skin , lass , miosis , musc fasc , nau , rhin , salv , vomit		
Target Organs	Blood, Nervous system - unspecified, RBC		

Appendix E. Military Exposure Guidelines For Soil

All concentrations in mg/kg

Chemical Name	CASRN	1-year Negligible	Cancer Class
Methyl tertiary butyl ether	1634-04-4	1.6E+03	3
Methyl-5-nitroaniline, 2-	99-55-8	4.5E+04	C
Methylaniline hydrochloride, 2-	636-21-5	6.9E+03	B2
Methylaniline, 2-	95-53-4	5.2E+03	B2
Health Effects	anoxia , carc , cyan , derm , dizz , drow , eye burns , head , irrit eyes , lass , micro hema		
Target Organs	Kidneys, Skin		
Methylene chloride	75-09-2	3.5E+02	B2
Health Effects	carc , dizz , drow , irrit eyes , irrit skin , lass , nau , numb limbs , tingle limbs		
Target Organs	CNS - unspecified, Liver, Nervous system - unspecified, Unspecified		
Methylene diphenyl diisocyanate	101-68-8	6.5E+04	D
Health Effects	asthma , chest pain , cough , dysp , irrit eyes , irrit nose , irrit throat , pulm secretions , resp sens		
Target Organs	Lungs, Nasal - pharynx, Nose		
Methylene-bis(2-chroloaniline), 4,4'-	101-14-4	3.5E+02	LI
Health Effects	carc , cyan , hema , kidney irrit , methemo , nau		
Target Organs	Liver, Lungs		
Methylenebis(N,N'-dimethyl)aniline, 4,4'-	101-61-1	2.7E+04	B2
Methylenedianiline, 4,4'-	101-77-9	1.4E+04	2B
Health Effects	hepatitis , in animals: carc , in animals: heart damage , in animals: liver damage , in animals: spleen damage , irrit eyes , jaun , myocardial damage		
Target Organs	Liver		
Methylmercury	22967-92-6	2.1E+01	C
Methylnaphthalene, 1-	90-12-0	1.5E+04	
Methylnapthalene, 2-	91-57-6	6.7E+02	IN
Methylphosphonic acid	993-13-5	2.2E+07	D
Methylstyrene, alpha-	98-83-9	1.5E+05	
Health Effects	derm , drow , irrit eyes , irrit nose , irrit skin , irrit throat		
Metolachlor	51218-45-2	3.2E+04	C
Metribuzin	21087-64-9	5.3E+03	D
Health Effects	in animals: CNS depres , liver enzyme changes , thyroid changes		
Target Organs	Blood, Kidneys, Liver, Whole body		
Mirex	2385-85-5	4.2E+01	B2
Molinate	2212-67-1	4.2E+02	
Molybdenum	7439-98-7	1.1E+03	
Health Effects	anemia , in animals: anor , in animals: diarr , in animals: dysp , in animals: inco , in animals: irrit eyes , in animals: irrit nose , in animals: irrit throat , in animals: kidney damage , in animals: listlessness , in animals: liver damage , in animals		
Target Organs	Blood, CNS - unspecified, Joints, Kidneys, Lungs, Ureters/urethra		
Monochloramine	10599-90-3	2.1E+04	D
Naled	300-76-5	4.2E+02	
Health Effects	abdom cramps , anor , ataxia , card irreg , chest tight , convuls , cyan , diarr , dizz , head , irrit eyes , irrit skin , lac , lar spasm , lass , low BP , miosis , nau , para , salv , twitch , vomit , wheez		

Appendix E. Military Exposure Guidelines For Soil

All concentrations in mg/kg

Chemical Name	CASRN	1-year Negligible	Cancer Class
Target Organs	Brain		
Naphthalene	91-20-3	1.8E+01	C
Health Effects	abdom pain , conf , corn damage , derm , excitement , head , hema , irrit bladder , irrit eyes , jaun , mal , nau , optical neuritis , profuse sweat , renal shutdown , vomit		
Target Organs	Blood, Eyes, Nervous system - unspecified, Nose, Respiration - unspecified, Whole body		
Napropamide	15299-99-7	2.1E+04	
Nickel refinery dust	Ni ref dust	2.7E+07	A
Nickel subsulfide	12035-72-2	1.4E+07	A
Nickel, soluble salts	Ni sol salts	4.2E+03	1
Nitrate	14797-55-8	3.4E+05	
Nitrite	14797-65-0	2.1E+04	
Nitroaniline, 2-	88-74-4	3.7E+05	D
Nitrobenzene	98-95-3	1.1E+02	D
Health Effects	anemia , anoxia , derm , in animals: kidney damage , in animals: liver damage , in animals: testicular effects , irrit eyes , irrit skin , methemo		
Target Organs	Adrenal glands, Blood, Kidneys, Liver		
Nitrofurantoin	67-20-9	1.5E+05	3
Nitrofurazone	59-87-0	9.9E+02	B2
Nitroglycerin	55-63-0	2.1E+01	
Health Effects	abdom pain , angina , CNS depres , delirium , dizz , flush , hypotension , irrit skin , methemo , nau , palp , throb head , vomit		
Target Organs	Blood, CVS - unspecified		
Nitroguanidine	556-88-7	2.1E+04	D
Nitromethane	75-52-5	5.6E+07	LI
Health Effects	convuls , derm , in animals: irrit eyes , in animals: irrit resp sys , liver damage , narco		
Target Organs	Breast, Nasal-pharynx, Thyroid		
Nitrophenol, 2-	88-75-5	2.3E-02	
Nitropropane, 2-	79-46-9	2.4E+06	B2
Health Effects	anor , carc , diarr , head , irrit eyes , irrit nose , irrit resp sys , irrit skin , kidney damage , liver damage , nau , vomit		
Target Organs	Liver		
Nitrosodiethanolamine, N-	1116-54-7	4.4E+02	B2
Nitrosodiethylamine, N-	55-18-5	8.2E+00	B2
Nitrosodimethylamine, N-	62-75-9	1.4E+00	B2
Health Effects	abdom cramps , carc , decr kidney func , decr liver func , decr pulm func , diarr , enlarged liver , fever , head , jaun , nau , vomit		
Target Organs	Developmental - Generic and/or multiple, Liver		
Nitroso-di-n-butylamine, N-	924-16-3	1.5E+01	B2
Nitrosodiphenylamine, N-	86-30-6	3.0E+05	B2
Nitrosodipropylamine, N-	621-64-7	1.8E+02	B2
Nitroso-N-ethylurea, N-	759-73-9	1.1E+01	B2
Nitroso-N-methylethylamine, N-	10595-95-6	6.7E+01	B2

Appendix E. Military Exposure Guidelines For Soil

All concentrations in mg/kg

Chemical Name	CASRN	1-year Negligible	Cancer Class
Nitrosopyrrolidine, N-	930-55-2	5.9E+02	B2
Nitrotoluene, m-	99-08-1	2.1E+02	D
Health Effects	anoxia , ataxia , cyan , dizz , dysp , head , lass , nau , tacar , vomit		
Target Organs	HMP system - generic, Spleen		
Nitrotoluene, o-	88-72-2	2.1E+03	B2
Health Effects	anoxia , ataxia , cyan , dizz , dysp , head , lass , nau , tacar , vomit		
Target Organs	Blood, Spleen, Whole body		
Nitrotoluene, p-	99-99-0	8.5E+02	C
Health Effects	anoxia , ataxia , cyan , dizz , dysp , head , lass , nau , tacar , vomit		
Target Organs	Female reproduction - generic, Spleen		
Norflurazon	27314-13-2	8.5E+03	
NuStar	85509-19-9	1.5E+02	
Octabromodiphenyl ether	32536-52-0	6.4E+03	D
Octamethylpyrophosphoramide	152-16-9	4.2E+02	
Oryzalin	19044-88-3	1.1E+04	C
Oxadiazon	19666-30-9	1.1E+03	
Oxamyl	23135-22-0	5.3E+03	
Oxyfluorfen	42874-03-3	6.4E+02	
Paclobutrazol	76738-62-0	2.8E+04	
Paraquat dichloride	1910-42-5	9.5E+02	C
Health Effects	derm , epis , fingernail damage , heart damage , irrit eyes , irrit GI tract , irrit nose , irrit resp sys , irrit skin , irrit throat , kidney damage , liver damage		
Target Organs	Conceptuses/Fetuses, Female reproduction - unspecified, Lungs		
Parathion	56-38-2	1.3E+03	C
Health Effects	abdom cramps , anor , ataxia , card irreg , chest tight , coma , conf , convuls , cyan , diarr , dizz , head , irrit eyes , irrit resp sys , irrit skin , lar spasm , lass , low BP , miosis , musc fasc , nau , para , rhin , salv , sweat , vomit , wheez		
Target Organs	Cholinesterase		
Pebulate	1114-71-2	1.1E+04	
Pendimethalin	40487-42-1	8.5E+03	
Pentabromo-6-chlorocyclohexane, 1,2,3,4,5-	87-84-3	6.5E+04	C
Pentabromodiphenyl ether	32534-81-9	4.2E+03	D
Pentachlorobenzene	608-93-5	1.7E+03	D
Pentachloroethane	76-01-7	1.6E+04	3
Health Effects	in animals: irreg respiration , in animals: irrit eyes , in animals: irrit skin , in animals: kidney changes , in animals: lass , in animals: liver changes , in animals: lung changes , in animals: musc inco , in animals: restless		
Target Organs	Liver		
Pentachloronitrobenzene	82-68-8	6.4E+02	C
Pentachlorophenol	87-86-5	1.4E+02	B2
Health Effects	anor , chest pain , cough , derm , dizz , dysp , head , high fever , irrit eyes , irrit nose , irrit throat , lass , low weight , nau , sneez , sweat , vomit		
Target Organs	CNS - unspecified, Conceptuses/Fetuses, CVS - unspecified, Developmental - generic, Hormones -		

Appendix E. Military Exposure Guidelines For Soil

All concentrations in mg/kg

Chemical Name	CASRN	1-year Negligible	Cancer Class
	unspecified, Kidneys, Liver, Reproductive - unspecified by gender		
Perchloroethylene	127-18-4	9.7E+01	2A
Health Effects	carc , dizz , drow , flush face , flush neck , head , inco , irrit eyes , irrit nose , irrit resp sys , irrit skin , irrit throat , liver damage , nau , skin eryt		
Target Organs	CNS - unspecified, Developmental - generic, Liver, Nervous system - unspecified		
Permethrin	52645-53-1	4.2E+04	3
Phenmedipham	13684-63-4	5.3E+04	
Phenol	108-95-2	1.3E+05	D
Health Effects	anor , convuls , cyan , dark urine , derm , irrit eyes , irrit nose , irrit throat , kidney damage , lass , liver damage , low weight , musc ache , musc pain , ochronosis , skin burns , tremor , twitch		
Target Organs	Blood, CNS - unspecified, Conceptuses/Fetuses, Female reproduction - unspecified, Respiration - unspecified, Whole body		
Phenylenediamine, m-	108-45-2	1.3E+04	3
Phenylenediamine, o-	95-54-5	2.6E+04	B2
Phenylenediamine, p-	106-50-3	4.0E+04	3
Health Effects	bronchial asthma , irrit larynx , irrit pharynx , sens derm		
Target Organs	Eyes, Skin, Whole body		
Phenylmercuric acetate	62-38-4	1.7E+01	
Phenylphenol, 2-	90-43-7	6.4E+05	C
Phorate	298-02-2	4.2E+01	
Health Effects	abdom cramps , anor , ataxia , card irreg , chest tight , coma , conf , convuls , cyan , diarr , dizz , head , irrit eyes , irrit resp sys , irrit skin , lar spasm , lass , low BP , miosis , musc fasc , nau , para , rhin , salv , sweat , vomit , wheez		
Target Organs	Cholinesterase		
Phosgene	75-44-5	8.4E+05	
Health Effects	chest pain , cough Lungs, cough , cyan , dry burning throat , dysp , foamy sputum , inj Lungs, irrit Throat, irrit Respiration - unspecified, irrit Eyes, irrit eyes , liquid: frostbite , pulmonary edema Lungs, vomit		
Target Organs	Lungs, None		
Phosmet	732-11-6	4.2E+03	
Phosphine	7803-51-2	6.4E+01	D
Health Effects	abdom pain , chest tight , chills , diarr , dysp , liquid: frostbite , musc pain , nau , pulm edema , stupor or syncope , thirst , vomit		
Target Organs	CNS - unspecified, GI tract - unspecified, Nose, Whole body		
Phosphoric acid	7664-38-2	9.3E+07	
Health Effects	burns , derm , eye burns , irrit eyes , irrit skin , irrit upper resp sys , skin burns		
Target Organs	Bronchi		
Phosphorus, white	12185-10-3	4.2E+01	
Phthalic anhydride	85-44-9	4.2E+05	
Health Effects	bron , bronchial asthma , conj , derm , in animals: kidney damage , in animals: liver damage , irrit eyes , irrit skin , irrit upper resp sys , nasal ulcer bleeding		
Target Organs	Kidneys, Lungs, Nose		
Picloram	1918-02-1	1.5E+04	3
Health Effects	in animals: kidney changes , in animals: liver changes , irrit eyes , irrit resp sys , irrit skin , nau		
Target Organs	Liver		
Pirimiphos-methyl	29232-93-7	2.1E+03	
Polybrominated biphenyl	36355-01-8	1.5E+01	B2

Appendix E. Military Exposure Guidelines For Soil

All concentrations in mg/kg

Chemical Name	CASRN	1-year Negligible	Cancer Class
Polychlorinated biphenyls	1336-36-3	5.8E+02	B2
Potassium cyanide	151-50-8	1.1E+04	
Health Effects	asphy , blood changes , conf , head , incr rate resp , irrit eyes , irrit skin , irrit upper resp sys , lass , nau , slow gasping resp , thyroid changes , vomit		
Target Organs	CNS - unspecified, Lungs, Nerves, Thyroid, Whole body		
Potassium perchlorate	7778-74-7	1.5E+02	NO
Potassium silver cyanide	506-61-6	4.2E+04	
Prochloraz	67747-09-5	1.9E+03	C
Profluralin	26399-36-0	1.3E+03	
Prometon	1610-18-0	3.2E+04	
Prometryn	7287-19-6	8.5E+02	
Pronamide	23950-58-5	1.6E+04	
Propachlor	1918-16-7	2.8E+04	
Propanil	709-98-8	1.1E+03	
Propargite	2312-35-8	4.2E+03	
Propargyl alcohol	107-19-7	4.2E+03	
Health Effects	CNS depres , in animals: kidney damage , in animals: liver damage , irrit muc memb , irrit skin		
Target Organs	Kidneys, Liver		
Propazine	139-40-2	4.2E+03	
Propham	122-42-9	4.2E+04	3
Propiconazole	60207-90-1	2.8E+03	
Propylene glycol	57-55-6	3.6E+06	E
Propylene glycol dinitrate	6423-43-4	2.5E+05	
Health Effects	conj , head , head , impaired balance , in animals: kidney damage , in animals: liver damage , irrit Eyes, irrit eyes , methemo , vis dist		
Target Organs	Blood, CNS - unspecified, CVS - unspecified, Nervous system - unspecified, Whole body		
Propylene glycol monoethyl ether	1569-02-4	1.5E+06	
Propylene glycol monomethyl ether	107-98-2	1.2E+06	
Health Effects	diarr , dizz , drow , head , inco , irrit eyes , irrit nose , irrit skin , irrit throat , nau , vomit		
Target Organs	CNS - unspecified, Kidneys, Liver		
Propylene oxide	75-56-9	5.6E+01	B2
Health Effects	carc , irrit eyes , irrit resp sys , irrit skin , skin blisters , skin burns		
Target Organs	Epithelium, Nasal - pharynx, Nose, Stomach		
Pursuit	81335-77-5	5.3E+04	
Pydrin	51630-58-1	5.3E+03	3
Pyrene	129-00-0	5.1E+04	D
Pyridine	110-86-1	2.1E+03	3
Health Effects	anor , anxi , derm , dizz , head , insom , irrit eyes , kidney damage , liver damage , nau		
Target Organs	CNS - unspecified, Kidneys, Liver		
Quinalphos	13593-03-8	1.1E+02	

Appendix E. Military Exposure Guidelines For Soil

All concentrations in mg/kg

Chemical Name	CASRN	1-year Negligible	Cancer Class
Quinoline	91-22-5	4.1E+02	B2
RDX	121-82-4	6.2E+03	C
Health Effects	convuls , dizz , head , insom , irrit eyes , irrit skin , irrity , lass , nau , tremor , vomit		
Target Organs	Blood, CNS - unspecified, Liver, Nervous system - unspecified, Prostate, Reproductive - unspecified by gender		
Refractory ceramic fibers	ref ceramic fiber	9.8E+07	B2
Resmethrin	10453-86-8	6.4E+03	
Ronnel	299-84-3	1.1E+04	
Health Effects	chol inhibition , in animals: irrit eyes , kidney damage , liver damage		
Target Organs	Liver		
Rotenone	83-79-4	8.5E+02	
Health Effects	abdom pain , clonic convuls , inco , irrit eyes , irrit resp sys , irrit skin , musc tremor , nau , numb muc memb , stupor , vomit		
Target Organs	CNS - unspecified, Developmental - generic		
Savey	78587-05-0	5.3E+03	
Selenious acid	7783-00-8	1.1E+03	D
Selenium	7782-49-2	1.1E+03	D
Health Effects	bron , chills , cirr , derm , dysp , eye burns , fever , garlic breath , GI dist , head , in animals: anemia , irrit eyes , irrit nose , irrit skin , irrit throat , kidney damage , liver nec , metallic taste , skin burns , spleen damage , vis dist		
Target Organs	Liver, Skin, Whole body		
Selenourea	630-10-4	1.1E+03	
Sethoxydim	74051-80-2	1.9E+04	
Silver	7440-22-4	1.1E+03	D
Health Effects	blue-gray eyes , blue-gray nasal septum , blue-gray skin , blue-gray throat , GI dist , irrit skin , ulceration skin		
Target Organs	Eyes, Mucosa, Skin		
Silver cyanide	506-64-9	2.1E+04	
Silvex	93-72-1	1.7E+03	D
Simazine	122-34-9	1.1E+03	C
Sodium azide	26628-22-8	8.5E+03	
Health Effects	blurred vision , bradycardia , dizz , head , irrit eyes , irrit skin , kidney changes , lass , low BP		
Target Organs	CNS - unspecified, CVS - unspecified, Lungs, Whole body		
Sodium cyanide	143-33-9	1.1E+04	
Health Effects	asphy , blood changes , conf , head , incr resp rate , irrit eyes , irrit skin , lass , nau , slow gasping respiration , thyroid changes , vomit		
Target Organs	CNS - unspecified, Lungs, Nerves, Nervous system - unspecified, Reproductive - unspecified by gender, Thyroid, Whole body		
Sodium diethydithiocarbamate	148-18-5	5.5E+03	C
Sodium fluoroacetate	62-74-8	4.2E+01	
Health Effects	anxi , auditory halu , card arrhy , convuls , ectopic heartbeat , facial pares , kidney damage , liver damage , nystagmus , pulm edema , pulsus altenans , tacar , twitch face musc , vomit		
Target Organs	CNS - unspecified, CVS - unspecified, Heart, Sperm, Testes		
Sodium metavanadate	13718-26-8	2.1E+03	
Sodium perchlorate	7601-89-0	1.5E+02	NO
Strontium, stable	7440-24-6	4.2E+05	

Appendix E. Military Exposure Guidelines For Soil

All concentrations in mg/kg

Chemical Name	CASRN	1-year Negligible	Cancer Class
Strychnine	57-24-9	6.4E+02	
Health Effects	anxi , cyan , incr acuity of perception , incr reflex excitability , restless , stiff facial musc , stiff neck , tetanic convuls with opisthotonos		
Target Organs	CNS - unspecified, Unspecified, Whole body		
Styrene	100-42-5	1.6E+03	2B
Health Effects	conf , defatting derm , dizz , drow , head , irrit eyes , irrit nose , irrit resp sys , lass , mal , narco , possible liver inj , repro effects , unsteady gait		
Target Organs	CNS - unspecified, Liver, Nervous system - unspecified, RBC		
Sulfonylbis(4-chlorobenzene),1,1'-	80-07-9	8.5E+02	E
Systhane	88671-89-0	5.3E+03	
TCDD, 2,3,7,8-	1746-01-6	4.0E-03	B2
Health Effects	allergic derm , chloracne , GI dist , in animals: carc , in animals: hemorr , in animals: kidney damage , in animals: liver damage , irrit eyes , porphyria , possible repro effects , possible terato effects		
Target Organs	Developmental - generic, IMM system - unspecified, Liver, LYMP system - unspecified, Respiration - unspecified		
Tebuthiuron	34014-18-1	1.5E+04	
Temephos	3383-96-8	4.2E+04	
Health Effects	abdom cramps , blurred vision , diarr , dizz , dysp , irrit eyes , nau , salv , vomit		
Terbacil	5902-51-2	2.8E+03	
Terbufos	13071-79-9	5.3E+00	
Terbutryn	886-50-0	2.1E+02	
Tetrachlorobenzene, 1,2,4,5-	95-94-3	4.2E+02	
Tetrachloroethane, 1,1,1,2-	630-20-6	1.8E+03	C
Health Effects	in animals: liver changes , irreg respiration , irrit eyes , irrit skin , lass , musc inco , restless		
Target Organs	Kidneys, Liver		
Tetrachloroethane, 1,1,2,2-	79-34-5	2.3E+02	C
Health Effects	abdom pain , carc , derm , hepatitis , jaun , kidney damage , leucyt , liver tend , nau , tremor fingers , vomit		
Target Organs	CNS - unspecified, GI tract - unspecified, Kidneys, Liver		
Tetrachlorophenol, 2,3,4,6-	58-90-2	6.4E+04	
Tetrachlorotoluene, para, alpha, alpha, alpha-	5216-25-1	7.4E+01	B2
Tetrachlorovinphos	961-11-5	6.4E+03	C
Tetraethyl dithiopyrophosphate	3689-24-5	1.1E+03	
Health Effects	anor , blurred vision , card irreg , Cheyne-Stokes respiration , convuls , cyan , diarr , eye pain , head , irrit eyes , irrit skin , lac , lass , local sweat , low BP , nau , para , rhin , twitch , vomit		
Target Organs	Blood, RBC		
Tetraethyl lead	78-00-2	2.1E-01	
Health Effects	anor , anxi , bradycardia , coma , conf , convuls , halu , hyper-reflexia , hypotension , hypothermia , insom , irrit eyes , lass , low weight , mania , nau , pallor , psychosis , spasticity , tremor		
Target Organs	CNS - unspecified, Liver, Thymus		
Tetrahydrofuran	109-99-9	4.5E+02	
Health Effects	CNS depres , dizz , head , irrit eyes , irrit upper resp sys , nau		
Target Organs	CNS, Kidneys, Liver		
Thallium (I) acetate	563-68-8	1.9E+02	D

Appendix E. Military Exposure Guidelines For Soil

All concentrations in mg/kg

Chemical Name	CASRN	1-year Negligible	Cancer Class
Thallium (I) carbonate	6533-73-9	1.7E+02	D
Thallium (I) chloride	7791-12-0	1.7E+02	D
Thallium (I) sulfate	7446-18-6	1.7E+02	D
Thiobencarb	28249-77-6	2.1E+03	
Thiocyanates	463-56-9	1.3E+02	
Thiodiglycol	111-48-8	1.0E+05	
Thiofanox	39196-18-4	6.4E+01	
Thiophanate-methyl	23564-05-8	1.7E+04	
Thiram	137-26-8	1.3E+03	3
Health Effects	antabuse-like effects , derm , irrit eyes , irrit muc memb , irrit skin		
Target Organs	Nervous system - unspecified, Reproductive - unspecified by gender		
Tin, inorganic	7440-31-5	6.4E+04	
Health Effects	in animals: diarr , in animals: para with musc twitch , in animals: vomit , irrit eyes , irrit resp sys , irrit skin		
Target Organs	Blood, Kidneys, Liver		
Titanium tetrachloride	7550-45-0	9.3E+06	
Toluene	108-88-3	2.7E+03	D
Health Effects	anxi , conf , derm , dilated pupils , dizz , euph , head , insom , irrit eyes , irrit nose , kidney damage , lac , lass , liver damage , musc ftg , pares		
Target Organs	CNS - unspecified, Kidneys, Liver, Nervous system - unspecified		
Toluene diisocyanate mixture, 2,4-/2,6-	26471-62-5	6.5E+04	2B
Toluene-2,4-diamine	95-80-7	3.9E+02	B2
Health Effects	ataxia , bluish skin , carc , convuls , cyan , derm , dizz , head , irrit eyes , irrit nose , irrit skin , irrit throat , lass , liver inj , methemo , nau , resp depres , tacar , vomit		
Target Organs	Breasts		
Toluene-2,5-diamine	95-70-5	1.3E+05	3
Toluene-2,6-diamine	823-40-5	1.3E+04	
Toluidine, p-	106-49-0	7.8E+03	C
Health Effects	anemia , carc , convuls , cyan , derm , hema , irrit eyes , irrit skin , lass , low BP , methemo , nau , vomit		
Target Organs	Kidneys, Liver		
Toxaphene	8001-35-2	2.1E+02	B2
Health Effects	agitation , carc , conf , convuls , dry skin , nau , reddening skin , tremor , uncon		
Target Organs	Liver		
Tralomethrin	66841-25-6	1.6E+03	
Triallate	2303-17-5	2.8E+03	
Triasulfuron	82097-50-5	2.1E+03	
Tribromobenzene, 1,2,4-	615-54-3	1.1E+04	
Tributyl phosphate	126-73-8	4.2E+03	B2
Health Effects	head , irrit eyes , irrit resp sys , irrit skin , nau		
Target Organs	Bladder		
Tributyltin oxide	56-35-9	6.4E+01	D
Trichloro-1,2,2-trifluoroethane, 1,1,2-	76-13-1	6.6E+03	

Appendix E. Military Exposure Guidelines For Soil

All concentrations in mg/kg

Chemical Name	CASRN	1-year Negligible	Cancer Class
Health Effects	CNS depres , derm , drow , in animals: card arrhy , in animals: narco , irrit skin , irrit throat		
Target Organs	Brain, CVS - unspecified, Whole body		
Trichloroaniline hydrochloride, 2,4,6-	33663-50-2	5.1E+04	C
Trichloroaniline, 2,4,6-	634-93-5	4.4E+04	C
Trichlorobenzene, 1,2,4-	120-82-1	1.2E+02	D
Health Effects	in animals: kidney damage , in animals: liver damage , in animals: possible terato effects , irrit eyes , irrit muc memb , irrit skin		
Target Organs	Adrenal glands, Kidneys, Liver, None, Ureters/urethra		
Trichloroethane, 1,1,1-	71-55-6	1.2E+03	D
Health Effects	card arrhy , CNS depres , derm , head , irrit eyes , irrit skin , lass , liver damage , poor equi		
Target Organs	Brain, CNS - unspecified, Liver, Nervous system - unspecified, Whole body		
Trichloroethane, 1,1,2-	79-00-5	3.9E+02	C
Health Effects	carc , CNS depres , derm , irrit eyes , irrit nose , kidney damage , liver damage		
Target Organs	Blood, CNS - unspecified, Liver, Nervous system - unspecified, None		
Trichloroethylene	79-01-6	2.8E+01	2A
Health Effects	carc , card arrhy , derm , dizz , drow , head , irrit eyes , irrit skin , lass , liver inj , nau , pares , tremor , vis dist , vomit		
Target Organs	Conceptuses/Fetuses, Developmental - generic, Kidneys, Liver, Nervous system - unspecified		
Trichlorofluoromethane	75-69-4	1.8E+02	
Health Effects	asphy , card arrest , card arrhy , derm , inco , liquid: frostbite , tremor		
Target Organs	CNS - unspecified, CVS - unspecified, Liver, Whole body		
Trichlorophenol, 2,4,5-	95-95-4	6.4E+04	
Trichlorophenol, 2,4,6-	88-06-2	2.1E+02	B2
Trichlorophenoxyacetic acid	93-76-5	2.1E+04	
Health Effects	acne-like rash , in animals: ataxia , irrit skin , liver damage		
Target Organs	Blood, Developmental - generic, Kidneys, Liver, Lungs		
Trichloropropane, 1,1,2-	598-77-6	1.1E+04	
Trichloropropane, 1,2,3-	96-18-4	4.6E+00	B2
Health Effects	carc , CNS depres , in animals: kidney inj , in animals: liver inj , irrit eyes , irrit nose , irrit throat		
Target Organs	Blood, Kidneys, Liver, Multiple sites, RBC, Respiration - unspecified, Whole body		
Trichloropropene, 1,2,3-	96-19-5	4.6E+00	D
Trichlorotoluene, 2,3,6-	2077-46-5	1.1E+01	
Trichlorotoluene, alpha, 2,6-	2014-83-7	1.1E+01	
Triclosan	3380-34-5	8.5E+05	
Tridiphane	58138-08-2	6.4E+02	
Triethylamine	121-44-8	8.6E+01	
Health Effects	in animals: kidney damage , in animals: liver damage , in animals: myocardial damage , irrit eyes , irrit resp sys , irrit skin		
Target Organs	Eyes, Nasal-pharynx, None		
Trifluralin	1582-09-8	1.3E+03	C
Trimethyl phosphate	512-56-1	4.0E+04	B2
Trimethylbenzene, 1,2,4-	95-63-6	1.9E+02	
Health Effects	bron , chemical pneu (aspir liquid) , conf , dizz , drow , head , hypochromic anemia , inco , irrit eyes , irrit		

Appendix E. Military Exposure Guidelines For Soil

All concentrations in mg/kg

Chemical Name	CASRN	1-year Negligible	Cancer Class
	nose , irrit resp sys , irrit skin , irrit throat , lass , nau , vomit		
Target Organs	Blood, Lungs		
Trimethylbenzene, 1,3,5-	108-67-8	1.1E+01	D
Health Effects	bron , chemical pneu (aspir liquid) , conf , dizz , drow , head , hypochromic anemia , inco , irrit eyes , irrit nose , irrit resp sys , irrit skin , irrit throat , lass , nau , vomit		
Target Organs	Blood, Nervous system - unspecified, Respiration - generic, Whole body		
Trinitrobenzene, 1,3,5-	99-35-4	1.0E+02	
Trinitrophenylmethylnitramine	479-45-8	2.1E+03	IN
Health Effects	anemia , coryza , cough , edema on cheeks , edema on nasal folds , edema on neck , eryt , head , insom , irrity , itch , kera , kidney damage , lass , liver damage , mal , nau , sens derm , sneez , vomit		
Target Organs	Liver, Skin		
Trinitrotoluene, 2,4,6-	118-96-7	3.0E+02	C
Health Effects	anemia , card irreg , cataract , cough , cyan , irrit muc memb , irrit skin , jaun , kidney damage , leucyt , liver damage , musc pain , peri neur , sens derm , sneez , sore throat		
Target Organs	Bladder, Blood, Eyes, Liver		
Triphenylphosphine oxide	791-28-6	4.2E+03	D
Tris(2-chloroethyl)phosphate	115-96-8	4.2E+03	C
Tris(2-ethylhexyl)phosphate	78-42-2	2.1E+04	C
Uranium, highly soluble salts	HZ1800-90-T	4.2E+02	
Health Effects	carc. Potential for cancer is a result of alpha-emitting properties & radioactive decay products (e.g. radon) , casts in urine , chest rales , conj , cough , high BUN , lac , nau , prot , RBC in urine , short breath , skin burns , vomit		
Target Organs	Kidneys		
Vanadium	7440-62-2	1.5E+03	
Vanadium pentoxide	1314-62-1	1.9E+03	2B
Health Effects	bron , cough , drow , dysp , eczema , fine rales , green tongue , irrit eyes , irrit skin , irrit throat , metallic taste , wheez		
Target Organs	Hair		
Vanadium sulfate	16785-81-2	4.2E+03	
Vernam	1929-77-7	2.1E+03	
Vinclozolin	50471-44-8	5.3E+03	
Vinyl acetate	108-05-4	2.4E+01	2B
Health Effects	cough , eye burns , hoarseness , irrit eyes , irrit nose , irrit skin , irrit throat , loss of smell , skin blisters		
Target Organs	Kidneys, Nasal - pharynx, Nasal-pharynx, Respiration - unspecified, Whole body		
Vinyl chloride	75-01-4	1.1E+01	A
Health Effects	abdom pain , carc , enlarged liver , GI bleeding , lass , liquid: frostbite , pallor or cyan of extremities		
Target Organs	Developmental - generic, Liver, Lungs		
Vinyl toluene	25013-15-4	5.4E+01	3
Health Effects	drow , in animals: narco , irrit eyes , irrit skin , irrit upper resp sys		
Warfarin	81-81-2	6.4E+01	
Health Effects	abdom pain , abnor hematologic indices , back pain , bleeding lips , epis , fecal blood , hema , hematoma arms , hematoma legs , muc memb hemorr , petechial rash , vomit		
Target Organs	Blood		
Xylene, m-	108-38-3	4.2E+05	
Health Effects	abdom pain , anor , corn vacuolization , derm , dizz , drow , excitement , inco , irrit eyes , irrit nose , irrit skin , irrit throat , nau , staggering gait , vomit		

Appendix E. Military Exposure Guidelines For Soil

All concentrations in mg/kg

Chemical Name	CASRN	1-year Negligible	Cancer Class
Target Organs	CNS - unspecified, Liver, Whole body		
Xylene, o-	95-47-6	4.2E+05	
Health Effects	abdom pain , anor , corn vacuolization , derm , dizz , drow , excitement , inco , irrit eyes , irrit nose , irrit skin , irrit throat , nau , staggering gait , vomit		
Target Organs	CNS - unspecified, Whole body		
Xylenes, total	1330-20-7	3.4E+02	IN
Zinc cyanide	557-21-1	1.1E+04	
Zinc phosphide	1314-84-7	6.4E+02	
Zinc, metallic	7440-66-6	6.4E+04	D
Zineb	12122-67-7	1.1E+04	3

Footnotes for Table E-1: Long-Term Soil-MEGs

CASRN = Chemical Abstract Service Registry Number
MEG = Military Exposure Guideline
mg/kg = milligrams per kilogram (same as ppm or parts per million)

Cancer Classes were obtained from the U.S. Environmental Protection Agency (EPA) when available. If EPA did not list a chemical, the International Agency for Research on Cancer (IARC) was consulted. Class descriptions are provided below. Please see RD230 for additional information.

EPA's Previous Weight-of-Evidence Classifications (EPA 1986a):
- A - Human carcinogen
- B - Probable human carcinogen
- C - Possible human carcinogen
- D - Not classifiable
- E - No evidence of human carcinogenicity

EPA's Current Weight-of-Evidence Classifications (EPA 2005b):
- CA - Carcinogenic to humans
- LI - Likely to be carcinogenic to humans
- SU - Suggestive evidence of carcinogenic potential
- IN - Inadequate information to assess carcinogenic potential
- NO - Not likely to be carcinogenic to humans

IARC's Classifications (IARC 2006):
- 1 - Carcinogenic to humans
- 2A - Probably carcinogenic to humans
- 2B - Possibly carcinogenic to humans
- 3 - Not classifiable as to carcinogenicity in humans
- 4 - Probably not carcinogenic to humans

Potential Health Effects: please see Appendix B for acronyms and definitions. Health effects information was obtained from the following sources:

1) CDC 2004. Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health (NIOSH) Pocket Guide to Chemical Hazards, 97-140, Feb 2004.

2) NRC/COT 2003. National Research Council, Committee on Toxicology. Acute Exposure Guideline Levels for Selected Airborne Chemicals, Volume 3. Committee on Toxicology, Subcommittee on Acute Exposure Guideline Levels. National Academy Press, Washington, DC.

3) USACHPPM 2004. Acute Toxicity Estimation and Operational Risk Management of Chemical Warfare Agent Exposures, U.S. Army Center for Health Promotion and Preventive Medicine. Report No. 47-EM-5863-04: May, 2004.

4) HQDA 2005. Headquarters Department of the Army. TB MED 577, Sanitary Control and Surveillance of Field Water Supplies: December 15, 2005.

Target organs were identified from the sources providing the health criteria used to develop the Soil-MEGs. Please see RD 230 for a list of sources.

APPENDIX F FREQUENTLY ASKED QUESTIONS (FAQs) ABOUT MEGs

What are military exposure guidelines?

Military exposure guidelines (MEGs) are decision aids used to assess health risk to deployed forces from chemical exposures in the environment. The MEGs are designed specifically for use within the risk management framework (Field Manual 5-19) supporting the Commander's decision making process.

A MEG is a chemical concentration in air, water, or soil that represents an exposure threshold. There are several types of thresholds that refer to an increasing potential for mission-related health effects within the entire exposed military population. These thresholds are specifically linked to one part of the military risk management framework in FM 5-19.

Each MEG is an estimate of the exposure level above which certain types of health effects may begin to occur in individuals within the exposed population after an exposure of the specified duration. The severity of the health effects and percentage of the exposed population that might demonstrate the health effects may increase as concentrations increase above the MEG. The degree to which severity and/or incidence of health effects increase as exposure increases above a MEG is chemical-specific. Some of the MEGs are "screening levels" below which certain health effects would not be expected to occur within a deployed population under reasonable worst-case exposure conditions.

The MEGs are population-based; therefore, they are not designed for predicting health effects in specific individuals. The MEGs provide the basis for more detailed evaluation by appropriate health experts—they are not stand-alone action levels. They are often based on other U.S. Federal standards, such as unsafe levels use for emergency response planning or safe levels in the workplace as prescribed by the U.S. Occupation Safety and Health Administration. They are either the same values as U.S. federal agency standards or guidelines or they are adjusted to match the unique exposure scenarios or subpopulations of the deployed forces.

The MEGs have been developed for many chemicals; some chemicals have MEGs for different media (e.g., air, water, and soil) and for different exposure conditions and timeframes (e.g., for short-term exposures of 1 hour or 1 day, as well as for long-term, continuous 1-year exposures). The MEGs are designed to assess a variety of military exposure scenarios, such as a single release of large amounts of a chemical, temporary exposure conditions lasting hours to days, or for continuous ambient environmental conditions, such as a regional pollution.

What kind of MEGs are available and what does 'exceedance of a MEG' mean?

The currently available set of MEGs includes values for air, water, and soil for several different exposure durations arranged along differing military hazard severity levels from Negligible to Catastrophic (see Field Manual 5-19). For example, for a given chemical, there are four possible Air MEG values for the 1-hour exposure duration. The following table presents the standard interpretation and use of the MEGs.

Example of the Potential Types of Air MEGs for the 1-Hour Exposure Duration for a Hypothetical Chemical and the Standard Interpretation of the Hazard Severity Level Associated with Various Field Exposures

Exposure Estimate*	MEG Name	MEG Value	Hazard Severity Designation ‡
† 5 – 29 mg/m^3	1-hour Negligible MEG	5 mg/m^3	Negligible
30 – 149 mg/m^3	1-hour Marginal MEG	30 mg/m^3	Marginal
150 – 339 mg/m^3	1-hour Critical MEG	150 mg/m^3	Critical
≥ 340 mg/m^3	1-hour Catastrophic MEG	340 mg/m^3	Catastrophic

* This exposure estimate represents an average 1 hour exposure. Analytical error associated with measurements at the boundaries of the categories (e.g., 29 vs. 30 mg/m^3) must be acknowledged.
† Field exposures < 5 milligrams per cubic meter (mg/m^3) would not be considered to be a deployment hazard and would not be evaluated in a formal risk assessment.
‡ In reality, hazard severity blends together at the margins between each category, which reflects a graded series of health responses as exposure increases. For example, there is no practical measurement and toxicological distinction between 29 and 30 mg/m3 even though the selected severity categories will be different. The risk assessment method addresses exposures near the borders of the categories.

This standard approach for setting hazard severity levels within a risk assessment sets a useful framework, but it does not highlight the chemical-specific knowledge and the scientific uncertainties associated with the underlying data for any given assessment. The USAPHC (Prov) TG 230 provides additional details on what data the MEGs are based on and what it means to exceed a MEG (i.e., where a field exposure is greater than a MEG).

The fact that a chemical concentration measured in the field is greater than a MEG should never, by itself, be interpreted to mean there is a notable or definitive risk of a specific health effect in an exposed individual. The MEGs are not stand-alone action levels. The MEGs are decision tools used within a risk assessment which informs decision makers about the potential need for actions for adjustments to military operations, potential medical treatment, long-term health surveillance. Because MEGs are derived from protective 'threshold' estimates that often have low confidence, exceeding a MEG only indicates a potential for specified health effects increase among some members of the exposed military population. However, the significance of the increased risk (i.e., type of health effects, severity, and number or personnel) will depend

on many factors. These factors include chemical-specific, dose-response relationships, exposure-time profiles, and the frequency of human susceptibility factors (underlying illnesses, health behaviors (e.g., smoking) and at-risk genes) within the exposed population that may predispose certain individuals to certain effects.

What types of health effects are considered when developing a MEG?

When short-term MEGs are generated, health effects that may develop immediately or shortly after an exposure are considered. Generally speaking, acute/short term effects occur after single relatively brief or short-term exposures (minutes to days). Reversible and irreversible health effects are considered when developing these MEGs. Some of the short-term MEG categories also consider increased risk for developing cancer.

When long-term MEGs are generated, health effects that may develop or continue post-deployment (e.g., months or years later) are considered. In general, the long-term Negligible MEGs are protective of both cancer and the most sensitive health endpoints other than cancer that have been identified in toxicological or epidemiological studies.

How accurate does a MEG estimate a threshold for the possibility of health effects?

The quantity and quality of the health effects and toxicological data upon which the MEGs are based varies substantially across the chemicals. Since existing toxicological databases and health criteria were utilized to develop the MEGs, the quality and extensiveness of toxicological and epidemiological information underlying these guidelines is comparable and as variable as that used by other Federal agencies for worker and civilian applications.

The overall confidence that certain kinds of health effects will not occur within a population when field exposures are below a MEG is generally high. The overall confidence that effects will occur in the population when exposures are above a MEG ranges from low to moderate for most chemicals and health effects. In most cases, some type of margin of safety has been built into a MEG value to address the uncertainty resulting from gaps in toxicological data. This means that MEGs typically reflect levels that are lower than effect levels determined in scientific studies. The amount lowered (safety margin) depends on the extent of scientific uncertainties for that chemical and effect. Some MEGs, especially those for long-term exposures and health effects, have a safety margin that is several orders of magnitude lower than what would be considered safe for the animals studied in the laboratory.

What is a "screening-level" MEG?

The most commonly used MEG is the long-term (1-year) Negligible MEG, which is the lowest MEG concentration for a chemical. This 1-year Negligible MEG is often used as a "screening level" in that it addresses the worst case deployment exposure conditions (most frequent and continuous long-term exposure conditions, e.g. soldiers continuously exposed "on-the-job" 24 hours a day, 7 days a week, for 1 whole year). The screening-level MEG is used as the initial basis to compare field sampling data to determine if there is a potential hazard. As long as sample data for a detected chemical is below the screening level MEG, then there is no hazard

and, thus, no operational risk. If concentrations are above the 1-year Negligible MEG, then a chemical exposure may pose a military hazard and it requires further assessment, to include comparison to the other available MEGs for that chemical.

How are MEGs used?

Within the context of a health risk assessment, MEGs are used to determine the significance of field exposures to the military mission at a specific location or for a specific operation. The MEGs are used to rank the hazard severity of the exposure. See the section called "*What kind of MEGs are available and what does 'exceedance of a MEG' mean?*" to understand how severity is ranked.

The severity rank is then combined with estimates of hazard probability to estimate the operational risk of the field exposure (the hazard). Risk is estimated using the following risk matrix.

Military Risk Assessment Matrix

HAZARD SEVERITY	HAZARD PROBABILITY				
	Frequent (A)	Likely (B)	Occasional (C)	Seldom (D)	Unlikely (E)
Catastrophic (I)	Extremely High	Extremely High	High	High	Moderate
Critical (II)	Extremely High	High	High	Moderate	Low
Marginal (III)	High	Moderate	Moderate	Low	Low
Negligible (IV)	Moderate	Low	Low	Low	Low

Source: Army Field Manual 5-19

Can MEGs be used to estimate the number of personnel that will develop certain health effects?

The MEGs are not designed for determining casualty estimates. In general, there will not be adequate toxicity data, exposure data, and modeling to support the development of casualty estimates for most chemicals and pollutants. While the severity of the health effects and percentage of personnel potentially demonstrating health effects will generally increase as concentrations increase above the MEG, it is not considered reasonable to estimate the number of individuals that will have specific effects using the MEGs.

The MEGs are preventive medicine guidelines designed for use in determining a qualitative level of risk posed to an exposed military population. The qualitative risk rank is specified in terms that are derived from the military risk management model (see Field Manual 5-19). The MEGs cannot be used as a planning tool for estimating the loss of effectiveness of personnel to perform daily duties due to incapacitation or other health effects without knowing the actual level and duration of exposure to a specified chemical.

Can MEGs be used to determine which personnel will develop health effects?

The MEGs are population-based and are not designed for predicting health effects in specific individuals. While it is true that for many chemicals there are certain types of human susceptibility factors or underlying health conditions that may predispose persons to develop effects, the available information is inadequate to predict specific cases with certainty. Many, if not most, MEGs are based on civilian health criteria designed to address certain key susceptible subgroups in the civilian population (e.g., asthmatics). Even though these subgroups make up a small fraction of any given military population, the intent in using these guidelines was to ensure protective estimates that would address these Service members.

The general human factors that play a role in susceptibility to chemical exposures include the following:

- Gender: For example, females are more susceptible to effects from exposures to benzene and nerve agents.

- Underlying heath conditions: For example, asthmatics (estimated 2-5 percent of troops) are more susceptible to effects from exposure to PM matter as well as other air pollutants and certain acid gases.

- Other health factors: For example, susceptibility generally changes with age, fitness level, dehydration, fatigue, nutritional status/anemia, tobacco use, and so forth.

Why were MEGs developed for Soldiers instead of using U.S. civilian health standards?

While there are some specific exceptions, in general, civilian exposure standards and guidelines are not sufficient for the military Force Health Protection mission for several reasons. For example, those guidelines are not specific to the exposure scenarios faced by deployed personnel. In general, deployed personnel can experience exposure rates (for example, amount of air inhaled, amount of water consumed) that are higher than their civilian counterparts. While an existing civilian exposure standard or guideline can often form the basis for a MEG value, the MEG development process often makes population-specific adjustments to address different exposure rates or exposure durations.

In addition, civilian standards and guidelines are generally not aligned to the military risk management hazard severity levels used to rank risks for Commanders. The MEG development process takes adjusted-civilian guidelines and aligns them according to the severity levels of Negligible, Marginal, Critical, and Catastrophic. These categories are used by preventive medicine personnel to rank risks according to mission and force health protection metrics.

Notably, U.S. short-term emergency response guidelines, such as the AEGLs and ERPGs, are examples of civilian guidelines that do align with aligned to the military risk management hazard severity levels. When available, these are used as MEGs.

Who should use MEGs? When should MEGs be used?

The MEGs (and USAPHC (Prov) TG 230) are designed for preventive medicine and medical personnel trained in the identification and evaluation of environmental health hazards. Within the Army, these individuals function at or above the Health Service Support Level II, according to DA Pam 40-11 Section 3–2 (DA Pam, 2006). The MEGs are designed for use in the context of a health risk assessment for use within the military risk management framework (see FM 5-19, 2006). The DOD (DoDI 6490.03, 2006) and Joint Staff (CJCS 2007) policy states that MEGs are to be used to assess environmental chemical exposures that occur during military deployments. Since MEGs have been specifically developed for military deployment conditions, unless otherwise indicated, they should be used in place of other civilian or occupational standards during deployments.

The risk assessment guidance provided in USAPHC (Prov) TG 230 serves as an objective base from which to make educated determinations within this framework. Risk assessors should have a basic understanding of the underlying toxicological and health basis for the MEGs. They should be familiar with basic methods of exposure assessment for chemicals in the environment. Finally, it is necessary that the risk assessor appreciate the uncertainties associated with sampling and with the assumptions used for estimating representative exposure levels and possess a high degree of understanding of basic risk communication principles. This guidance does not replace the need for basic technical training in these areas; nor does it provide guidance for sample planning or collection.

Where can I learn more?

The USAPHC (Prov) TG 230 provides risk assessment guidance on how to interpret field data using the MEGs. Also, USAPHC (Prov) RD 230 provides methodological details on how the MEGs were developed. These reference materials and guidance can be obtained electronically at: http://phc.amedd.army.mil/tg.htm.

G

RISK ASSESSMENT REFERENCE TOOLS

SECTIONS / WORKSHEETS

TABLES

NOTE

Risk assessors should understand the written risk assessment process described in the main body of TG 230 before use of the worksheets and tables in this appendix. There are methodological details described in Chapter 3 that are <u>not</u> highlighted in this Appendix.

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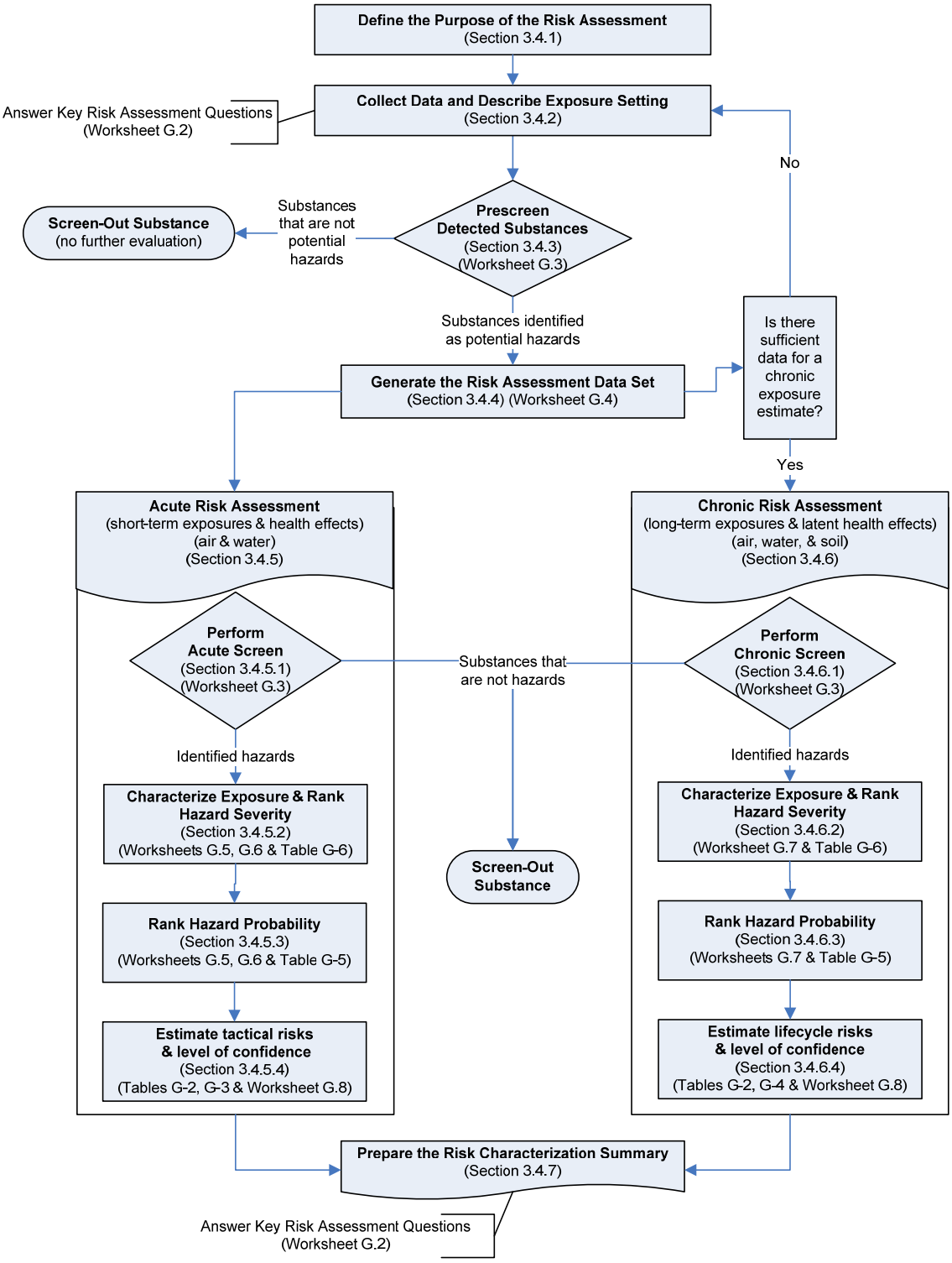
G.1 RISK ASSESSMENT FLOWCHART



Consultation with subject matter experts — When MODERATE or higher risk levels are identified, it is recommended that subject matter experts, or other qualified medical/health professionals, be consulted in order to validate the risk assessment. If exposures actually occur, then such a validation should also review the need for increased medical surveillance and risk communication support.

G.2 Key Risk Assessment Questions

Questions to answer at the beginning of a risk assessment

- What is the purpose of the risk assessment?
- What is the exposure event or ambient environmental condition under consideration?
- What is the population at risk?
- What is the timeframe under consideration?
- What are the activity patterns of the exposed population?
- What is known about the source of the chemicals?
- What is known about the exposure setting?
- What are the exposure pathways?
- Where are the sampling locations relative to where exposure occurs?
- Is there adequate data quality to conduct a chronic assessment?

Questions to answer near the end of the risk assessment

- Has the risk assessment incorporated any of the unique considerations identified in **Section 3.5**?
- Has a level of confidence been assigned to the final risk estimates? Is data quality adequate to base risk management decisions on the risk assessment?
- When risk levels greater than LOW are identified, it is recommended that USAPHC (Prov) subject matter experts, or other qualified medical/health professionals, be consulted in order to validate the risk assessment and review the need for increased medical surveillance and risk communication support.
- Is it worth collecting additional data to increase the confidence in the risk assessment conclusion?
- Are there readily available exposure control measures that can be implemented?

G.3 HAZARD IDENTIFICATION WORKSHEET

Prescreen

- Air and Soil. Eliminate from consideration all chemical substances that do not have a single sample concentration greater than the 1-year Negligible MEG.

- Drinking Water. Eliminate from consideration all chemical substances that do not have a single sample concentration greater than the 1-year Negligible MEG for the 15 L/day consumption rate.

- Nondrinking Water. Eliminate from consideration all chemical substances that do not have a single sample concentration greater than 2.5 times the 1-year Negligible MEG for the 5 L/day rate.

Screen for Acute Hazards

- Air. Eliminate from further consideration all chemical substances with peak PEPCs less than or equal to the following MEGs.
    - For particulate matter and chemical warfare agents: 24-hour Negligible MEG.
    - For other chemicals: 14-day Negligible MEG.
        - When a 14-day Negligible MEG is equal to the 1-year Negligible MEG, or is unavailable, then use the 8-hour Negligible MEG for elimination. If an 8-hour Negligible MEG is unavailable, then use the 1-hour Negligible MEG.

- Drinking Water. Eliminate from further consideration all chemical substances with a peak PEPC that is less than or equal to the 14-day, 15-L/day Negligible MEG.

- Non-drinking Water. Eliminate from further consideration all chemical substances with a peak PEPC that is less than or equal to 2.5 times the 14-day, 5-L/day Negligible MEG.

- Soil. Not evaluated in an acute risk assessment.

Screen for Chronic Hazards

- Frequency of detection screen. Eliminate from further consideration all chemical substances that are detected less than 5 percent of the time within the sample set to be used to calculate exposure estimates for each exposure pathway.

- Air and Soil. Eliminate from further consideration all chemical substances with average deployment-length PEPCs that are less than or equal to the 1-year Negligible MEG.

- Drinking Water. Eliminate from further consideration all chemical substances with average source PEPCs that are less than or equal to the 1-year, 15-L/day Negligible MEG.

- Non-drinking Water. Eliminate from further consideration all chemical substances with average source PEPCs that are less than or equal to 2.5 times the 5-L/day, 1-year Negligible MEG.

G.4 POPULATION EXPOSURE POINT CONCENTRATIONS WORKSHEET

Population exposure point concentrations (PEPCs) are designed to be compared to the MEGs within the context of a health risk assessment. Multiple PEPCs for the same chemical are usually needed to perform a risk assessment. The PEPC definitions are found in Section 3.4.4. Note: There are methodologic details found in Chapter 3 that are not highlighted here.

Peak PEPCs

- Air. One or more peak PEPCs can be selected directly from the data set. They are the maximum detected concentrations for each of the available sample averaging times. The highest peak PEPC for a given chemical is considered to be the overall peak PEPC, and it is usually associated with the shortest available sample averaging time.

- Water. The peak PEPC for a water source is simply the maximum detected concentration of the chemical.

Average PEPCs

Average PEPC calculations require an explicit definition of the exposure duration with start and stop times. In general, the arithmetic mean is recommended for calculating the average PEPC when the size of the data set is limited. However, depending upon the number of samples and the distribution of the sample data, various estimation procedures can be used to calculate the average PEPC other than the simple arithmetic mean. Other estimation procedures should be considered for skewed data distributions, which can be common for environmental contaminant data. Average PEPC calculations (especially for air) may need to involve estimation of surrogate values for missing time periods (see Section 3.4.4.2). Also, average PEPC calculations may need to involve procedures for handling results that are less than the reporting limit (see last bullet below).

- Air (acute average PEPCs). The acute average (or event-length) PEPC across the duration of the exposure event is calculated for each chemical. While there may be multiple peak PEPCs for a chemical (i.e., one associated with each sample averaging time), there will be only one average PEPC for a chemical.

- Air (chronic average PEPC). The chronic average (or deployment-length) PEPC is calculated by averaging across the length of deployment (or the length of time of site operations). This duration is usually 1 year but should not exceed 3 years for risk assessment purposes.

- Water (acute and chronic PEPCs). The average PEPC is the average concentration across the exposure duration (i.e., the duration of use of the water/ice source). These values are calculated directly from the data set. For many water sources only one sample will be available.

- Soil (chronic average PEPCs). The average (or deployment-length) PEPC is calculated by averaging across all the collected samples within the exposure area during the time of site operations (or during the deployment). Specific soil contamination events, such as leaks and spills, should be characterized independently.

- Surrogate Values for Samples Measured as Not Detected. When a chemical is not detected in every sample, then sample values reported as not detected (i.e, U-flagged) should be assigned surrogate values equal to ½ LOD or ½ LOQ for the purposes of calculating average PEPCs. The ½ LOD surrogate is recommended when the LOD is known, as it is a more accurate reflection of the information at hand. Definitions of the LOD (Limit of Detection) and LOQ (Limit of Quantitation) are provided in Section 3.4.4. Note that in chronic assessments there is a 5 rule (see Section 3.4.6.1).

G.5 HAZARD ASSESSMENT WORKSHEET FOR ACUTE AIRBORNE EXPOSURES

Characterize Exposure and Rank Hazard Severity

Both the peak PEPCs and the average PEPC across the selected exposure duration should be determined and/or calculated from the risk assessment data set. Compare to the MEGs as shown below and rank hazard severity. The decision logic presented below ranks severity according to the highest MEG that the PEPC exceeds.

For most chemicals	***Hazard Severity***
PEPC ≤ 14-day Negligible MEG	Negligible
PEPC > 14-day Negligible MEG but ≤ 8-hour Negligible MEG	Negligible
PEPC > 8-hour Negligible MEG but ≤ 1-hour Negligible MEG	Negligible
PEPC > 1-hour Negligible MEG but ≤ 1-hour Marginal MEG	Negligible
PEPC > 1-hour Marginal MEG but ≤ 1-hour Critical MEG	Marginal *
PEPC > 1-hour Critical MEG	Critical – Catastrophic *

For particulate matter	***Hazard Severity***
PEPC ≤ 24-hour Negligible MEG	Negligible
PEPC > 24-hour Negligible MEG but < 24-hour Marginal MEG	Negligible
PEPC ≥ 24-hour Marginal MEG but < 24-hour Critical MEG	Marginal
PEPC ≥ 24-hour Critical MEG	Critical *†

For chemical warfare agents and key toxic industrial chemicals	***Hazard Severity***
Unlike the other chemicals, there are multiple sets of MEGs available for these chemicals. That is, for each of the exposure durations of 10 minutes, 1 hour, 8 hours, and 24 hours, there are Negligible, Marginal, Critical, and sometimes Catastrophic MEGs. Severity should be ranked using the MEG exposure duration most closely aligned with the exposure duration experienced by the population.	
PEPC < Negligible MEG	Negligible
PEPC ≥ Negligible MEG but < Marginal MEG	Negligible
PEPC ≥ Marginal MEG but < Critical MEG	Marginal *
PEPC ≥ Critical MEG (for key toxic industrial chemicals)	Critical – Catastrophic *
PEPC ≥ Critical MEG but < Catastrophic MEG (for chemical warfare agents)	Critical *
PEPC ≥ Catastrophic MEG (for chemical warfare agents)	Catastrophic *

Notes:

* In these situations, it is recommended that USAPHC (Prov) be contacted in order to validate the severity ranking and provide technical support.

† An exceedance of the Critical 24-hour MEG for coarse PM_{10} is anticipated to result in significant irritation to eyes and respiratory system, but such exposures are not ever considered 'Catastrophic' from a health standpoint. However, it is acknowledged that certain blinding windstorms conditions can be so severe so has to halt most all outdoor operations (not technically a health hazard per se).

[Continued on next page]

Rank Hazard Probability *[acute air assessment]*

Factor 1 – Degree of exposure	
Method A – When the PEPC is between MEGs of different severity levels for the duration	*Factor Score*
PEPC is below the 25th percentile of the severity range	1
PEPC is at or between the 25th and 75th percentiles of the severity range	2
PEPC is above the 75th percentile of the severity range	3
25th percentile $= MEG_{lo} + \left(\frac{MEG_{hi} - MEG_{lo}}{4} \right)$ 75th percentile $= MEG_{hi} - \left(\frac{MEG_{hi} - MEG_{lo}}{4} \right)$	
Method B – When the PEPC is not between MEGs of different severity levels for the duration	*Factor Score*
PEPC ≤ Negligible MEG	1
PEPC > Negligible, Marginal, or Critical MEG (and the next higher severity MEG does not exist)	2

Factor 2 – Representativeness of the field data	***Factor Score***
Field data overestimates the population exposure	1
Field data adequately estimates population exposure	2
Field data underestimates the population exposure	3

Factor 3 – Duration of exposure	***Factor Score***
Field exposure duration : MEG exposure duration ratio is less than 1	1
Field exposure duration : MEG exposure duration ratio is from 1 to 3	2
Field exposure duration : MEG exposure duration ratio is greater than 3	3

Factor 4 – Rate of exposure: Level of activity related to inhalation rate	***Factor Score***
Light exertion. Standing in foxhole. Guard duty. Desk work. Vehicle driving.	1
Typical exertion. Equipment maintenance. March with LBE no rucksack. (Use this option for site-wide annual assessments of air quality.)	2
Heavy exertion. Forced load carriage march with 20-kg load. Repetitive lifting and carrying heavy loads (e.g., ammo handlers).	3

Hazard probability →	**UNLIKELY**	**SELDOM**	**OCCASIONAL**	**LIKELY**	**FREQUENT**
Total factor score →	4 – 6	7	8	9	10 – 12

G.6 HAZARD ASSESSMENT WORKSHEET FOR ACUTE DRINKING WATER EXPOSURES

Characterize Exposure and Rank Hazard Severity

The average PEPC across the selected exposure duration should be calculated from the risk assessment data set. Compare to the MEGs as shown below and rank hazard severity. The decision logic presented below ranks severity according to the highest MEG that the PEPC exceeds.

1. Based on the exposure duration being assessed, either the 7-day or 14-day MEGs must be chosen for these comparisons. The 7-day MEGs are designed for exposure durations less than 7 days. The 14-day MEGs are designed for exposures that are greater than 7 days in length.

2. The risk assessor must choose either the 5-L/day or 15-L/day MEGs for these comparisons. The choice must be consistent across all evaluations in the same risk assessment. This choice should be based on knowledge of site conditions, climate, and expected consumption rates in the population at risk. The 5-L/day MEGs should be used for consumption rates not to exceed 10-L/day, while the 15-L/day MEGs should be used for consumption rates of 10-L/day or higher.

Exposure to MEG relationship	***Hazard Severity***
PEPC ≤ 7-day or 14-day Negligible MEG	Negligible
PEPC > 7-day or 14-day Negligible MEG	Negligible – Catastrophic *

* At this time Marginal and higher severity MEGs for water are not available. Until USACHPPM establishes such MEGs for a chemical, the hazard severity determination for exposures greater than the Negligible MEG will need to be chemical- and site-specific. In most cases, based on USAPHC (Prov) experience, the acute hazard severity ranks for PEPC estimates that are greater than the 7-day or 14-day Negligible MEGs will be Negligible. However, when an acute PEPC estimate is substantially higher than the Negligible MEG, then the severity may be Marginal or greater. The severity rank should depend on the following factors:

- The WOE and confidence in the precision of the Negligible MEG as an estimate of the threshold for the health outcomes associated with the chronic hazard severity definition (see Section 3.3.2).

- The dose-response relationships for the health endpoints under consideration in relation to the magnitude of the estimated long-term PEPC.

Subject matter experts with appropriate understanding of the underlying chemical- and endpoint- specific toxicity data should be consulted to determine most appropriate severity level when the next higher severity level MEG is unavailable.

In these situations, it is recommended that USAPHC (Prov) be contacted in order to validate or determine the severity ranking and provide technical support.

[Continued on next page]

Rank Hazard Probability *[acute drinking water assessment]*

Factor 1 – Degree of exposure	
Method A – When the PEPC is between MEGs of different severity levels for the duration	*Factor Score*
PEPC is below the 25th percentile of the severity range	1
PEPC is at or between the 25th and 75th percentiles of the severity range	2
PEPC is above the 75th percentile of the severity range	3
25th percentile $= MEG_{lo} + \left(\frac{MEG_{hi} - MEG_{lo}}{4} \right)$ 75th percentile $= MEG_{hi} - \left(\frac{MEG_{hi} - MEG_{lo}}{4} \right)$	
Method B – When the PEPC is not between MEGs of different severity levels for the duration	*Factor Score*
PEPC ≤ Negligible MEG	1
PEPC > Negligible, Marginal, or Critical MEG (and the next higher severity MEG does not exist)	2

Factor 2 – Representativeness of the field data	***Factor Score***
Field data overestimates the population exposure	1
Field data adequately estimates population exposure	2
Field data underestimates the population exposure	3

Factor 3 – Duration of exposure	***Factor Score***
Field exposure duration : MEG exposure duration ratio is less than 1	1
Field exposure duration : MEG exposure duration ratio is from 1 to 3	2
Field exposure duration : MEG exposure duration ratio is greater than 3	3

Factor 4 – Rate of exposure: Estimated average water consumption rate		***Factor Score***
Evaluations using a 5L/d MEG	*Evaluations using a 15L/d MEG*	
< 3 L/day	10 – 13 L/day	1
4 – 7 L/day	14 – 16 L/day	2
8 – 10 L/day	> 17 L/day	3

Hazard probability →	**UNLIKELY**	**SELDOM**	**OCCASIONAL**	**LIKELY**	**FREQUENT**
Total factor score →	4 – 6	7	8	9	10 – 12

G.7 HAZARD ASSESSMENT WORKSHEET FOR CHRONIC EXPOSURES TO AIR, DRINKING WATER, AND SOIL

Characterize Exposure and Rank Hazard Severity

Compare the calculated annual-average PEPC, or deployment-length PEPC, to the long term 1-year MEGs. For drinking water exposures, the risk assessor should choose either the 5-L/day or the 15-L/day water MEGs for comparison purposes based on knowledge of site conditions, climate, and expected consumption rates in the population at risk. The 5-L/day MEGs should be used for consumption rates not to exceed 10-L/day, while the 15-L/day MEGs should be used for consumption rates of 10-L/day or higher.

Exposure to MEG relationship	***Hazard Severity***
PEPC ≥ 1-year Negligible MEG but < 1-year Marginal MEG	Negligible *
PEPC ≥ 1-year Marginal MEG	Marginal – Critical *

* At this time only one long-term Marginal MEG is available (for $PM_{2.5}$) and no long-term Critical MEGs are available. Until USAPHC (Prov) establishes a long-term Marginal and Critical MEG for a chemical, the hazard severity determination for an exposure greater than the Negligible MEG will need to be chemical- and site-specific. In most cases, based on USAPHC (Prov) experience, the chronic hazard severity ranks for PEPC estimates that are greater than the 1-year Negligible MEG will be Negligible. However, when a long-term PEPC estimates are substantially higher than the Negligible MEG, then the severity may be Marginal or, in rare cases, Critical. The severity rank should depend on the following factors:

- The WOE and confidence in the precision of the Negligible MEG as an estimate of the threshold for the health outcomes associated with the chronic hazard severity definition (see Section 3.3.2).
- The dose-response relationships for the health endpoints under consideration in relation to the magnitude of the estimated long-term PEPC.

Subject matter experts, with appropriate understanding of the underlying chemical- and endpoint- specific toxicity data, should be consulted to determine most appropriate severity level when the next higher severity level MEG is unavailable.

In these situations, it is recommended that USAPHC (Prov) be contacted in order to validate or determine the severity ranking and provide technical support.

[Continued on next page]

Rank Hazard Probability *[chronic assessments]*

Factor 1 – Degree of exposure	
Method A – When the PEPC is between MEGs of different severity levels for the duration	*Factor Score*
PEPC is below the 25th percentile of the severity range	1
PEPC is at or between the 25th and 75th percentiles of the severity range	2
PEPC is above the 75th percentile of the severity range	3
25th percentile $= MEG_{lo} + \left(\frac{MEG_{hi} - MEG_{lo}}{4} \right)$ 75th percentile $= MEG_{hi} - \left(\frac{MEG_{hi} - MEG_{lo}}{4} \right)$	
Method B – When the PEPC is not between MEGs of different severity levels for the duration	*Factor Score*
PEPC ≤ Negligible MEG	1
PEPC > Negligible, Marginal, or Critical MEG (and the next higher severity MEG does not exist)	2

Factor 2 – Representativeness of the field data	***Factor Score***
Field data overestimates the population exposure	1
Field data adequately estimates population exposure	2
Field data underestimates the population exposure	3

Factor 3 – Duration of exposure	***Factor Score***
Field exposure duration : MEG exposure duration ratio is less than 1	1
Field exposure duration : MEG exposure duration ratio is from 1 to 3	2
Field exposure duration : MEG exposure duration ratio is greater than 3	3

[Continued on next page]

Rank Hazard Probability (continued) *[chronic assessments]*

Factor 4 – Rate of exposure (air): Level of activity related to inhalation rate	***Factor Score***
Light exertion. Standing in foxhole. Guard duty. Desk work. Vehicle driving.	1
Typical exertion. Equipment maintenance. March with LBE no rucksack. (Use this option for site-wide annual assessments of air quality.)	2
Heavy exertion. Forced load carriage march with 20-kg load. Repetitive lifting and carrying heavy loads (e.g., ammo handlers).	3

Factor 4 – Rate of exposure (water): Estimated average water consumption rate		***Factor Score***
Evaluations using a 5-L/day MEG	***Evaluations using a 15-L/day MEG***	
< 3 L/day	10 – 13 L/day	1
4 – 7 L/day	14 – 16 L/day	2
8 – 10 L/day	> 17 L/day	3

Factor 4 – Rate of exposure (soil): Level of activity related to soil contact rate	***Factor Score***
Minor contact with soil on an infrequent basis (office work, maintenance work in shops).	1
Moderate contact with soil on a regular basis (frequent patrols on unpaved areas, standard construction). (Use this option for site-wide assessments of soil quality.)	2
Heavy contact with soil on a daily basis (road construction, digging defensive positions).	3

Hazard probability →	**UNLIKELY**	**SELDOM**	**OCCASIONAL**	**LIKELY**	**FREQUENT**
Total factor score →	4 – 6	7	8	9	10 – 12

G.8 LEVEL OF CONFIDENCE WORKSHEET

Assigning a level of confidence to a risk estimate requires knowledge about the limitations of the assessment tools and the uncertainty in the available data underlying the exposure assessment. Additional details for consideration are found in TG 230 Section 3.3.4.

- **High Confidence**. High confidence in a risk level implies significant understanding of all the variables used to determine the risk. It results from sampling data that is adequate to characterize typical exposures and the range of those types of exposures, as well as a good understanding of the exposure patterns of the population being characterized.

- **Medium Confidence**. Medium confidence in a risk level implies some understanding of most of the variables used to determine the risk. It results from sampling data that is plausibly adequate to characterize typical exposures and the range of those types of exposures.

- **Low Confidence**. Low confidence is assigned when sampling data may not be adequate to characterize the situation, and when the assessor is making a best scientific assessment in the absence of complete information.

Table G-1 Example Criteria for Assigning Confidence Levels

Confidence	Criteria
High	- Field Sampling data quality is very good – substantial samples over time/space. - Field activity patterns are well known. - True exposures are reasonably approximated. - No critical missing information. - The predicted health outcomes are highly plausible (strong toxicological weight of evidence/human data) or already demonstrated.
Medium	- Field data quality is relatively good. - Estimates of field exposure are likely to be greater than true exposures due to incomplete data coverage relative to actual exposure durations. - Detailed information is lacking regarding true personnel activity patterns in the field. - Predicted health outcomes are plausible but there is toxicological data but limited weight of evidence/human data is lacking.
Low	- Important data gaps and/or inconsistencies exist. - Exposure conditions are not well defined. - Field personnel activity patterns are basically unknown. - Predicted health outcomes are not plausible because it is not consistent with real-world events/experience.

G.9 Quick Reference Tables

Table G-2 Military Risk Assessment Matrix (FM 5-19 and FM 4-02)

HAZARD SEVERITY	HAZARD PROBABILITY				
	Frequent (A)	Likely (B)	Occasional (C)	Seldom (D)	Unlikely (E)
Catastrophic (I)	Extremely High	Extremely High	High	High	Moderate
Critical (II)	Extremely High	High	High	Moderate	Low
Marginal (III)	High	Moderate	Moderate	Low	Low
Negligible (IV)	Moderate	Low	Low	Low	Low

Consultation with subject matter experts. When Moderate or higher risk levels are identified, it is recommended that USAPHC (Prov) subject matter experts, or other qualified medical/health professionals, be consulted in order to validate the risk assessment. If exposures actually occur, then such a validation should also review the need for increased medical surveillance and risk communication support.

Table G-3 Tactical Risk Definitions (FM 5-19) and Possible Medical Responses Associated with Real-Time or "Acute" Health Effects

Risk Level	Consequences to Military Operations and Force Readiness *
Extremely High	Loss of ability to accomplish the mission if hazards occur during mission. *Notable in-theater medical countermeasures and resources anticipated. For example, protection, treatment, and exposure documentation*.
High	Significant degradation of mission capabilities in terms of the required mission standard, inability to accomplish all parts of the mission, or inability to complete the mission to standard if hazards occur during the mission. *Some in-theater medical countermeasures and resources anticipated. For example, protection, treatment, and exposure documentation*.
Moderate	Expected degraded mission capabilities in terms of the required mission standard and will result in reduced mission capability if hazards occur during the mission. *Limited in-theater medical countermeasures and resources anticipated. For example, protection, treatment, and exposure documentation*.
Low	Expected losses have little or no impact on accomplishing the mission. *Little to no in-theater medical resources anticipated for protection and treatment. However, a summary of any negative or low level sampling results should be documented and archived particularly if some personnel express concerns.*

Notes:

[1] The italicized phrases are not part of the doctrinal definitions, but are the types of anticipated medical and preventive medicine responses associated with the expected health outcomes associated with these risk levels.

[2] In addition to the medical resources needed to treat and document acute effects, certain exposures that result in acute health effects may also be associated with effects that require post-deployment medical surveillance/follow-up. The potential for any post-deployment medical follow-up and surveillance should be addressed as part of the risk management response triggered by the "chronic" risk estimate as discussed in the following section.

[3] For certain chemical exposures, the risk outcomes may be especially pronounced in certain people. For example, moderate risk exposures to sulfur dioxide may be very irritating to most and cause some mild impairment, but may significantly exacerbate the condition of asthmatics and require medical countermeasures.

[4] Exposure documentation (per DoDI 6490.03) includes any applicable medical treatment documentation as well as exposure data incident information (to include field data and incident descriptions). In addition to required in-theater reporting channels, documentation should also be submitted through the designated DoD OEHS Data Archive (oehs@apg.amedd.army.mil) or secure e-mail (oehsdata@usachppm.army.smil.mil). Environmental exposure data archive data reports can be viewed through the DoD OEHS Data Portal (https://doehsportal.apgea.army.mil/doehrs-oehs/).

Table G-4 Recommended Lifecycle Risk Definitions and Possible Medical Responses Associated with Post-Deployment "Chronic" Health Effects

Risk Level	Consequences to Military Operations and Force Readiness *
Extremely High	Significant future medical surveillance activities and medical provider resources anticipated. *Documentation of environmental data in designated DoD archive and designate a registry to actively track the exposed personnel. Conduct specific active surveillance and/or medical follow-up procedures for life-cycle of identified group.*
High	Notable future medical surveillance activities and related resources anticipated. *Documentation of environmental data in designated DoD archive. Specific identification and documentation of the exposed personnel. Possible passive medical surveillance related activities*.
Moderate	Limited future medical surveillance activities and related resources anticipated. *Documentation of environmental data in designated DoD archive. Consider documenting exposed groups or personnel of surveillance interest.*
Low	No specific medical action required. *Documentation of environmental data in designated DoD archive.*

Notes;
[1] The definitions are based on the USAPHC (Prov) interpretation of DoD and Joint Staff policies and requirements. The italicized phrases are the types of anticipated medical and preventive medicine responses associated with the expected health outcomes associated with these risk levels.
[2] Environmental documentation (per DoDI 6490.03) should be submitted through the designated DoD OEHS Data Archive (oehs@apg.amedd.army.mil) or secure e-mail (oehsdata@usachppm.army.smil.mil). Environmental archive data reports can be viewed through the DoD OEHS Data Portal (https://doehsportal.apgea.army.mil/doehrs-oehs/).

Table G-5 TG 230 Hazard Probability Levels

Rank	Interpretation
Frequent	Personnel will continuously experience exposures that are greater than that required to produce the health effect outcomes associated with the hazard severity level.
Likely	Personnel will likely experience exposures that are greater than that required to produce the health effect outcomes associated with the hazard severity level.
Occasional	Personnel will occasionally experience exposures that are greater than that required to produce the health effect outcomes associated with the hazard severity level.
Seldom	Personnel will seldomly experience exposures that are greater than that required to produce the health effect outcomes associated with the hazard severity level.
Unlikely	Personnel are unlikely to experience exposures that are greater than that required to produce the health effect outcomes associated with the hazard severity level.

Table G-6 Health Effects Descriptions for Each Hazard Severity Category (CJCS 2007)*

Negligible Severity	Marginal Severity	Critical Severity	Catastrophic Severity
Acute Effects Few exposed personnel (if any) are expected to have noticeable health effects during mission. Exposed personnel are expected to be able to effectively perform all critical tasks during mission operations. Minimal to no degradation of abilities to conduct complex tasks are expected.	Acute Effects Many exposed persons are expected to have noticeable but not incapacitating health effects. Observable effects require minimal if any medical attention but may reduce some individual physical capabilities and/or may enhance stress-related casualties. Exposed personnel able to perform most critical tasks. Note: Ability to accomplish complex tasks may be degraded.	Acute Effects Personnel are expected to have incapacitating health effects that require immediate medical treatment or support (e.g., are considered 'casualties'.) There may be limited numbers of fatalities. Personnel not experiencing these more serious effects are expected to have at least noticeable, but not incapacitating health effects. Exposed personnel will have limited ability to perform most critical tasks. Note: Ability to accomplish complex tasks likely to be degraded.	Acute Effects Casualties with severe incapacitating effects requiring immediate and significant medical attention and/or additional support for survival. Increasing number of fatalities are expected. Exposed personnel unable to perform critical tasks.
and/or	and/or	and/or	not a driver
Chronic Effects Few exposed personnel (if any) are expected to develop delayed onset, irreversible effects	Chronic Effects Many exposed personnel are plausibly expected to develop delayed onset, irreversible effects. While this may not affect the immediate physiological capabilities of individuals, commanders must consider long term implications and appropriately communicate the potential risks. Operational stress related implications may adversely impact operations particularly over extended operational periods.	Chronic Effects Majority to all exposed personnel are plausibly expected to develop delayed onset, irreversible effects due to the specified exposure. While this may not affect the immediate physiological capabilities of individuals, commanders must consider long term implications and appropriately communicate the potential risks. Psychological implications may adversely impact operations particularly over extended operational periods.	Chronic Effects This level of hazard severity is reserved for the most serious of conditions where immediate survivability against acute effects is the priority. Those that survive may be at increased risk for certain chronic effects.

Notes:
This matrix applies to all health hazards encountered during deployment. Health effects associated with chemical exposures are typically either acute or chronic, but in some cases may be both. In general, short term one-time chemical exposures are primarily associated with acute effects, while repeated long term exposures are associated with chronic effects.
***** Format modified from the original Joint Staff Memorandum MCM-0028-07 (CJCS 2007) version for ease of presentation, to include the elimination of the 'no effects' category.

Appendix H

Hypothetical Case Studies

CONTENTS

NOTE

These case studies do not represent risk assessments performed at real sites. These are hypothetical case studies that illustrate the TG 230 risk assessment methodology and application of MEGs for characterizing risks using military risk management (FM 5-19).

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CASE STUDY 1 — Catastrophic Release of Chlorine and Methyl Isobutyl Ketone in the Air

Teaching Points

- Performs an acute assessment for a hypothetical industrial accident near a base camp.
- Illustrates how to determine exposure event duration.
- Demonstrates hazard probability factor 1 method A (the 25th and 75th MEG percentiles).
- Addresses potential latent/long-term health effects from an acute exposure
- Demonstrates USAPHC (Prov) SME input into the process.

1. BACKGROUND

This is a hypothetical case study designed to illustrate the TG 230 risk assessment process. This case study is based on evaluating the effects of a hypothetical catastrophic release of chlorine and Methyl isobutyl ketone from an industrial facility. Projected air concentrations of these two toxic industrial chemicals (TICs) were generated by a quantitative air dispersion model in order to conduct a Composite Risk Management evaluation for a nearby basecamp.

2. DEFINE THE PURPOSE OF THE RISK ASSESSMENT

Refer to TG 230 Section 3.4.1 for guidance. Appendix G provides a process flow-chart.

This study is prospective in nature and is to be used for planning purposes. The evaluation is centered on determining the potential acute risk associated with a brief (16-hour) exposure to potentially high levels of the subject chemicals in ambient air.

3. COLLECT DATA AND DESCRIBE EXPOSURE SETTING

Refer to TG 230 Section 3.4.2 for guidance.

3.1 Data Sampling Summary

Include a description of who collected the data and how data were collected (i.e. sampling method).

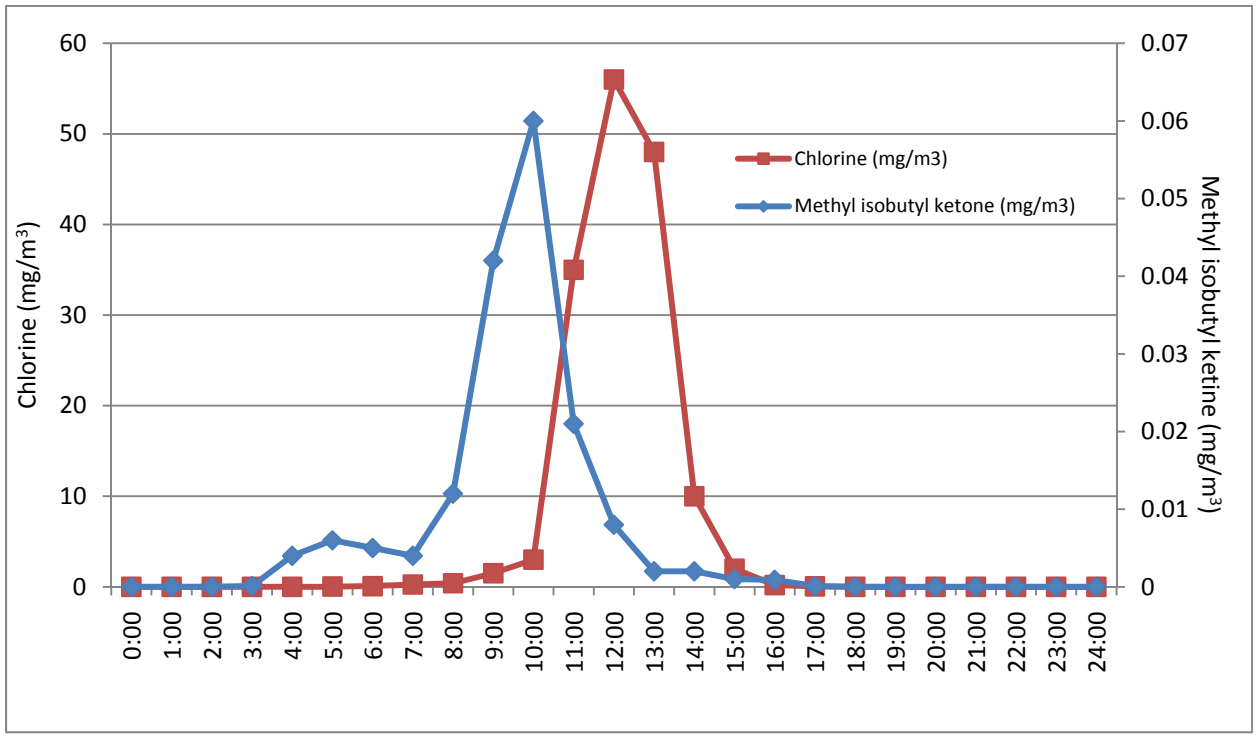
Since this risk assessment is based on evaluating a hypothetical scenario, no sampling data were collected. Instead, concentrations in ambient air were determined by a quantitative air dispersion model and were provided by the Defense Threat Reduction Agency (DTRA).

CASE STUDY 1 — Catastrophic Release of Chlorine and Methyl Isobutyl Ketone in the Air

3.2 Available sampling data and statistics

Time After Release (Hours)	*Methyl isobutyl ketone (mg/m^3)*	*Chlorine (mg/m^3)*
0:00	0	0
1:00	0	0
2:00	0	0
3:00	0.0001	0.0002
4:00	0.004	0.002
5:00	0.006	0.035
6:00	0.005	0.075
7:00	0.004	0.26
8:00	0.012	0.4
9:00	0.042	1.5
10:00	0.06	3
11:00	0.021	35
12:00	0.008	56
13:00	0.002	48
14:00	0.002	10
15:00	0.001	2
16:00	0.0009	0.2
17:00	0.0001	0.05
18:00	0	0.0001
19:00	0	0
20:00	0	0
21:00	0	0
22:00	0	0
23:00	0	0
24:00	0	0
Maximum Concentration	***0.06***	***56***
24 Hour Average Concentration	***0.0067***	***6.3***

CASE STUDY 1 — Catastrophic Release of Chlorine and Methyl Isobutyl Ketone in the Air



3.3 MEG Tables

Chlorine
7782-50-5

	Air (mg/m3)					
CAT						
CRIT	145	58	20.6			
MARG	8.12	5.8	2.06			
NEG	1.45	1.45	1.45		0.29	0.00014
	10 min	**1 hr**	**8 hr**	**24 hr**	**14 day**	**1 year**

Methyl isobutyl ketone
108-10-1

	Air (mg/m3)					
CAT						
CRIT		2000				
MARG		2000				
NEG		300	205		205	0.548
	10 min	**1 hr**	**8 hr**	**24 hr**	**14 day**	**1 year**

CASE STUDY 1 Catastrophic Release of Chlorine and Methyl Isobutyl Ketone in the Air

3.4 Chemical information

Provide general information about the chemical(s) and the general source(s) in the environment.

Chlorine: The Agency for Toxic Substances and Disease Registry (ATSDR) has a publically available ToxFAQ™ and Toxicological Profile for this chemical. What follows is general information obtained from these sources.

> Chlorine gas is not usually detected in the environment. Exposure to chlorine can occur following an accident, such as a leak or spill from a chlorine tank or the improper use of swimming pool chemicals. Chlorine gas is too reactive to be detected in environmental media at hazardous waste sites. Any chlorine gas released at these sites would be quickly converted to other substances. If chlorine is released into the air, the chlorine will evaporate very quickly forming a greenish-yellow cloud that is heavier than air and can be carried by the wind several miles from the source. Chlorine is broken down by sunlight within a matter of several minutes. Exposure to low levels of chlorine can result in nose, throat, and eye irritation. At higher levels, breathing chlorine gas may result in changes in breathing rate and coughing, and damage to the lungs. In general, people who suffer from respiratory conditions such as allergies or hay fever, reactive airways dysfunction syndrome, or who are heavy smokers, tend to experience more severe effects than healthy subjects or nonsmokers. Chlorine is not known to cause cancer.

Methyl isobutyl ketone: The Environmental Protection Agency has a publically available Toxicological Review of this chemical, which is also known as MIBK. This chemical is also included in the National Institute for Occupational Safety and Health Pocket Guide. What follows is general information obtained from these sources.

> MIBK is used mainly as a coating solvent in cellulose and resin based coating systems. It is also used as a separating agent for metals from solutions of their salts and in the mining industries to extract plutonium from uranium. MIBK is also used in the production of paints, pesticide formulations, adhesives, wax/oil separation, leather finishing, textile coating, and specialty surfactants for inks and as a denaturant for ethanol formulations. Another increasingly important use of MIBK is in the production of rubber antioxidants. Potential health effects from MIBK exposure include irritation of the eyes, skin, mucous membrane; headache, narcosis, coma; dermatitis; in animals: liver, kidney damage. Data are inadequate for an assessment of human carcinogenic potential.

3.5 Describe the Exposure Setting

Refer to TG 230 Section 3.4.2 for guidance. The description should answer as many of the pre-assessment key questions from Worksheet G.2 as possible. If an answer is unavailable, then indicate that information is missing.

The exposure event is the major release of these toxic industrial chemicals into ambient air near (within 2 km) a basecamp occupied by U.S. personnel. The population at risk is the entire population at the nearby basecamp. The event takes place over a very confined timeframe. The modeled air concentrations cover a 24 hour period. Positive ambient air levels were reported

CASE STUDY 1 — Catastrophic Release of Chlorine and Methyl Isobutyl Ketone in the Air

spanning 16 hours. The chemicals were released during a hypothetical storage tank failure at an industrial facility that stores large quantities of these compounds.

- What is the population at risk?
- What is the timeframe under consideration?
- What is the exposure event or ambient environmental condition under consideration?
- What is known about the source of the chemicals?
- What are the exposure pathways?
- What else is known about the exposure setting?
- What are the activity patterns of the population at risk?
- Where are the sampling locations relative to where exposure occurs?
- Is there adequate data quality to conduct a chronic assessment?

The only exposure pathway of concern for this evaluation is inhalation of ambient air. During this emergency situation, it was assumed that most personnel would be engaged in some type of emergency-response task and therefore have elevated inhalation rates and their rate of exposure would be typical of heavy exertion.

There are insufficient data to conduct a chronic risk assessment because the data set represents only a brief exposure duration based on 24 hours of modeling data. In addition, it is meant to evaluate the potential acute risk to troops, and so a chronic evaluation is not needed by the decision maker in this case.

4. PRESCREEN

Refer to TG 230 Section 3.4.3 and Worksheet G.3 for guidance. Enter the results into the table below.

Chemical Name	Maximum Sample Concentration	1 Year Negligible MEG	Result
Chlorine	56 mg/m^3	0.00014 mg/m^3	Retain as a hazard
Methyl isobutyl ketone	0.06 mg/m^3	0.548 mg/m^3	Exclude as a hazard

5. GENERATE THE RISK ASSESSMENT DATA SET

Refer to TG 230 Section 3.4.4 and Worksheet G.4 for guidance. Enter the results into the table below.

Chemical Name	Acute Exposure		Chronic Exposure
	Peak PEPC	Average PEPC	Average PEPC
Chlorine	56 mg/m^3 *	9.8 mg/m^3 **	Not needed

* This is a 1h "average." ** This is a 16h average.

5.1 Acute PEPCs

Since this is modeled data, there is no sample averaging time *per se*; however, the time splits for the model are hourly. This is analogous to 1 hour sampling times. The acute peak PEPC is the highest modeled concentration for 1 hour. This occurs 12 hours after the release.

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The duration of the exposure event is roughly 24 hours; however, positive concentrations were modeled for only 16 hours. Positive chlorine concentrations at the base camp are predicted to occur from 3 to 18 hours after the release (see section 3.2 of the case study). In this situation, it would be best to characterize the event as lasting for 16 hours (see graphic). In other words, the population at risk is exposed to chlorine for 16 hours. Therefore, the acute average chlorine PEPC is the 16-hour average concentration.

Note: In situations with many chemicals, there may be multiple ways to view the event duration because the time-profile of each chemical may vary due to different chemical properties. For example, some chemicals may move through an area faster than others. Because exposure to multiple chemicals can be important in some cases, the defined event duration should consider the overlap of time periods that are relevant to all the chemicals.

5.2 Chronic PEPC

A chronic risk assessment is not being conducted. See Section 7 for a discussion of potential latent/long-term health effects.

6. ACUTE RISK ASSESSMENT

Refer to TG 230 Section 3.4.5 for guidance.

6.1 Screen for Acute Hazards

Refer to TG 230 Section 3.4.5.1 and Worksheet G.3 for guidance to perform screen for acute hazards. Enter the results into the table below.

Chemical Name	Peak PEPC	Screening MEG		Result
Chlorine	56 mg/m^3	0.29 mg/m^3	14d NEG	Retain as an acute hazard

6.2 Rank Acute Hazard Severity

Refer to TG 230 Section 3.4.5.2 for guidance. The peak and average PEPC across the selected exposure duration are used to select a hazard severity for each PEPC using Worksheet G.5 (airborne exposures) or Worksheet G.6 (water exposures).

Chemical Name	PEPC		Comparison MEG		Hazard Severity
Chlorine	Peak	56 mg/m^3 *	5.8 mg/m^3	1h MARG	Marginal***
	Average	9.8 mg/m^3 **	2.06 mg/m^3	8h MARG	Marginal***

* This is a 1h "average." ** This is a 16h average.

*** Note that in the risk assessment methodology, these high severity ranks are accompanied by a recommendation that USAPHC (Prov) be contacted in order to validate, or determine, the severity ranking (see TG 230 Figure 3-3 or Worksheet G.5).

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Because chlorine is considered a key toxic industrial chemical (TIC), the bottom ranking chart in TG 230 Figure 3-3 (or Worksheet G.5) is used to rank severity.

Peak PEPC: Because the Peak PEPC represents a 1h "sampling time," it is compared to the 1h MEGs. The Peak PEPC is between the 1h Marginal and Critical MEGs, meaning that the severity rank is Marginal.

Average PEPC: Because the Average PEPC represents a 16h exposure, it is compared to the 8h MEGs because 24h MEGs are unavailable. The 8h MEGs are closer in duration than the 14d MEG. The Average PEPC falls between the 1h Marginal and Critical MEGs. Therefore, hazard severity is ranked as Marginal.

Note: These severity ranks require that USAPHC (Prov) subject matter experts, or other qualified medical/health professionals, be consulted in order to validate the severity ranking.

USAPHC (Prov) Opinion for this Hypothetical Case Study:

Though the Peak PEPC (56 mg/m^3) is very close to the 1h Critical MEG (58 mg/m^3), a hazard severity of Marginal would be chosen because the concentration is still below the Critical MEG. Being this close to the next higher severity level MEG will be incorporated later into the process during the scoring for hazard probability factor 1 (degree of exposure).

The Average PEPC is associated with an event duration of 16h, which does not match any of the MEG durations. Therefore, an extra degree of uncertainty exists in the accuracy of the severity rank for the average exposure. Additional confidence can be obtained by calculating an 8h average and comparing this with the 8h MEGs. The highest 8h average chlorine concentration is 19 mg/m^3. And represents the time period from 8 to 15 hours after the release. The 8h average exposure falls between the 8h Marginal and Critical MEGs, indicating that such an exposure represents a Marginal severity. This result corroborates the initial ranking.

6.3 Rank Acute Hazard Probability

Refer to TG 230 Section 3.4.5.3 for guidance. Assess the hazard probability for each PEPC using Worksheet G.5 (airborne exposures) or Worksheet G.6 (water exposures).

Acute Peak PEPC scoring for Chlorine

Acute Peak PEPC		Hazard Probability Scoring					Hazard Probability
		Degree of exposure	Represent-ativeness of field data	Duration of exposure	Rate of exposure	Total Score	
Chlorine	56 mg/m^3	3	2	2	3	10	Frequent

The following text explains the rationale underlying the scoring.

CASE STUDY 1 — Catastrophic Release of Chlorine and Methyl Isobutyl Ketone in the Air

- Factor 1 (Degree of exposure). The Peak PEPC is between the 1h Marginal and Critical MEGs. Therefore, Method A is used. The PEPC is within the upper 25th percentile of the Marginal severity range. This scores as a 3.

  25th percentile = $MEG_{lo} + \left(\frac{MEG_{hi} - MEG_{lo}}{4}\right) = 5.8 + \left(\frac{58-5.8}{4}\right) = 19\ mg/m^3$

  75th percentile = $MEG_{hi} - \left(\frac{MEG_{hi} - MEG_{lo}}{4}\right) = 58 - \left(\frac{58-5.8}{4}\right) = 45\ mg/m^3$

- Factor 2 (Representativeness of field data). Modeled data are based on many nonspecific assumptions. In this particular example there has been no further information provided that allow for the further determination of the representativeness of these data. As a result, there is no indication that the model produces overly high or low estimates of true population exposures. Therefore, this scores as a 2.

- Factor 3 (Duration of exposure). The exposure duration of the Peak PEPC is 1 hour and the comparison MEGs are 1 hour, so the ratio is 1. This scores as a 2.

- Factor 4 (Rate of exposure). It was assumed that personnel would be physically active during the emergency and so based on this level of anticipated activity, the rate of exposure was given a score of 3.

Acute Average PEPC scoring for Chlorine

Acute Average PEPC		Hazard Probability Scoring					Hazard Probability
		Degree of exposure	Represent-ativeness of field data	Duration of exposure	Rate of exposure	Total Score	
Chlorine	9.8 mg/m^3	2	2	2	3	9	Likely

The following text explains the rationale underlying the scoring.

- Factor 1 (Degree of exposure). The Average PEPC is between the 8h Marginal and Critical MEGs. Therefore, Method A is used. The PEPC is within the middle 50th percentile of the Marginal severity range. This scores as a 2.

  25th percentile = $MEG_{lo} + \left(\frac{MEG_{hi} - MEG_{lo}}{4}\right) = 2.06 + \left(\frac{20.6-2.06}{4}\right) = 6.69\ mg/m^3$

  75th percentile = $MEG_{hi} - \left(\frac{MEG_{hi} - MEG_{lo}}{4}\right) = 20.59 - \left(\frac{20.6-2.06}{4}\right) = 15.96\ mg/m^3$

- Factor 2 (Representativeness of field data). Modeled data are based on many nonspecific assumptions. In this particular example there has been no further information provided that allow for the further determination of the representativeness of these data. As a result, there

is no indication that the model produces overly high or low estimates of true population exposures. Therefore, this scores as a 2.

- Factor 3 (Duration of exposure). The exposure duration of the Average PEPC is 16 hours and the comparison MEGs are 8 hours, so the ratio is 2. This scores as a 2.

- Factor 4 (Rate of exposure). It was assumed that personnel would be physically active during the emergency and so based on this level of anticipated activity, the rate of exposure was given a score of 3.

6.4 Estimate of Tactical Risk and Level of Confidence

Refer to TG 230 Section 3.4.5.4 for guidance. Use the risk assessment matrix in Table G-2 to combine the hazard severity and hazard probability selections to derive a Risk Level. Use the guidance in Worksheet G.8 to set levels of confidence.

Acute Hazard		Severity	Probability	Risk Level	Confidence
Chlorine	Peak	Marginal	Frequent	HIGH	Medium
	Average	Marginal	Likely	MODERATE	Medium

Conclusion statement

Additional detail is provided in the overall Risk Characterization section at the end.

The airborne chlorine hazard associated with the industrial accident poses a High–Moderate tactical risk. The chlorine plume will impact the base camp between 3–18 hours after the industrial release with the highest risk occurring 12 hours after the initial release. Predicted acute health effects may range from burning of the eyes and throat, cough and choking sensations to the sense of suffocation, chest pain, shortness of breath, nausea, vomiting, and hoarseness. These effects may be incapacitating for some personnel. The predicted peak 1 hour exposure is practically the same as the level where personnel are expected to have incapacitating health effects. These will require immediate medical treatment or support and may even be fatal if left untreated. (See TG 230 Table C-3 for potential effects.)

Note: When Moderate or higher risk levels are identified, it is recommended that USAPHC (Prov) subject matter experts, or other qualified medical/health professionals, be consulted in order to validate the risk assessment.

USAPHC (Prov) Opinion for this Hypothetical Case Study:

Earlier in the case study, the USAPHC (Prov) opinion on the hazard severity ranking was obtained. In this case, the peak exposure would be ranked as a Marginal severity. This High risk hazard could result in the loss of the ability to accomplish part of the mission. At the very least, this hazard is likely to produce significant degradation of mission capabilities. There is also a potential for latent/long-term health effects

in some personnel because both the 1h and 8h Marginal MEGs are exceeded and those MEGs are based on AEGL-2 values, which for chlorine are thresholds for irreversible effects such as lung tissue damage leading to respiratory impairment and/or disease.

Rationale for confidence levels

Consider all of the information at hand and communicate to the decision maker the level of confidence they have in the risk level being presented. Use the guidance in Worksheet G.8 to set levels of confidence.

This evaluation is based on a purely hypothetical exposure to chlorine in ambient air resulting from a modeled release. As such, there is no actual exposure, activity pattern, or environmental media concentration on which to base the evaluation. Modeled data are based on many nonspecific assumptions. In this particular example there has been no further information provided that allow for the further determination of the representativeness of these data. The inherent uncertainty in this type of evaluation reduces the confidence level to MEDIUM.

7. CHRONIC RISK ASSESSMENT

Refer to TG 230 Section 3.4.6 for guidance.

There is insufficient data to conduct a chronic risk assessment because the data set represents only a brief exposure duration based on 24 hours of modeling data. In addition, it is meant to evaluate the potential acute risk to troops due to this isolated incident and so a chronic evaluation is not pertinent in this situation.

However, an important distinction should be understood. The chronic assessment is based on the evaluation of chronic exposure and not on the likelihood of latent/long-term health effects due to high acute/short-term exposures. TG 230 Section 3.3.2.2 and other areas of the TG provide additional information.

In this case study, with a High risk from chlorine exposure, there may be a potential for latent/long-term health effects to arise post-exposure and/or post-deployment. The recommended lifecycle medical responses found in TG 230 Table 3-3 and Table G-4 would be appropriate to consider for this population if this exposure were to actually occur. The recommended possible medical actions to consider for this case study are shown below.

For High Risk outcomes:

> Documentation of exposure data in designated DoD archive. Specific identification and documentation of the exposed personnel. Possible passive medical surveillance related activities.

CASE STUDY 1 — Catastrophic Release of Chlorine and Methyl Isobutyl Ketone in the Air

8. RISK CHARACTERIZATION SUMMARY

Refer to TG 230 Section 3.4.7 and tables G-2 through G-6 for guidance.

8.1 Summary Table

The summary should present the risk level(s), associated anticipated impacts to the tactical and lifecycle missions, and the level of confidence associated with the assessments. Recommended actions should be presented.

OEH Hazard		Tactical Risk Estimate	Lifecycle Risk Estimate	Current Recommended Actions **
Media/ Source	**Chemical**	(acute effects)	(chronic effects)	
Airborne Chemicals from an Industrial Accident	**Chlorine**	**Moderate–High *** Significant degradation of mission capabilities in terms of the required mission standard, inability to accomplish all parts of the mission, or inability to complete the mission to standard if hazards occur during the mission. *Some in-theater medical countermeasures and resources anticipated. For example, protection, treatment, and exposure documentation.* Confidence in the assessment is medium on a low-medium-high scale.	**No lifecycle risk directly estimated**	If there is a release, follow established emergency response procedures. These may involve masking and moving upwind, or sheltering in place and sealing up living spaces. For specific information on smaller chlorine releases see the USAPHC (Prov) Fact Sheet on Chlorine IED's (36-015-0407)

*This summary prepared in consultation with USAPHC (Prov) subject matter experts.
** These actions are recommended in order to protect against exposure if this accident were to occur. They do not include recommendations for medical follow-up if the event actually occurs.

8.2 Potential Health Effects

Refer to the tables in TG 230 Appendices B, C, D, and E. Additional information is also available in RD 230. This section should present the potential health effects that are relevant in the final assessments. When risk levels are Moderate or higher, the identification of potential health effects should be based on consultations with appropriately trained subject matter experts at USAPHC (Prov) or other such service organization.

- **Acute exposure**: Acute health effects may range from burning of the eyes and throat, cough and choking sensations to the sense of suffocation, chest pain, shortness of breath, nausea, vomiting, and hoarseness. These effects may be incapacitating for some personnel. There is a potential for latent/long-term health effects for the most highly exposed, such as lung tissue damage leading to respiratory impairment and/or disease.

- **Chronic exposure**: Chronic exposure will not occur in this scenario.

8.3 Answers to Key Post-Risk Assessment Questions

Refer to Worksheet G.2. These questions should be considered when preparing a risk assessment. The case study answers provide teaching points.

CASE STUDY 1 — Catastrophic Release of Chlorine and Methyl Isobutyl Ketone in the Air

- Has the risk assessment incorporated any of the unique considerations identified in TG 230 Section 3.5? The TG 230 Section 3.5 identifies no considerations that are relevant to this case study.

- Is data quality adequate to base risk management decisions on the risk assessment? Yes. The quality of the data is limited by the accuracy of the air dispersion model that was used to generate the ambient air concentrations. While the accuracy of the model has not been quantified, it is assumed to be a reasonable estimate of what the true concentrations would be during a similar event.

- Is it worth collecting additional data to increase the confidence in the risk assessment conclusion? Further refinement of the model parameters could be done, but may not be necessary or beneficial.

- Are there readily available exposure control measures that can be implemented? During an actual emergency, appropriate personal protective equipment (PPE) would be worn by the population at risk. There are available protective masks that can be used for escape and to protect against chlorine-limited chlorine exposure.

8.4 Bottom-line-up-front briefing statements (BLUF Statements)

Refer to TG 230 Section 4 for over-arching risk communication guidance. The following bullets should represent succinct case-study specific points that should be emphasized when communicating to stakeholders.

- This risk assessment evaluated the health risk associated with toxic industrial chemicals associated with the hypothetical industrial accident 2km from the base camp.

- Airborne chlorine poses a health hazard to the base camp population if released.

- Population exposures to chlorine will occur from 3 to 18 hours after the release from the facility.

- Airborne chlorine will pose a MODERATE–HIGH RISK. The confidence in the assessment is medium, but additional analysis is not feasible.

- The highest risk is associated with the peak exposure that the population will experience, which occurs 12 hours after the initial release and will last roughly 2 hours. Predicted acute health effects may range from burning of the eyes and throat, cough and choking sensations to the sense of suffocation, chest pain, and shortness of breath, nausea, vomiting, and hoarseness. These effects may be incapacitating for some personnel and last for a short period of time post-exposure. The predicted peak 1 hour exposure is practically the same as the level where personnel are expected to have incapacitating health effects that require immediate medical treatment or support or that may even be fatal. Latent/long-term health

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effects are possible at these exposure levels, specifically lung tissue damage leading to respiratory impairment and/or disease.

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CASE STUDY 2 — Airborne Particulate Matter and Nickel at a Base Camp

Teaching Points

- Performs both an acute and chronic assessment with 4 months of data.
- Shows how incomplete data coverage over time can be used to assess exposure.
- Deals with multiple MEG choices for a metal, based on the form of the metal.
- Demonstrates USAPHC (Prov) SME input into the process.

1. BACKGROUND

This is a hypothetical case study designed to illustrate the TG 230 risk assessment process. This assessment focuses of the use of routine sampling data to determine the health risk to personnel deployed at a base camp. This is a well-established camp with some routine air quality measurements take over the course of four months.

2. DEFINE THE PURPOSE OF THE RISK ASSESSMENT

Refer to TG 230 Section 3.4.1 for guidance. Appendix G provides a process flow-chart.

The purpose of the assessment is to evaluate the health risk to military population from airborne particulates and metals during a 15-month deployment, January 2008 – April 2009.

3. COLLECT DATA AND DESCRIBE EXPOSURE SETTING

Refer to TG 230 Section 3.4.2 for guidance.

3.1 Data Sampling Summary

Include a description of who collected the data and how data were collected (i.e. sampling method).

Ambient air particulate matter samples were collected by PVNTMED personnel using a low volume sampling pump using different sampling heads/impactors to distinguish between particulates less than 10 and less than 2.5 microns in aerodynamic diameter. Nickel was analyzed from the filters used to collect the PM_{10} samples.

3.2 Available Sampling Data and Statistics

See next pages

CASE STUDY 2

Airborne Particulate Matter and Nickel at a Base Camp

Sample Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	$PM_{2.5}$ / PM_{10}**	Nickel ($\mu g/m^3$)
14-Jul-2008	85	63	0.74	<0.05
21-Jul-2008	101	53	0.52	<0.05
29-Jul-2008	NA	83	NA	NA
5-Aug-2008	376	NA	NA	<0.05
12-Aug-2008	147	95	0.65	7
21-Aug-2008	236	85	0.36	<0.05
5-Sep-2008	NA	167	NA	NA
13-Sep-2008	227	96	0.42	<0.05
25-Sep-2008	84	NA	NA	<0.05
4-Oct-2008	191	NA	NA	<0.05
14-Oct-2008	115	80	0.70	1
29-Oct-2008	NA	42	NA	<0.05

Notes: NA: Data not available (Not Sampled) **See case study Section 5.3.

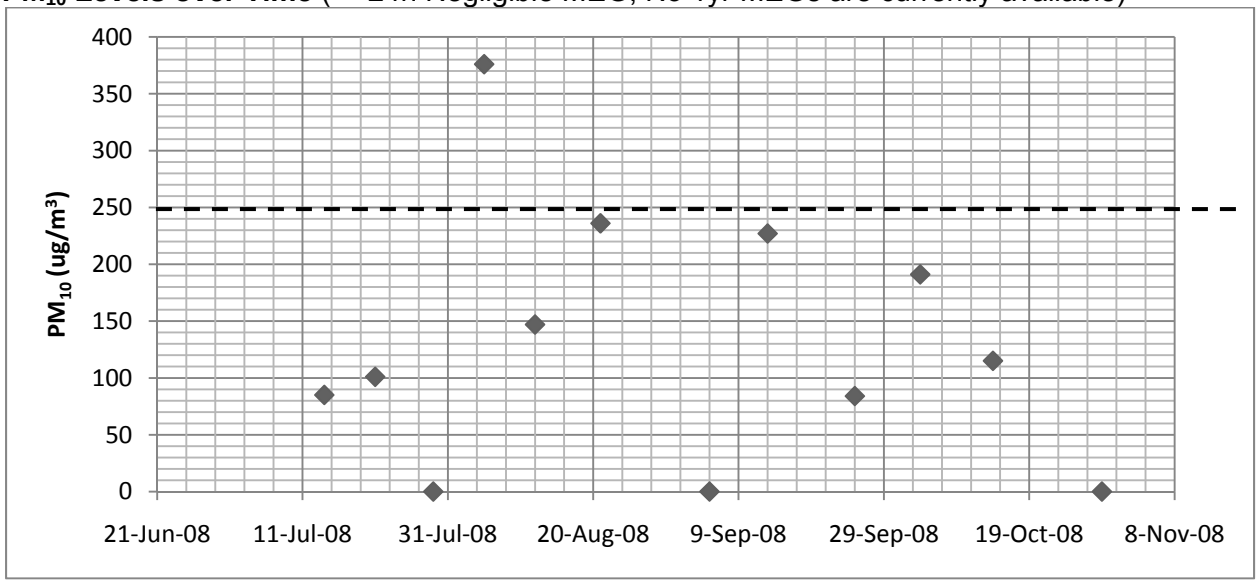
SAMPLE DATA SUMMARY	PM_{10}	$PM_{2.5}$	Nickel
Detected/Sampled	9/9	9/9	2/9
Detection Frequency	100%	100%	22%
Average ($\mu g/m^3$)	174	85	0.82
Peak ($\mu g/m^3$)	376	167	7
Sample Time per Sample (hrs)	24	24	24

*NA treated as missing data for calculating this average. That is, the sample was not treated as zero nor as ½ the limit of quantitation (LOQ).

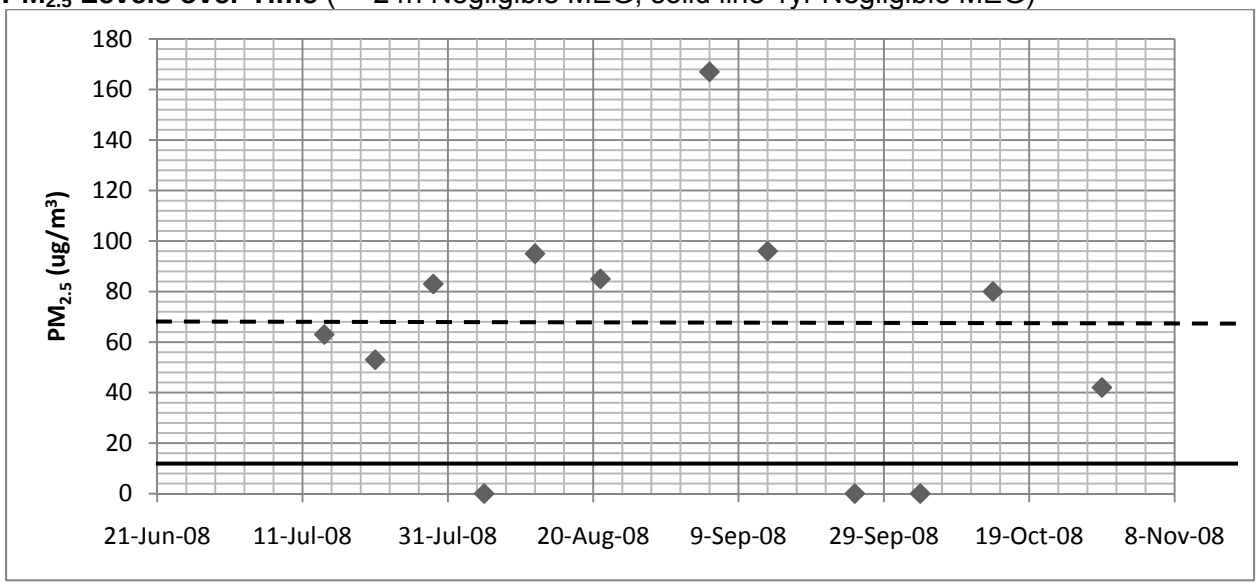
CASE STUDY 2

Airborne Particulate Matter and Nickel at a Base Camp

PM_{10} Levels over Time (--- 24h Negligible MEG, No 1yr MEGs are currently available)



$PM_{2.5}$ Levels over Time (--- 24h Negligible MEG, solid line 1yr Negligible MEG)



CASE STUDY 2 — Airborne Particulate Matter and Nickel at a Base Camp

3.3 MEG Tables

Short-Term (24-hour) Particulate Matter Air MEGs*

Hazard Severity	$PM_{2.5}$	PM_{10}	Description of Military Health and Operational Effects
Critical	500 µg/m^3	600 µg/m^3	Above these, most if not all personnel will experience very notable eye, nose, and throat irritation and respiratory effects. Visual acuity is impaired, as is overall aerobic capacity. Some personnel will not be able to perform assigned duties. Some lost duty days are expected. Those with a history of asthma or cardiopulmonary disease will experience more severe symptoms.** Conditions may also result in adverse, non-health related materiel/logistical impacts.
Marginal	250 µg/m^3	420 µg/m^3	Above these, a majority of personnel will experience notable eye, nose, and throat irritation and some respiratory effects. Some lost duty days are expected. Significant aerobic activity will increase risk. Those with a history of asthma or cardiopulmonary disease are expected to experience increased symptoms.**
Negligible	65 µg/m^3	250 µg/m^3	Above these, a few personnel may experience notable mild eye, nose, or throat irritation; most personnel will experience only mild effects. Pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may be exacerbated.**

* The MEGs and descriptors are based on professional judgment reflecting a consensus opinion of USAPHC (Prov) subject matter experts. ** Diagnosis of pulmonary or cardiopulmonary diseases would prevent deployment, though some conditions may go undetected. A small percentage of deployed personnel fall into this sensitive group.

Long-Term (1-year) Particulate Matter Air MEGs*

Hazard Severity	$PM_{2.5}$	PM_{10}	Description of Military Health and Operational Effects
Marginal	65 µg/m^3	Not defined	With repeated exposures above this, it is plausible that development of chronic health conditions such as reduced lung function or exacerbated chronic bronchitis, COPD, asthma, atherosclerosis, or other cardiopulmonary diseases could occur in generally healthy troops. Those with a history of asthma or cardiopulmonary disease are considered to be at particular risk. This guideline is an uncertain screening value—it is not a known health effects concentration.
Negligible	15 µg/m^3	Not defined	With repeated exposures above this, it is considered possible that a small percentage of personnel may have increased risk for developing chronic conditions such as reduced lung function or exacerbated chronic bronchitis, COPD, asthma, atherosclerosis, or other cardiopulmonary diseases. Personnel with history of asthma or cardiopulmonary disease are considered to be at particular risk. Exposures below this are not expected to result in development of chronic health conditions in generally healthy troops.

* The MEGs and descriptors are based on professional judgment reflecting a consensus opinion of USAPHC (Prov) subject matter experts. USAPHC (Prov) no longer recommends long-term MEGs for PM_{10}. The Negligible MEG is the EPA NAAQS standard reflecting a threshold level for the general population based on studies evaluating primarily children or individuals with cardiovascular and other diseases. Alternative standards for health adults do not yet exist. This MEG is considered a point of departure for further consideration and is not an action level.

CASE STUDY 2

Airborne Particulate Matter and Nickel at a Base Camp

Nickel Exposure Guidelines (Selected MEGs shaded)

Forms of Nickel with Air MEGs	CASRN	Selected Form of Nickel for this Case Study is Nickel Soluble Salts (Ni^{2+})	
		Exposure Guideline	Value ($\mu g/m^3$)
Nickel (elemental)	7440-02-0	1 Hour Negligible	NA
Nickel (II) bromide	13462-88-9	1 Hour Marginal	NA
Nickel (II) chloride hexahydrate	7791-20-0	1 Hour Critical	NA
Nickel (II) formate	3349-06-2	1 Hour Catastrophic	NA
Nickel (II) hydroxide	12054-48-7	8 Hour Negligible	100
Nickel (II) hydroxide carbonate hydrate	39430-27-8	24 Hour Negligible	NA
Nickel (II) nitrate hexahydrate	13478-00-7	14 Day Negligible	100
Nickel (II) nitrite	17861-62-0	1 Year Negligible	34
Nickel (II) hydroxide	12125-56-3		
Nickel ammonium sulfate	15699-18-0		
Nickel carbonyl	13463-39-3		
Nickel chloride	7718-54-9		
Nickel cyanide	557-19-7		
Nickel insoluble inorganic compounds	NA		
Nickel oxalate dihydrate	6018-94-6		
Nickel oxide	1313-99-1		
Nickel refinery dust	NA		
Nickel subsulfide	12035-72-2		
Nickel sulfamate	13770-89-3		
Nickel sulfate	7786-81-4		
Nickel sulfate hexahydrate	10101-97-0		
Nickel, (carbonato(2-))tet	12607-70-4		
Nickel, soluble salts	**NA**		
Nickelous nitrate	13138-45-9		

CASRN = Chemical Abstract Service Registry Number
NA = Not available.

Nickel has MEGs available for both soluble and insoluble forms. Because there is no available site-specific information indicating if the nickel is in a soluble or insoluble form, the recommended default MEGs were chosen (see TG 230 Section 3.5.5). In this case the comparison will be made with Nickel Soluble Salts. Additional information supporting this decision is provided in the next section.

CASE STUDY 2 — Airborne Particulate Matter and Nickel at a Base Camp

3.4 Chemical information

Provide general information about the chemical(s) and the general source(s) in the environment.

Particulate matter: The RD 230 provides an entire chapter discussing particulate matter sources and health effects. The following is extracted from RD 230.

> Particulate matter air pollution is a complex mixture of extremely small particles and liquid droplets in the air. When breathed in, some of these particles can reach the deepest regions of the lungs. Exposure to particle pollution is linked to a variety of significant health problems. Particulate matter pollution can be a major health and operational risk concern in some deployment environments. An accurate assessment of the health and operational risks of high concentrations of airborne particulate matter in the deployment environment is challenging (see RD 230). Although particulate matter may emanate from many sources, fossil-fuel combustion is the predominant source of particulate in areas with high population density, such as in the US and the European Union. However, in some deployed settings, blowing sand can be a major contributor to the total particulate matter concentration. The size and composition of measured particulate matter in deployment settings is directly relevant to the accurate assessment of particulate matter health risks for deployed personnel. For this reason, the accurate health assessment of particulate matter measurements must be accompanied by evaluations of the likely sources and composition of the measured particles.

Nickel: The Agency for Toxic Substances and Disease Registry (ATSDR) has a publically available ToxFAQ™ and Toxicological Profile for Nickel. The following is general information obtained from these sources.

> Nickel is a naturally occurring element. Pure nickel is a hard, silvery-white metal used to make stainless steel and other metal alloys. Skin effects are the most common effects in people who are sensitive to nickel. Workers who breathed very large amounts of nickel compounds developed chronic bronchitis and lung and nasal sinus cancers. Nickel is released into the atmosphere by industries that make or use nickel, nickel alloys, or nickel compounds. It is also released into the atmosphere by oil-burning power plants, coal-burning power plants, and trash incinerators. In the air, it attaches to small particles of dust that settle to the ground or are taken out of the air in rain or snow; this usually takes many days.
>
> While nickel can exist in oxidation states -1, 0, +2, +3, and +4, its only important oxidation state is nickel(+2) under normal environmental conditions. Environmental nickel is generally from two sources—(1) naturally occurring and (2) as a byproduct of human activities. In both cases, nickel is usually believed to exist in the atmosphere as the oxidized nickel state (Ni^{2+}). Metallic nickel is usually only associated with occupational settings. The oxidized state (Ni^{2+}) exists in either soluble or insoluble forms, depending on the matrix (or anion).

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3.5 Describe the Exposure Setting

Refer to TG 230 Section 3.4.2 for guidance. The description should answer as many of the pre-assessment key questions from Worksheet G.2 as possible. If an answer is unavailable, then indicate that information is missing.

The population at risk is the entire population at the base camp from January 2008 – April 2009, a 15 month period. Site-wide exposure to ambient air pollution is being assessed. The potential hazards are airborne, so inhalation is the primary exposure route of concern.

The base camp is located in Southwest Asia and is home to the 3rd Brigade Combat Team 1st Armored Division and support staff of 6000 personnel. They will be deployed to this location for 15 continuous months.

There are numerous activities that occur at the base camp. These activities include desk work, training exercises, typical daily routines (sleeping, eating, vehicle driving, etc.), equipment maintenance and heavy labor. About 30% of the unit will remain on the base camp at all times performing administrative and logistics operations. The remaining 70% will spend two 30-day deployments at smaller outposts off the base camp, and perform 12-hour combat patrols most other days beginning and ending at the base camp.

- What is the population at risk?
- What is the timeframe under consideration?
- What is the exposure event or ambient environmental condition under consideration?
- What is known about the source of the chemicals?
- What are the exposure pathways?
- What else is known about the exposure setting?
- What are the activity patterns of the population at risk?
- Where are the sampling locations relative to where exposure occurs?
- Is there adequate data quality to conduct a chronic assessment?

There is no particular exposure event. Specific sources of the airborne particulate matter and nickel are not known. No other types of airborne pollutant hazards have been identified and no soil sampling has occurred. Trash and waste is hauled and burned offsite (>20 km). No major industry is within 20 km.

PVNTMED personnel sampled ambient air at a central camp location that is believed to generally represent the typical population exposure. There is adequate data quality to conduct a chronic assessment—there are multiple samples throughout a year and no data have been invalidated.

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4. PRESCREEN

Refer to TG 230 Section 3.4.3 and Worksheet G.3 for guidance. Enter the results into the table below.

Chemical Name	Maximum Sample Concentration	1 Year Negligible MEG	Result
PM_{10}	376 ug/m^3	NA	Retain as a hazard
$PM_{2.5}$	167 ug/m^3	15 ug/m^3	Retain as a hazard
Nickel, soluble salts	7 ug/m^3	34 ug/m^3	Exclude as a hazard

There is no 1 year Negligible MEG for PM_{10}, therefore it cannot be eliminated at this stage.

5. GENERATE THE RISK ASSESSMENT DATA SET

Refer to TG 230 Section 3.4.4 and Worksheet G.4 for guidance. Enter the results into the table below.

Chemical Name	Acute Exposure		Chronic Exposure
	Peak PEPC	Average PEPC	Average PEPC
PM_{10}	376 ug/m^3	174 ug/m^3	174 ug/m^3
$PM_{2.5}$	167 ug/m^3	85 ug/m^3	85 ug/m^3

* All PEPCs in this assessment are based on 24-hour sampling times. The acute average PEPCs represent the expected concentrations on any given day. The chronic average PEPCs represent the expected average concentration over a 15-month period (see text).

5.1 Acute PEPCs

There is only one sampling averaging time for each pollutant (PM_{10} and $PM_{2.5}$), which is 24 hours; so only 24hr PEPCs are needed. Therefore, the acute peak PEPCs are the highest sample concentrations. Since there is no known "exposure event", the acute average PEPCs are equal to the average 24hr concentrations across the entire sampling period (Jul–Oct 2008).

5.2 Chronic PEPCs

The chronic average PEPCs should represent the average concentrations across the time period of interest, which is 15 months (Jan 2008 – Apr 2009) as defined in the risk assessment purpose. Unfortunately, the available data does not cover this entire period. Therefore, use of the average concentration from the collected data to represent the expected average concentration across the 15-month deployment period contains an embedded assumption. It is assumed that the particulate matter concentrations during January – June 2008 and November 2008 – April 2009 are reasonably represented by the data collected during July – October 2008.

Note: If there was information that indicated that much higher or lower concentrations would be expected

during these "missing data months," then the risk assessor may choose to handle this knowledge in one of two ways.

Option A—he/she could calculate a weighted average using an assumed concentration for the missing data months. For this case, this option would not be recommended because there is insufficient data by which to estimate reasonable surrogate concentrations for the missing time periods.

Option B—he/she could stick with the calculated average PEPC from the available data, but then rank hazard probability factor 2 (Representativeness of field data) at a score of 1 or 3. For this case, this option is recommended. The chronic PEPCs are considered to represent conservative estimates because that data was collected during the time of the year that is associated with higher winds and more airborne particulate matter. This information is incorporated into the assessment at a later point in the process.

5.3 Ratios of Particulate Matter Mass Fractions

Note: USAPHC (Prov) subject matter experts, or other qualified environmental professionals, should be consulted prior to the use particulate matter mass ratios to support an exposure assessment. At this time, use of particulate matter mass fractions to inform the risk assessment is not a recommended action for routine risk assessments.

USAPHC (Prov) Opinion for this Hypothetical Case Study:

When data for both PM_{10} and $PM_{2.5}$ is available, it is useful to calculate the $PM_{2.5}/PM_{10}$ mass fraction ratio. This ratio provides an indication of the likely differential chemical composition within each mass fraction. It is reasonable to generally assume that, based on data and information presented in the DoD Enhanced Particulate Matter Surveillance Program[1], ratios that are low (e.g., 0.36) are typical of regions dominated by geological dust (i.e., combustion sources are few), whereas ratios that are high (e.g., as high as 0.85) are typical of regions where combustion processes are common.

At this site the average mass ratio across the data collection period is 0.57 (the data table at the beginning shows the ratios for each sampling day), indicating that there are likely to be some combustion sources upwind of the site, but that the combustion sources do not represent consistent contributions to the overall particulate mass.

[1] Department of Defense Enhanced Particulate Matter Surveillance Program Final Report. Prepared for the Assistant Secretary of Defense for Health Affairs and the US Army Developmental Test Command. Desert Research Institute, Reno, Nevada; 2008.

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6. ACUTE RISK ASSESSMENT

Refer to TG 230 Section 3.4.5 for guidance.

6.1 Screen for Acute Hazards

Refer to TG 230 Section 3.4.5.1 and Worksheet G.3 for guidance to perform screen for acute hazards. Enter the results into the table below.

Chemical Name	Peak PEPC*	Screening MEG		Result
PM_{10}	376 ug/m^3	250 ug/m^3	24hr NEG	Retain as an acute hazard
$PM_{2.5}$	167 ug/m^3	65 ug/m^3	24hr NEG	Retain as an acute hazard

* All PEPCs are 24 hour averages.

6.2 Rank Acute Hazard Severity

Refer to TG 230 Section 3.4.5.2 for guidance. The peak and average PEPC across the selected exposure duration are used to select a hazard severity for each PEPC using Worksheet G.5 (airborne exposures) or Worksheet G.6 (water exposures).

Chemical Name	PEPC*		Comparison MEG		Hazard Severity
PM_{10}	Peak	376 ug/m^3	250 ug/m^3	24 hr NEG	Negligible
	Average	174 ug/m^3	is less than	24 hr NEG	Negligible
$PM_{2.5}$	Peak	167 ug/m^3	65 ug/m^3	24 hr NEG	Negligible
	Average	85 ug/m^3	65 ug/m^3	24 hr NEG	Negligible

* All PEPCs represent 24 hour averages.

Based on the decision logic in Worksheet G.5, all PM_{10} and $PM_{2.5}$ PEPCs are ranked as Negligible because they are either less than the 24hr Negligible MEG or less than the 24hr Marginal MEG.

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6.3 Rank Acute Hazard Probability

Refer to TG 230 Section 3.4.5.3 for guidance. Assess the hazard probability for each PEPC using Worksheet G.5 (airborne exposures) or Worksheet G.6 (water exposures).

Acute Peak PEPC scoring for PM_{10}

Acute PEPC		Hazard Probability Scoring					Hazard Probability
		Degree of exposure	Represent-ativeness of field data	Duration of exposure	Rate of exposure	Total Score	
Peak	376 ug/m^3	2	2	2	2	8	Occasional

The following text explains the rationale underlying the scoring.

- Factor 1 (Degree of exposure). The peak PEPC is in the middle of the MEG range. This scores as a 2.

  25th percentile = $MEG_{lo} + \left(\frac{MEG_{hi} - MEG_{lo}}{4}\right) = 250 + \left(\frac{420-250}{4}\right) = 293\ ug/m^3$

  75th percentile = $MEG_{hi} - \left(\frac{MEG_{hi} - MEG_{lo}}{4}\right) = 420 - \left(\frac{420-250}{4}\right) = 377\ ug/m^3$

- Factor 2 (Representativeness of field data). For this case study, this factor should be scored in terms of answering this question: how likely is it that this data set contains the true peak acute PEPC? While field data (based on 4 months) is not necessarily representative across the 15-month duration, the estimates of the peak field exposure are considered to be slightly conservative because data was collected during the summer months, which are associated with higher winds and more airborne particulate matter. This scores as a 2.

- Factor 3 (Duration of exposure). The exposure duration (24 hrs) in the field matches the exposure duration (24 hrs) of the MEG, a ratio of 1. This scores as a 2.

- Factor 4 (Rate of exposure). Typical exertion. Site-wide annual assessments of air quality. This scores as a 2.

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Acute Average PEPC scoring for PM_{10}

Acute PEPC		Hazard Probability Scoring					Hazard Probability
		Degree of exposure	Represent-ativeness of field data	Duration of exposure	Rate of exposure	Total Score	
Average	174 ug/m^3	1	2	2	2	7	Seldom

The following text explains the rationale underlying the scoring.

- Factor 1 (Degree of exposure). The average PM_{10} PEPC is below the Negligible MEG. This scores as a 1.

- Factor 2 (Representativeness of field data). For this case study, this factor should be scored in terms of answering this question: how likely is it that this data set can be used to estimate the true typical PM_{10} concentration on any given day of the 15-month period? While field data (based on 4 months) is not necessarily representative across the 15-month duration, the estimates of field exposure are considered to be slightly conservative because data was collected during the summer months, which are associated with higher winds and more airborne particulate matter. This scores as a 2.

- Factor 3 (Duration of exposure). The exposure duration (24 hrs) in the field matches the exposure duration (24 hrs) of the MEG, a ratio of 1. This scores as a 2.

- Factor 4 (Rate of exposure). Typical exertion. Site-wide annual assessments of air quality. This scores as a 2.

Acute Peak PEPC scoring for $PM_{2.5}$

Acute PEPC		Hazard Probability Scoring					Hazard Probability
		Degree of exposure	Represent-ativeness of field data	Duration of exposure	Rate of exposure	Total Score	
Peak	167 ug/m^3	2	2	2	2	8	Occasional

The following text explains the rationale underlying the scoring.

- Factor 1 (Degree of exposure). The average PEPC is in the middle of the MEG range. This scores as a 2.

25th percentile = $MEG_{lo} + \left(\frac{MEG_{hi} - MEG_{lo}}{4}\right) = 65 + \left(\frac{250-65}{4}\right) = 112\ ug/m^3$

75th percentile = $MEG_{hi} - \left(\frac{MEG_{hi} - MEG_{lo}}{4}\right) = 250 - \left(\frac{250-65}{4}\right) = 204\ ug/m^3$

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- Factor 2 (Representativeness of field data). For this case study, this factor should be scored in terms of answering this question: how likely is it that this data set contains the true peak acute PEPC? While field data (based on 4 months) is not necessarily representative across the 15 month duration, the estimates of field exposure are considered to be slightly conservative because data was collected during the summer months, which are associated with higher winds and more airborne particulate matter. This scores as a 2.

- Factor 3 (Duration of exposure). The exposure duration (24 hrs) in the field matches the exposure duration (24 hrs) of the MEG, a ratio of 1. This scores as a 2.

- Factor 4 (Rate of exposure). Typical exertion. Site-wide annual assessments of air quality. This scores as a 2.

Acute Average PEPC scoring for $PM_{2.5}$

Acute PEPC		Hazard Probability Scoring					Hazard Probability
		Degree of exposure	Represent-ativeness of field data	Duration of exposure	Rate of exposure	Total Score	
Average	85 ug/m^3	1	2	2	2	7	Seldom

The following text explains the rationale underlying the scoring.

- Factor 1 (Degree of exposure). The average $PM_{2.5}$ PEPC is in the lower 25 % of the MEG range. This scores as a 1.

  25th percentile = $MEG_{lo} + \left(\frac{MEG_{hi} - MEG_{lo}}{4}\right) = 65 + \left(\frac{250-65}{4}\right) = 112\ ug/m^3$

  75th percentile = $MEG_{hi} - \left(\frac{MEG_{hi} - MEG_{lo}}{4}\right) = 250 - \left(\frac{250-65}{4}\right) = 204\ ug/m^3$

- Factor 2 (Representativeness of field data). For this case study, this factor should be scored in terms of answering this question: how likely is it that this data set can be used to estimate the true typical $PM_{2.5}$ concentration on any given day of the 15-month period? While field data (based on 4 months) is not necessarily representative across the 15 month duration, the estimates of field exposure are considered to be slightly conservative because data was collected during the summer months, which are associated with higher winds and more airborne particulate matter. This scores as a 2.

- Factor 3 (Duration of exposure). The exposure duration (24 hrs) in the field matches the exposure duration (24 hrs) of the MEG, a ratio of 1. This scores as a 2.

- Factor 4 (Rate of exposure). Typical exertion. Site-wide annual assessments of air quality. This scores as a 2.

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Summary of Acute Hazard Probability Ranks

Hazard probability →		Unlikely	Seldom	Occasional	Likely	Frequent
Total factor score →		4–6	7	8	9	10–12
PM_{10}	Peak			Occasional		
	Average		Seldom			
$PM_{2.5}$	Peak			Occasional		
	Average		Seldom			

6.4 Estimate of Tactical Risk and Level of Confidence

Refer to TG 230 Section 3.4.5.4 for guidance. Use the risk assessment matrix in Table G-2 to combine the hazard severity and hazard probability selections to derive a Risk Level. Use the guidance in Worksheet G.8 to set levels of confidence.

Acute Hazard		Severity	Probability	Risk Level	Confidence
PM_{10}	Peak	Negligible	Occasional	LOW	Medium
	Average	Negligible	Seldom	LOW	
$PM_{2.5}$	Peak	Negligible	Occasional	LOW	
	Average	Negligible	Seldom	LOW	

Conclusion statement

Additional detail is provided in the overall Risk Characterization section at the end.

In summary, the airborne particulate matter hazard poses a Low tactical risk. A few personnel may experience notable mild eye, nose, or throat irritation; most personnel will experience only mild effects, even on peak exposure days. Pre-existing health conditions (e.g., asthma or cardiopulmonary diseases) may be exacerbated" (see the case study's short-term MEG table in Section 3.3).

Rationale for confidence level

Consider all of the information at hand and communicate to the decision maker the level of confidence they have in the risk level being presented. Use the guidance in Worksheet G.8 to set levels of confidence.

The level of confidence in the acute assessment is Medium. There is significant activity pattern information. The potential health outcomes are plausible. While field data is not necessarily representative across the 15 month duration, the estimates of field exposure are considered to be slightly conservative because data was collected during the summer months, which are

associated with higher winds and more airborne particulate matter. At this site the average particulate mass ratio across the data collection period is 0.57, indicating that there are likely to be some combustion sources upwind of the site, but that the combustion sources do not represent consistent contributions to the overall particulate mass.

7. CHRONIC RISK ASSESSMENT

Refer to TG 230 Section 3.4.6 for guidance.

7.1 Screen for Chronic Hazards

Refer to TG 230 Section 3.4.6.1. Screen for hazardous exposures that may lead to long term health effects. Use the chronic screening criteria described in Worksheet G.3 and enter the results in the table below.

Chemical Name	Chronic PEPC	1 Year Negligible MEG	Frequency of Detection	Result
PM_{10}	174 ug/m^3	Not defined	100 %	Exclude as a hazard
$PM_{2.5}$	85 ug/m^3	15 ug/m^3	100 %	Retain as a hazard

For both mass fractions, the frequency of detection is greater than 5 percent. The $PM_{2.5}$ exposure is retained as a chronic hazard because it is higher than the 1yr Negligible MEG.

The PM_{10} exposure is excluded as a chronic hazard because USAPHC (Prov) no longer recommends any long-term MEGs for PM_{10} since the U.S. Environmental Protection Agency revoked the annual National Ambient Air Quality Standard for PM_{10} citing a lack of evidence to linking health problems to long-term exposure to coarse particle pollution. The health risks of long-term exposures to particulate matter are primarily associated with the $PM_{2.5}$ fraction. Refer to TG 230 Section 3.5.3 for more information.

7.2 Rank Chronic Hazard Severity

Refer to TG 230 Section 3.4.6.2 for guidance. The average PEPCs across the selected exposure duration are used to select a hazard severity for each PEPC using Worksheet G.7.

Chemical Name	Chronic PEPC	Comparison MEG		Hazard Severity
$PM_{2.5}$	85 ug/m^3	65 ug/m^3	1yr MARG	Marginal*

* In this case the hazard severity is at least Marginal. However, because there is no 1yr Critical MEG (see TG 230 Figure 3-6) it is recommended that USAPHC (Prov) be contacted in order to validate, or determine, the final severity ranking.

Note: These exposure estimates require that USAPHC (Prov) subject matter experts, or other qualified medical/health professionals, be consulted in order to rank hazard severity.

USAPHC (Prov) Opinion for this Hypothetical Case Study:

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The severity ranks will depend on the weight of evidence and the dose-response information associated with the MEGs. In these situations, subject matter experts (SMEs) with an appropriate understanding of the underlying chemical- and endpoint-specific toxicity data should be consulted to determine most appropriate severity rank. Considerations include the basis and confidence in the MEG value, knowledge about the dose-response function, toxicological weight-of-evidence, other alternative health criteria and their basis, the short-term MEGs, and especially any unique applicable action levels.

$PM_{2.5}$: The 1yr Marginal MEG was developed in part by consideration of the U.S. EPA Air Quality Index (AQI). However, the AQI is primarily developed to address effects from short-term exposures and the associated short-term health effects. While a review of available literature shows relatively strong evidence that links chronic exposure to high $PM_{2.5}$ to long-term health effects such as chronically reduced lung function or exacerbated bronchitis, chronic obstructive pulmonary disease (COPD), asthma, atherosclerosis, and other cardiopulmonary diseases, there is no analogous source of published health criteria for $PM_{2.5}$ that provides guidelines for quantitatively predicting increasing levels of risk for these long-term health effects. Scientific research is especially inadequate for directly developing such guidelines for the deployed military population, composed mostly of healthy adults. Therefore, the selected long-term MEGs for $PM_{2.5}$ are based on professional judgment reflecting a consensus opinion of USAPHC (Prov) subject matter experts.

The 1yr Marginal MEG for $PM_{2.5}$ represents an estimated point of demarcation for a higher degree of plausible risk for long-term health effects amongst troops continuously exposed to such $PM_{2.5}$ levels. The military health and operational effects associated with exposures above the Marginal MEG are provided in the MEG tables in Section 3.3 of this case study.

There is a clear lack of data for setting or predicting where the exposure threshold would be for a 1yr Critical MEG for $PM_{2.5}$. Based on the professional opinion of USAPHC (Prov) subject matter experts, a 15-month average population exposure of 85 ug/m^3 would not produce a high enough incidence of chronic health conditions to warrant a severity designation of Critical, whereby most exposure personnel would be at risk for developing such long-term health problems. Therefore, the severity rank for this exposure is set to Marginal. This is considered a conservative (health-protective) ranking for this exposure level.

7.3 Rank Chronic Hazard Probability

Refer to TG 230 Section 3.4.6.3 for guidance. Assess the hazard probability for each PEPC using Worksheet G.7

Chronic Average PEPC scoring for $PM_{2.5}$

Chronic PEPC		Hazard Probability Scoring					Hazard Probability
		Degree of exposure	Represent-ativeness of field data	Duration of exposure	Rate of exposure	Total Score	
$PM_{2.5}$	85 ug/m^3	2	1	2	2	7	Seldom

The following text explains the rationale underlying the scoring.

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- Factor 1 (Degree of exposure). Scoring method B is used since the PEPC is higher than the 1yr Marginal MEG and a 1yr Critical MEG is unavailable. This scores as a 2.

- Factor 2 (Representativeness of field data). As discussed in the risk assessment data set section, the chronic average PEPC represents an estimate of the average concentration for 15 months (Jan 2008 – Apr 2009). Unfortunately, the available data does not cover this entire period; the estimates of field exposure are considered to be conservative for a chronic assessment because data was collected only during the late summer months that are associated with higher winds and more airborne particulate matter. This scores as a 1.

- Factor 3 (Duration of exposure). The duration of exposure is 15 months and the MEG duration is 12 months, a ratio of 1.25. This scores as a 2.

- Factor 4 (Rate of exposure). Since this is a site-wide, annual assessment of air quality, we choose the typical exertion category. This scores as a 2.

7.4 Estimate of Lifecycle Risk and Level of Confidence

Refer to TG 230 Section 3.4.6.4. Use the risk assessment matrix in Table G-2 to combine the hazard severity and hazard probability selections to derive a Risk Level. Use the guidance in Worksheet G.8 to set levels of confidence.

HAZARD	Severity	Probability	Risk Level	Confidence
$PM_{2.5}$	Marginal	Seldom	LOW	Low

Conclusion statement

Additional detail is provided in the overall Risk Characterization section at the end.

The lifecycle risk level associated with chronic exposure to airborne $PM_{2.5}$ is Low. The major health concern associated with exposure to $PM_{2.5}$ is from combustion sources. Based on this analysis personnel will seldom experience chronic exposures that would result in the plausibility that development of chronic health conditions such as reduced lung function or exacerbated lung conditions or other cardiopulmonary diseases in generally healthy troops. Those with a history of asthma or cardiopulmonary disease are more likely to develop these conditions.

Note: Under typical circumstances, a Low risk does not carry a recommendation to consult with USAPHC (Prov) subject matter experts, or other qualified medical/health professionals. However, in this case, these consultants should have already been contacted in order to rank the chronic hazard severity level. When this happens, these consultants would also likely assist in preparing the final conclusion statements and recommendations.

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Rationale for confidence level

Consider all of the information at hand and communicate to the decision maker the level of confidence they have in the risk level being presented. Use the guidance in Worksheet G.8 to set levels of confidence.

The level of confidence in the chronic assessment is Low.

There is significant activity pattern information. Predicted health outcomes are plausible. The estimated chronic average exposure level is supposed to represent the average concentration for 15 months (Jan 2008 – Apr 2009). Unfortunately, the available data does not cover this entire period. Therefore, it was assumed that this calculated average (from the 4 month data collection period) is a reasonable estimate. It is assumed that the particulate matter concentrations during January – June 2008 and November 2008 – April 2009 are reasonably represented by the data collected during July – October 2008.

Additionally, the 1y Marginal MEG for $PM_{2.5}$ is considered highly uncertain and its use should be associated with a low confidence ranking. Both the 1yr Negligible and Marginal MEGs for $PM_{2.5}$ is are likely to be revised pending continued USAPHC (Prov) experience, new data and/or scientific analyses, and future recommendations of national scientific panels. (See TG 230 Section 3.5.3.)

At this site the average particulate mass ratio across the data collection period is 0.57, indicating that there are likely to be some combustion sources upwind of the site, but that the combustion sources do not represent consistent contributions to the overall particulate mass. Since the long-term MEGs are based in large part on data where combustion sources of pollution were predominant, the risk level at this site may be overestimated.

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8. RISK CHARACTERIZATION SUMMARY

Refer to TG 230 Section 3.4.7 and tables G-2 through G-6 for guidance.

8.1 Summary Table

The summary should present the risk level(s), associated anticipated impacts to the tactical and lifecycle missions, and the level of confidence associated with the assessments. Recommended actions should be presented.

OEH Hazard		Tactical Risk Estimate	Lifecycle Risk Estimate	Current Recommended Actions
Media/ Source	**Chemical**	(acute effects)	(chronic effects)	
Ambient air	**PM_{10}**	**Low** Expected losses have little or no impact on accomplishing the mission. *Little to no in-theater medical resources anticipated for protection and treatment. However, a summary of any negative or low level sampling results should be documented and archived particularly if some personnel express concerns.* Confidence in the assessment is medium on a low-medium-high scale.	**No lifecycle risk**	Continue monitoring. Document data in designated DoD archive. Consider lowering physical activity when high PM is experienced.
	$PM_{2.5}$	**Low** Expected losses have little or no impact on accomplishing the mission. *Little to no in-theater medical resources anticipated for protection and treatment. However, a summary of any negative or low level sampling results should be documented and archived particularly if some personnel express concerns.* Confidence in the assessment is low on a low-medium-high scale.	**Low *** No specific medical action required. *Documentation of environmental data in designated DoD archive.* Confidence in the assessment is low on a low-medium-high scale.	Continue monitoring. Document data in designated DoD archive. Consider lowering physical activity when high PM is experienced.

* This summary prepared in consultation with USAPHC (Prov) subject matter experts.

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8.2 Potential Health Effects

Refer to the tables in TG 230 Appendices B, C, D, and E. Additional information is also available in RD 230. This section should present the potential health effects that are relevant in the final assessments. When risk levels are Moderate or higher, the identification of potential health effects should be based on consultations with appropriately trained subject matter experts at USAPHC (Prov) or other such service organization.

Note that health effects information for particulate matter is found in a specific section of TG 230, see Section 3.5.3.

$PM_{2.5}$

- **Acute exposure**: During the operation, a few personnel may experience notable mild eye, nose, or throat irritation; most personnel will experience only mild effects. Pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may be exacerbated.

- **Chronic exposure**: Personnel will rarely experience chronic exposures that would result in a plausible chance for developing chronic health conditions such as reduced lung function or exacerbated lung conditions or other cardiopulmonary diseases in generally healthy troops. Those with a history of asthma or cardiopulmonary disease are considered to be at particular risk.

PM_{10}

- **Acute exposure**: During the operation, a few personnel may experience notable mild eye, nose, or throat irritation; most personnel will experience only mild effects. Pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may be exacerbated.

8.3 Answers to Key Post-Risk Assessment Questions

Refer to Worksheet G.2. These questions should be considered when preparing a risk assessment. The case study answers provide teaching points.

- Has the risk assessment incorporated any of the unique considerations identified in TG 230 Section 3.5? The TG 230 Section 3.5 identifies one consideration that is relevant to this case study. This assessment addresses particulate matter MEGs.

- Is data quality adequate to base risk management decisions on the risk assessment? This level of detail is not atypical for a mature theater. While sparse it can result in a representative assessment of risk.

- Is it worth collecting additional data to increase the confidence in the risk assessment conclusion? Yes, more data collection is recommended. These data are representative of *the time period that samples were collected*. Solid estimates about the seasonality or

temporal stability of these exposures are premature without more information about the wind and activity pattern of the local population and environment. The data used in the assessment (collection from July – October 2008) is supposed to represent concentrations for 15 months (Jan 2008 – Apr 2009). Unfortunately, the available data does not cover this entire period.

- Are there readily available exposure control measures that can be implemented? Usually, particulate matter is a ubiquitous exposure that is difficult to control. Generally, control measures are limited to use of personal protective equipment (PPE) such as cravats and Command "Seek Cover Orders" and other activity restrictions.

8.4 Bottom-line-up-front briefing statements (BLUF Statements)

Refer to TG 230 Section 4 for over-arching risk communication guidance. The following bullets should represent succinct case-study specific points that should be emphasized when communicating to stakeholders.

- These risks are fairly typical of a desert exposure and there would be no need to explicitly identify exposed groups for medical intervention or monitoring.

- These risk levels are consistent with those seen in Iraq, Afghanistan, and other desert environments.

- The major health concern associated with exposure to particulate matter is the chemical composition of ultrafine particles ($PM_{2.5}$) from combustion sources.

- During the operation, most personnel will experience only mild effects; a few personnel may experience notable mild eye, nose, or throat irritation.. Personnel will rarely be exposed to PM levels that would increase their chance for developing chronic health conditions, such as reduced lung function or exacerbated lung conditions or other cardiopulmonary diseases in generally healthy troops. Those with a history of asthma or cardiopulmonary disease are considered to be at particular risk.

- Reducing uncertainty in this case will generally mean collecting seasonal exposure measures, identifying combustion sources of $PM_{2.5}$, and managing activities associated with risks for acute health effects—such as lowering physical activity during the worst part of the day (PT restrictions) and enforcing hygiene measures.

CASE STUDY 2

Airborne Particulate Matter and Nickel at a Base Camp

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CASE STUDY 3 — Acrolein, Dioxins, and Mercury Contamination in Air

Teaching Points

- Deals with chemicals with multiple non-detects in samples.
- Demonstrates an assessment of dioxin-like compounds.
- Illustrates how to handle chemicals whose MEG is lower than the limit of quantitation.
- Demonstrates USAPHC (Prov) SME input into the process.

1. BACKGROUND

This is a hypothetical case study designed to illustrate the TG 230 risk assessment process. Personnel at a base camp have been complaining about the smoke emitted from waste burning activities occurring off post. Twenty-five 24 hour samples have been taken throughout the year and will be used to assess the operational risk to personnel stationed at the base camp for one year.

2. DEFINE THE PURPOSE OF THE RISK ASSESSMENT

Refer to TG 230 Section 3.4.1 for guidance. Appendix G provides a process flow-chart.

The purpose of the risk assessment is to characterize acute and chronic health risks associated with exposure to the burning waste emissions to personnel stationed at the base camp for one year.

3. COLLECT DATA AND DESCRIBE EXPOSURE SETTING

Refer to TG 230 Section 3.4.2 for guidance.

3.1 Data Sampling Summary

Include a description of who collected the data and how data were collected (i.e. sampling method).

Sample data were collected by preventive medicine personnel stationed at the base camp. Air samples were collected over 24 hours using several methods: Summa canisters and a high volume sampler for organics, and a low-volume sampling pump for particulate matter (i.e., PM_{10}). Samples were analyzed for organics using the Environmental Protection Agency methods TO-9A and TO-14A. Mercury was analyzed from the PM_{10} filters.

3.2 Available sampling data and statistics

See next page

CASE STUDY 3 — Acrolein, Dioxins, and Mercury Contamination in Air

Date	Acrolein	Mercury	Summed Dioxin-like Compounds **	2,3,7,8-TCDD TEQ **
Jan 2	ND	0.2	2.15E-04	2.53E-05
Jan 18	ND	0.2	1.44E-05	1.09E-06
Jan 28	ND	0.7	7.42E-06	1.00E-06
Feb 8	ND	ND	1.07E-05	1.67E-06
Feb 9	ND	0.7	8.10E-06	1.04E-06
Feb 28	ND	0.7	5.12E-05	5.80E-06
Mar 2	ND	0.4	1.71E-05	2.12E-06
Mar 20	2.6	ND	1.24E-05	1.31E-06
Apr 1	ND	ND	3.53E-05	3.77E-06
Apr 19	ND	ND	1.40E-04	1.70E-05
May 2	ND	0.5	3.18E-05	3.51E-06
May 13	ND	ND	1.20E-05	9.98E-07
Jun 1	ND	0.2	2.61E-05	2.90E-06
Jun16	ND	ND	1.28E-05	1.43E-06
Jun 30	ND	8.3	1.30E-05	1.33E-06
Jul 7	ND	19.5	1.33E-06	9.87E-08
Jul 23	ND	24	1.54E-05	2.45E-06
Aug 8	ND	10.9	4.33E-05	1.21E-05
Aug 23	ND	19.4	6.77E-05	1.61E-05
Oct 3	ND	29.3	5.85E-06	9.32E-07
Nov 16	ND	0.9	1.72E-05	2.69E-06
Nov 24	ND	0.1	1.51E-05	2.13E-06
Dec 6	ND	ND	6.51E-06	6.62E-07
Dec 13	ND	8.4	1.89E-04	3.15E-05
Dec 25	ND	ND	1.81E-06	1.83E-07
Minimum	ND	ND	6.51E-06	9.87E-08
Maximum	2.6	29.3	2.15E-04	3.15E-05
Average*	***	5.0	3.88E-05	5.56E-06
Count	25	25	25	25
Units	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$
Detection Limit	2.0	Unknown	Not applicable	Not applicable
Limit of Quantitation	4.0	0.15	2.00E-07	2.00E-07
Detection Frequency	4%	68%	100%	100%
Sample Time	24h	24h	24h	24h

* This average was calculated using ½ the Limit of Quantitation (LOQ) for the non-detect (ND) results.
** See data tables at the back of the case study for the original dioxin-like compound data. TEQ stands for toxic equivalency concentration (refer to TG 230 Section 3.5.5 for more information).
*** An average for acrolein is not required. See case study Sections 4 and 5.

CASE STUDY 3 — Acrolein, Dioxins, and Mercury Contamination in Air

3.3 MEG tables

Acrolein 107-02-8

	Air (µg/m^3)					
CAT						
CRIT	1.42E+04	3.21E+03	6.19E+02			
MARG	1.01E+03	2.29E+02	2.29E+02			
NEG	6.88E+01	6.88E+01	6.88E+01		4.59E+01	1.37E-01
	10 min	**1 hr**	**8 hr**	**24 hr**	**14 day**	**1 year**

2,3,7,8-TCDD 1746-01-6

	Air (µg/m^3)					
CAT						
CRIT		7.50E+00				
MARG		7.50E+00				
NEG		1.50E+00				1.12E-04
	10 min	**1 hr**	**8 hr**	**24 hr**	**14 day**	**1 year**

Elemental Mercury 7439-97-6

	Air (µg/m^3)					
CAT						
CRIT		8.90E+03				
MARG		1.70E+03				
NEG		1.00E+02	2.50E+01		1.00E+01	2.05E-01
	10 min	**1 hr**	**8 hr**	**24 hr**	**14 day**	**1 year**

3.4 Chemical information

Provide general information about the chemical(s) and the general source(s) in the environment.

Acrolein: The Agency for Toxic Substances and Disease Registry (ATSDR) has a publically available ToxFAQ™ and Toxicological Profile for this chemical. The following is general information obtained from these sources.

> Acrolein is a colorless or yellow liquid with a disagreeable odor. It dissolves in water very easily and quickly changes to a vapor when heated. It also burns easily. Small amounts of acrolein can be formed and can enter the air when trees, tobacco, other plants, gasoline, and oil are burned. Acrolein is used as a pesticide to control algae, weeds, bacteria, and mollusks. It is also used to make other chemicals. Cigarette smoke and automobile exhaust contain acrolein. It breaks down fairly rapidly in the air (about half will disappear within 1 day) by reacting with other chemicals and sunlight. There is very little information about how exposure to acrolein affects people's health. The information we have indicates that breathing large amounts damages the lungs and could cause death. Breathing lower amounts may cause eye watering and burning of the nose and

throat and a decreased breathing rate; these effects usually disappear after exposure stops. Animal studies show that breathing acrolein causes irritation to the nasal cavity, lowered breathing rate, and damage to the lining of the lungs. Several agencies have stated that the potential carcinogenicity of acrolein cannot be determined based on an inadequate database.

Elemental (Metallic) Mercury: The Agency for Toxic Substances and Disease Registry (ATSDR) has a publically available ToxFAQ™ and Toxicological Profile for this chemical. The following is general information obtained from these sources.

Mercury is a naturally occurring metal which has several forms. The metallic mercury is a shiny, silver-white, odorless liquid. If heated, it is a colorless, odorless gas. Metallic mercury is used to produce chlorine gas and caustic soda, and is also used in thermometers, dental fillings, and batteries. Mercury salts are sometimes used in skin lightening creams and as antiseptic creams and ointments. Inorganic mercury (metallic mercury and inorganic mercury compounds) enters the air from mining ore deposits, burning coal and waste, and from manufacturing plants. Inhalation exposure can occur by breathing vapors in air from spills, incinerators, and industries that burn mercury-containing fuels. The nervous system is very sensitive to all forms of mercury. Methylmercury and metallic mercury vapors are more harmful than other forms, because more mercury in these forms reaches the brain. Exposure to high levels of metallic, inorganic, or organic mercury can permanently damage the brain, kidneys, and developing fetus. Effects on brain functioning may result in irritability, shyness, tremors, changes in vision or hearing, and memory problems. Short-term exposure to high levels of metallic mercury vapors may cause effects including lung damage, nausea, vomiting, diarrhea, increases in blood pressure or heart rate, skin rashes, and eye irritation. The EPA has determined that mercuric chloride and methylmercury are possible human carcinogens; however, elemental mercury has not been classified for its carcinogenicity potential.

Dioxin-like compounds: The Agency for Toxic Substances and Disease Registry (ATSDR) has a publically available ToxFAQ™ and Toxicological Profile for Dioxins. There are other numerous publically available resources to understand dioxins and dioxin-like compounds. The following is general information obtained from these sources.

Dioxins, or chlorinated dibenzo-*p*-dioxins (CDDs), are a class of structurally similar chlorinated hydrocarbons. Dioxin is a term used interchangeably with 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCCD or TCDD). This is the most toxic form of dioxins. Dioxin-like compounds are compounds from a group of halogenated aromatic hydrocarbons that have molecules shaped like TCDD. They produce similar toxic effects as dioxin. They include certain chlorinated dibenzofurans (CDFs), polychlorinated biphenyls (PCBs), polybrominated biphenyls (PBBs), brominated dibenzo-p-dioxins (BDDs), and brominated dibenzofurans (BDFs). The dioxin-like compounds exist in the environment as mixtures (i.e.,

a single compound is not found in isolation). Dioxin-like compounds are defined as those substances that induce a common battery of dioxin-like toxic responses through similar biological modes of action. Not all dioxins have the same toxicity or ability to cause illness and adverse health effects.

Dioxins are produced as by-products of incomplete combustion and some chemical processes, including natural ones. Dioxins are not intentionally produced and have no known use; however, some dioxin-like compounds, like the coplanar PCBs have been intentionally produced for industrial purposes. Dioxin-like compounds are mainly the by-products of various industrial processes (i.e., bleaching paper pulp, and chemical and pesticide manufacture) and combustion activities (i.e., burning household trash, forest fires, and waste incineration). The highest levels of dioxins are usually found in soil, sediment, and in the fatty tissues of animals. Much lower levels are found in air and water.

The most noted health effect in people exposed to large amounts of 2,3,7,8-TCDD is chloracne. Chloracne is a severe skin disease with acne-like lesions that occur mainly on the face and upper body. Other skin effects noted in people exposed to high doses of include skin rashes, discoloration, and excessive body hair. Changes in blood and urine that may indicate liver damage also are seen in people. Exposure to high concentrations of CDDs may induce long-term alterations in glucose metabolism and subtle changes in hormonal levels. Several studies suggest that exposure to 2,3,7,8-TCDD increases the risk of several types of cancer in people. Animal studies have also shown an increased risk of cancer from exposure to 2,3,7,8-TCDD.

3.5 Describe the Exposure Setting

Refer to TG 230 Section 3.4.2 for guidance. The description should answer as many of the pre-assessment key questions from Worksheet G.2 as possible. If an answer is unavailable, then indicate that information is missing.

- What is the population at risk?
- What is the timeframe under consideration?
- What is the exposure event or ambient environmental condition under consideration?
- What is known about the source of the chemicals?
- What are the exposure pathways?
- What else is known about the exposure setting?
- What are the activity patterns of the population at risk?
- Where are the sampling locations relative to where exposure occurs?
- Is there adequate data quality to conduct a chronic assessment?

The population at risk contains all personnel stationed at the base camp for one year, regardless of their duty or location. The ambient environmental condition under consideration is the ambient air as affected by emissions from waste burning activities of the local population just off post. The pathway examined in this assessment is inhalation of the emissions.

The waste burning activities are open to the air and apparently burns continuously each day. The substances contained in the waste are not specifically known but it is generally filled by garbage that the local population creates including plastics, metal cans, rubber, petroleum, solvents, metal and wood scraps.

CASE STUDY 3 — Acrolein, Dioxins, and Mercury Contamination in Air

The site is in an arid climate comprised of hot, dry summers, cold winters and comfortable springs and falls. The base camp has no vegetation and the site has frequent dust storms. Irrigation canals are the only surface water found at the site.

There are numerous activities that occur at the base camp. These activities vary between desk work, training exercises, typical daily routines (sleeping, eating, vehicle driving, etc.), equipment maintenance and heavy labor. Site-wide exposure is being assessed for all personnel at the base camp, regardless of proximity to the burn pit. No specific activities will be addressed in the assessment; populations will be assessed regardless of their activity patterns.

The samples were collected along the post fence line, nearest to the waste burning site. The base camp population generally tends to live and work further downwind from this point along the fence line. The number of valid samples taken throughout a one year period is robust enough to facilitate a chronic assessment.

4. PRESCREEN

Refer to TG 230 Section 3.4.3 and Worksheet G.3 for guidance. Enter the results into the table below.

Chemical Name	Maximum Sample Concentration	1 Year Negligible MEG	Result
Acrolein	2.6 µg/m^3	0.137 µg/m^3	Retain as a hazard
Elemental mercury	29.3 µg/m^3	0.205 µg/m^3	Retain as a hazard
Dioxin-like compounds*	0.000215 µg/m^3	0.000112 µg/m^3	Retain as a hazard

* Sum of the peak concentrations without incorporation of the TEF (see text).

Acrolein: Note that the LOQ for Acrolein is higher than the 1yr Negligible MEG. In order to account for possible false negatives (which would increase the chance that a potential hazard is not evaluated), chemicals with screening MEGs lower than the LOQ are screened differently than other chemicals. This is the case for Acrolein. See TG 230 Section 3.4.4.4 for more discussion.

Elemental mercury: No special considerations are necessary. A straight comparison of the maximum sample concentration to the 1yr Negligible MEG is made.

Dioxin-like compounds: Unique methods for dioxin-like compounds are provided in TG 230 Section 3.5.5. The sum of the maximum concentrations of the detected dioxin-like compounds (summed without regard to toxicity equivalency factors [TEFs]) was greater than the 1yr Negligible MEG. Therefore, it is retained as a hazard.

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5. GENERATE THE RISK ASSESSMENT DATA SET

Refer to TG 230 Section 3.4.4 and Worksheet G.4 for guidance. Enter the results into the table below.

Chemical Name	Acute Exposure		Chronic Exposure
	Peak PEPC	Average PEPC	Average PEPC
Acrolein	2.6 µg/m^3	Not applicable	Not applicable
Elemental mercury	29.3 µg/m^3	5.0 µg/m^3	5.0 µg/m^3
Dioxin-like compounds (total)*	0.000215 µg/m^3	0.0000388 µg/m^3	Not applicable
Dioxin-like compounds (TEQ)*	Not applicable	Not applicable	0.00000556 µg/m^3

* The total is the summation without regard to TEFs; while the TEQ is the summation incorporating the TEFs.

5.1 Acute PEPCs

The acute peak PEPCs are the highest sample concentrations. Since the exposure event (local burning waste emissions) is associated with a more or less continuous source, the acute average PEPCs are estimates of the average concentrations across the entire sampling period (Jan–Dec). The calculation of the acute average PEPCs involves handling results less than the detection limit. For purposes of calculating the average, the ND values were assigned surrogate values equal to ½ the LOQ (see TG 230 Section 3.4.4.3 for guidance).

An average PEPC for Acrolein is not needed. Even though the Acrolein Detection Limit (2 µg/m^3) and LOQ (4 µg/m^3) are higher than the 1y Negligible MEG (0.14 µg/m^3), it was actually detected in only one of 25 samples (4 percent) at an estimated concentration of 2.6 µg/m^3. (It is an 'estimated' concentration because it was detected between the DL and LOQ; such samples are often 'J-flagged.') Per guidance found in TG 230 Section 3.4.4.4, such a rare, sporadic detection without any additional information to suggest that it occurs more often, should be assessed as a unique acute exposure event and not averaged out as part of a longer exposure period. Therefore, neither an acute nor chronic average PEPC for Acrolein is required by the TG 230 method.

For the dioxin-like compounds, unique methods are needed (see TG 230 Section 3.5.5). The acute assessment is based on the sum of the maximum concentrations of the detected dioxin-like compounds, summed without regard to toxicity equivalency factors (TEFs). The acute assessment does not use a 2,3,7,8-TCDD Toxic Equivalency (TEQ) concentration; this is used in the chronic assessment only.

5.2 Chronic PEPCs

The chronic average PEPCs should represent the average concentrations across the time period of interest, which in this case is the one year period covered by the data collection (Jan–Dec). As described above, the averages for acrolein and elemental mercury incorporate

surrogate values for non-detect samples. The chronic average PEPC is equal to the acute average PEPC because the exposure is continuous and is not a time-limited exposure event.

6. ACUTE RISK ASSESSMENT

Refer to TG 230 Section 3.4.5 for guidance.

6.1 Screen for Acute Hazards

Refer to TG 230 Section 3.4.5.1 and Worksheet G.3 for guidance to perform screen for acute hazards. Enter the results into the table below.

Chemical Name	Peak PEPC	Screening MEG		Result
Acrolein	2.6 µg/m^3	46 µg/m^3	14d NEG	Exclude
Elemental mercury	29.3 µg/m^3	10 µg/m^3	14d NEG	Retain
Dioxin-like compounds (total)*	0.000215 µg/m^3	1.5 µg/m^3	1h NEG	Exclude

* The total is the summation without regard to TEFs.

The peak PEPC for dioxin-like compounds (summed without regard to TEFs) was compared to the 1h Negligible MEG because 14d and 8h Negligible MEGs were not available.

6.2 Rank Acute Hazard Severity

Refer to TG 230 Section 3.4.5.2 for guidance. The peak and average PEPC across the selected exposure duration are used to select a hazard severity for each PEPC using Worksheet G.5 (airborne exposures) or Worksheet G.6 (water exposures).

Chemical Name	PEPC		Comparison MEG		Hazard Severity
Elemental mercury	Peak	29.3 µg/m^3	25 µg/m^3	8h NEG	Negligible
	Average	5.0 µg/m^3	10 µg/m^3	14d NEG	Negligible

Peak PEPC: The peak PEPC is greater than the 14d and 8h Negligible MEGs, but is less than the 1h Negligible MEG. Therefore, it is ranked at a Negligible severity level.

Average PEPC: The acute average PEPC is less than the 14d Negligible MEG, so it is ranked at a Negligible severity level.

CASE STUDY 3 — Acrolein, Dioxins, and Mercury Contamination in Air

6.3 Rank Acute Hazard Probability

Refer to TG 230 Section 3.4.5.3 for guidance. Assess the hazard probability for each PEPC using Worksheet G.5 (airborne exposures) or Worksheet G.6 (water exposures).

Acute Peak PEPC scoring for Elemental Mercury

Acute Peak PEPC		Hazard Probability Scoring					Hazard Probability
		Degree of exposure	Represent-ativeness of field data	Duration of exposure	Rate of exposure	Total Score	
Elemental mercury	29.3 µg/m^3	2	1	2	3	8	Occasional

The following text explains the rationale underlying the scoring.

- Factor 1 (Degree of exposure). The peak PEPC is above the 8h Negligible MEG and a 8h Marginal MEG is unavailable. Therefore, Method B is used to score this factor. This scores as a 2.

- Factor 2 (Representativeness of field data). We know from the exposure setting that the samples were collected close to the source of the emissions. Therefore, the exposure estimates are likely to be overestimates of true population exposures, which occur further downwind. This scores as a 1.

- Factor 3 (Duration of exposure). The field exposure duration for the peak PEPC is 24 hours and the MEG used to rank severity was an 8 hour MEG. This ratio 24:8 equals 3. This scores as a 2.

- Factor 4 (Rate of exposure). Since some heavy labor occurs at the base and this is the evaluation of the peak PEPC, a health-protective approach would be to rank this factor with a higher exposure rate (i.e., higher inhalation rate). This approach is reasonable to rank probability for peak exposures in order to capture high-end exposures. This scores as a 3.

Acute Average PEPC scoring for Elemental Mercury

Acute Average PEPC		Hazard Probability Scoring					Hazard Probability
		Degree of exposure	Represent-ativeness of field data	Duration of exposure	Rate of exposure	Total Score	
Elemental mercury	5.0 µg/m^3	1	1	1	2	5	Unlikely

The following text explains the rationale underlying the scoring.

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- Factor 1 (Degree of exposure). The average PEPC is less than the 14d Negligible MEG. Therefore, Method B is used to score this factor. This scores as a 1.

- Factor 2 (Representativeness of field data). We know from the exposure setting that the samples were collected close to the source of the emissions. Therefore, the exposure estimates are likely to be overestimates of true population exposures, which occur further downwind. This scores as a 1.

- Factor 3 (Duration of exposure). The field exposure duration for the average PEPC is 24 hours and the MEG used to rank severity was a 14 day MEG. This ratio 1:14 equals 0.07. This scores as a 1.

- Factor 4 (Rate of exposure). Since this is an acute assessment of a "typical" exposure day, a moderate exposure rate is assumed. This scores as a 2.

6.4 Estimate of Tactical Risk and Level of Confidence

Refer to TG 230 Section 3.4.5.4 for guidance. Use the risk assessment matrix in Table G-2 to combine the hazard severity and hazard probability selections to derive a Risk Level. Use the guidance in Worksheet G.8 to set levels of confidence.

Acute Hazard		Severity	Probability	Risk Level	Confidence
Elemental mercury	Peak	Negligible	Occasional	LOW	Medium
	Average	Negligible	Unlikely	LOW	Medium

Conclusion statement

Additional detail is provided in the overall Risk Characterization section at the end.

The acute mercury hazard poses a Low tactical risk.

Rationale for confidence levels

Consider all of the information at hand and communicate to the decision maker the level of confidence they have in the risk level being presented. Use the guidance in Worksheet G.8 to set levels of confidence.

Confidence in the risk level is medium because field data quality is representative through-out the year and likely overestimates exposures, estimates of field exposure are conservative, some activity pattern information is available, and the measured exposure levels are not expected to induce significant health outcomes.

CASE STUDY 3 — Acrolein, Dioxins, and Mercury Contamination in Air

7. CHRONIC RISK ASSESSMENT

Refer to TG 230 Section 3.4.6 for guidance.

7.1 Screen for Chronic Hazards

Refer to TG 230 Section 3.4.6.1. Screen for hazardous exposures that may lead to long term health effects. Use the chronic screening criteria described in Worksheet G.3 and enter the results in the table below.

Chemical Name	Chronic PEPC	1 Year Negligible MEG	Frequency of Detection	Result
Acrolein	Not applicable	0.14 µg/m^3	4 %	Exclude
Elemental mercury	5.0 µg/m^3	0.2 µg/m^3	68 %	Retain
Dioxin-like compounds (TEQ)*	0.00000556 µg/m^3	0.000112 µg/m^3	100 %	Exclude

* The TEQ is the summation incorporating the TEFs.

A chronic average PEPC is not calculated for Acrolein because it is detected too infrequently (see TG 230 Section 3.4.4.4). Even if there was a chronic PEPC, it would be screened out of the process because its frequency of detection is less than 5 percent.

7.2 Rank Chronic Hazard Severity

Refer to TG 230 Section 3.4.6.2 for guidance. The average PEPCs across the selected exposure duration are used to select a hazard severity for each PEPC using Worksheet G.7.

Chemical Name	Chronic PEPC	Comparison MEG		Hazard Severity
Elemental mercury	5.0 µg/m^3	0.2 µg/m^3	1yr NEG	Negligible*

* Note that a standard protocol for setting this severity levels is unavailable because there is no 1yr [Marginal] MEG (see TG 230 Figure 3-6). In these situations, it is recommended that USAPHC (Prov) be contacted in order to validate, or determine, the severity ranking.

The chronic average PEPC is greater than the 1yr Negligible MEG and there is no 1yr Marginal MEG available for mercury. The hazard severity determination for an exposure greater than the Negligible MEG (where a Marginal MEG is unavailable) needs to be site-specific and determined by a qualified subject matter expert.

Note: These exposure estimates require that USAPHC (Prov) subject matter experts, or other qualified medical/health professionals, be consulted in order to rank hazard severity.

USAPHC (Prov) Opinion for this Hypothetical Case Study:

The 1y Negligible MEG for elemental mercury is based on protection against systemic, non-cancer health effects. The underlying health criterion for the MEG is a subchronic reference concentration from the USEPA Health Effects Assessment Summary Tables. This can be determined by reviewing the record in RD 230 Table D-5. From this same table the adjusted ACGIH TLV is reported as 6.1 µg/m3, which is

adjusted to a continuous exposure period and a higher inhalation rate for the military (see RD 230 Section 4.3.2). This adjusted TLV is higher than the chronic PEPC, indicating that the hazard severity rank for this exposure should be no higher than Negligible.

7.3 Rank Chronic Hazard Probability

Refer to TG 230 Section 3.4.6.3 for guidance. Assess the hazard probability for each PEPC using Worksheet G.7

Chronic Average PEPC scoring for Elemental Mercury

Chronic Average PEPC		Hazard Probability Scoring					Hazard Probability
		Degree of exposure	Represent-ativeness of field data	Duration of exposure	Rate of exposure	Total Score	
Elemental mercury	5.0 µg/m^3	2	1	2	2	7	Seldom

The following text explains the rationale underlying the scoring.

- Factor 1 (Degree of exposure). Because the PEPC is higher than the highest 1y MEG, Method B is used to score this factor. This is scored as a 2.

- Factor 2 (Representativeness of field data). We know from the exposure setting that the samples were collected close to the source of the emissions. Therefore, the exposure estimates are likely to be overestimates of true population exposures, which occur further downwind. This is scored as a 1.

- Factor 3 (Duration of exposure). The field exposure duration for the chronic average PEPC is 1 year and the 1 year MEG is used to rank severity. This ratio equals 1. This is scored as a 2.

- Factor 4 (Rate of exposure). Since this is a chronic assessment of a "typical" exposure day, a moderate exposure rate is assumed. This scores as a 2.

7.4 Estimate of Lifecycle Risk and Level of Confidence

Refer to TG 230 Section 3.4.6.4. Use the risk assessment matrix in Table G-2 to combine the hazard severity and hazard probability selections to derive a Risk Level. Use the guidance in Worksheet G.8 to set levels of confidence.

HAZARD	Severity	Probability	Risk Level	Confidence
Elemental mercury	Negligible	Seldom	LOW	Medium

CASE STUDY 3 — Acrolein, Dioxins, and Mercury Contamination in Air

Conclusion statement
Additional detail is provided in the overall Risk Characterization section at the end.

The chronic mercury hazard poses a Low strategic risk.

Rationale for confidence levels
Consider all of the information at hand and communicate to the decision maker the level of confidence they have in the risk level being presented. Use the guidance in Worksheet G.8 to set levels of confidence.

Confidence in the risk level is medium because field data quality is representative through-out the year and likely overestimates exposures, estimates of field exposure are conservative, some activity pattern information is available, and the measured exposure levels are not expected to induce significant health outcomes.

8. RISK CHARACTERIZATION SUMMARY
Refer to TG 230 Section 3.4.7 and tables G-2 through G-6 for guidance.

8.1 Summary Table
The summary should present the risk level(s), associated anticipated impacts to the tactical and lifecycle missions, and the level of confidence associated with the assessments. Recommended actions should be presented.

OEH Hazard		Tactical Risk Estimate	Lifecycle Risk Estimate	Current Recommended Actions [*]
Media/ Source	**Chemical**	(acute effects)	(chronic effects)	
Ambient air impacted by local waste burning	**Elemental mercury**	**Low** Expected losses have little or no impact on accomplishing the mission. *Little to no in-theater medical resources anticipated for protection and treatment. However, a summary of any negative or low level sampling results should be documented and archived particularly if some personnel express concerns.* Confidence in the assessment is medium on a low-medium-high scale.	**Low *** No specific medical action required. *Documentation of environmental data in designated DoD archive.* Confidence in the assessment is medium on a low-medium-high scale.	Continue monitoring ambient air. Document data in designated DoD archive.

*These risk levels were estimated in consultation with USAPHC (Prov) subject matter experts.

CASE STUDY 3 — Acrolein, Dioxins, and Mercury Contamination in Air

8.2 Potential Health Effects

Refer to the tables in TG 230 Appendices B, C, D, and E. Additional information is also available in RD 230. This section should present the potential health effects that are relevant in the final assessments. When risk levels are Moderate or higher, the identification of potential health effects should be based on consultations with appropriately trained subject matter experts at USAPHC (Prov) or other such service organization.

Elemental mercury

- **Acute exposure**: Potential acute health effects are not expected.
- **Chronic exposure**: Potential chronic health effects are not expected.

8.3 Answers to Key Post-Risk Assessment Questions

Refer to Worksheet G.2. These questions should be considered when preparing a risk assessment. The case study answers provide teaching points.

- Has the risk assessment incorporated any of the unique considerations identified in TG 230 Section 3.5? The TG 230 Section 3.5 identifies one consideration that is relevant to this case study and it was addressed — the assessment of dioxin-like compounds.
- Is data quality adequate to base risk management decisions on the risk assessment? Yes, field data quality is somewhat representative through-out the year. The data quality is not ideal for assessing chronic hazard from potential long-term acrolein exposure because the detection limit for acrolein is higher than the MEG for acrolein. However, the data overall are adequate for making risk management decisions.
- Is it worth collecting additional data to increase the confidence in the risk assessment conclusion? Unless a laboratory methodology that would lower the detection limit for acrolein below the MEG can be used, additional types of data will not increase confidence in the risk assessment conclusion. Nonetheless, continued monitoring over time is recommended.
- Are there readily available exposure control measures that can be implemented? Administrative controls should be considered to reduce the exposure of personnel to ambient air when air quality is poorest (e.g., avoid physical training exercises when inversions develop.)

CASE STUDY 3 — Acrolein, Dioxins, and Mercury Contamination in Air

8.4 Bottom-line-up-front briefing statements (BLUF Statements)

Refer to TG 230 Section 4 for over-arching risk communication guidance. The following bullets should represent succinct case-study specific points that should be emphasized when communicating to stakeholders.

- This risk assessment evaluated the health risk associated with exposure to ambient air impacted by emissions from the local waste burning activities occurring just off-post.
- Acrolein, mercury, and dioxin-like compounds were detected in the air. However, only the levels of elemental mercury could pose a health hazard to the base camp population.
- The predicted population exposures at this base camp are unlikely to lead to health effects in the population at risk.
- The airborne elemental mercury poses a LOW RISK. The confidence in the assessment is medium, but additional analysis is unlikely to increase confidence. Due to analytical limitations, there is some uncertainty whether acrolein exposure is continuous or rare and sporadic.

CASE STUDY 3 — Acrolein, Dioxins, and Mercury Contamination in Air

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CASE STUDY 3

Acrolein, Dioxins, and Mercury Contamination in Air

ANNEX

Congener-Specific Data for Detected Dioxin-like Compounds (1 of 2)

Date	1,2,3,4,6,7,8-HeptaCDD	1,2,3,4,6,7,8-HeptaCDF	1,2,3,4,7,8,9-HeptaCDF	1,2,3,4,7,8-HexaCDD	1,2,3,4,7,8-HexaCDF	1,2,3,6,7,8-HexaCDD	1,2,3,6,7,8-HexaCDF	1,2,3,7,8,9-HexaCDD	1,2,3,7,8,9-HexaCDF
Jan 2	1.36E-06	1.87E-06	1.78E-06	1.10E-05	6.14E-05	2.41E-05	5.35E-06	3.23E-06	ND
Jan 18	2.85E-06	4.41E-06	8.81E-07	2.33E-07	3.89E-07	6.12E-07	1.57E-06	7.31E-07	ND
Jan 28	2.94E-07	4.05E-07	5.93E-07	2.58E-07	3.34E-07	6.07E-07	1.36E-06	7.10E-07	ND
Feb 8	4.36E-07	5.32E-07	5.53E-07	3.22E-07	4.53E-07	8.03E-07	1.52E-06	1.00E-06	ND
Feb 9	3.09E-07	4.54E-07	5.42E-07	2.60E-07	3.63E-07	4.75E-07	1.44E-06	7.09E-07	ND
Feb 28	5.26E-07	7.06E-07	8.05E-07	3.74E-05	6.08E-07	1.13E-06	2.33E-06	1.32E-06	ND
Mar 2	5.51E-07	1.05E-06	1.17E-06	4.89E-07	8.36E-07	1.22E-06	2.65E-06	1.18E-06	ND
Mar 20	2.35E-06	6.26E-07	5.17E-07	1.43E-06	4.54E-07	3.91E-07	1.82E-06	6.00E-07	ND
Apr 1	3.39E-07	7.72E-07	9.29E-07	3.35E-07	5.93E-07	5.63E-07	2.19E-06	8.73E-07	ND
Apr 19	2.34E-06	2.81E-06	4.46E-06	1.60E-06	2.56E-06	4.23E-06	1.02E-05	6.69E-06	ND
May 2	4.37E-07	4.88E-07	9.52E-07	3.23E-06	5.11E-07	9.35E-07	2.16E-06	1.25E-06	2.57E-08
May 13	1.35E-06	2.13E-07	4.52E-07	1.83E-07	1.80E-07	2.50E-07	9.78E-07	3.33E-07	ND
Jun 1	4.54E-07	5.27E-07	1.03E-06	3.55E-07	4.81E-07	1.25E-06	9.78E-07	1.15E-06	ND
Jun16	2.74E-07	2.78E-07	6.22E-07	1.63E-07	2.45E-07	6.49E-07	1.05E-06	7.03E-07	2.13E-08
Jun 30	2.62E-07	2.66E-07	5.43E-07	2.69E-07	2.53E-07	5.83E-07	1.18E-06	7.04E-07	1.71E-08
Jul 7	9.25E-08	1.11E-07	ND	ND	8.02E-08	ND	3.61E-07	ND	ND
Jul 23	4.98E-07	5.64E-07	ND	5.64E-07	6.67E-07	1.15E-06	2.95E-06	1.64E-06	ND
Aug 8	1.45E-06	1.64E-06	ND	1.76E-06	1.55E-06	3.86E-06	5.40E-06	5.60E-06	6.12E-08
Aug 23	2.66E-06	2.25E-06	2.68E-06	2.66E-06	2.08E-06	4.80E-06	9.77E-06	7.08E-06	1.37E-07
Oct 3	2.08E-07	1.48E-07	1.62E-06	2.71E-07	4.61E-08	3.14E-07	ND	4.61E-07	ND
Nov 16	2.02E-07	2.04E-07	3.14E-07	1.91E-07	2.16E-07	4.11E-07	1.04E-06	5.82E-07	1.13E-08
Nov 24	2.67E-07	2.20E-07	3.80E-07	2.52E-07	1.86E-07	5.11E-07	7.15E-07	6.97E-07	5.70E-09
Dec 6	4.24E-08	8.20E-08	2.34E-07	4.92E-06	6.18E-08	7.96E-08	2.62E-07	1.08E-07	6.01E-09
Dec 13	6.79E-06	8.26E-06	9.48E-06	7.42E-06	8.05E-06	1.55E-05	2.66E-05	2.61E-05	ND
Dec 25	6.10E-08	1.33E-07	1.93E-07	4.46E-08	8.79E-08	1.11E-07	3.66E-07	1.36E-07	ND
Minimum	4.24E-08	8.20E-08	ND	ND	4.61E-08	ND	ND	ND	ND
Maximum	6.79E-06	8.26E-06	9.48E-06	1.10E-05	6.14E-05	2.41E-05	2.66E-05	2.61E-05	1.37E-07
Average*	1.06E-06	1.16E-06	1.24E-06	3.03E-06	3.31E-06	2.59E-06	3.37E-06	2.55E-06	7.94E-08
Count	25	25	25	25	25	25	25	25	25
Units	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3
Detect. limit	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Limit of Quant.	2.00E-07	2.00E-07	2.00E-07	2.00E-07	2.00E-07	2.00E-07	2.00E-07	2.00E-07	2.00E-07
Detect. Freq.	100%	100%	88%	96%	100%	96%	96%	96%	32%
Sample Time	24h	24h	24h	24h	24h	24h	24h	24h	24h

* This average was calculated using ½ LOQ for the non-detect (ND) results.

CASE STUDY 3

Acrolein, Dioxins, and Mercury Contamination in Air

Congener-Specific Data for Detected Dioxin-like Compounds (2 of 2)

Date	1,2,3,7,8-PentaCDD	1,2,3,7,8-PentaCDF	2,3,4,6,7,8-HexaCDF	2,3,4,7,8-PentaCDF	2,3,7,8-TetraCDD	2,3,7,8-TetraCDF	OctaCDD	OctaCDF
Jan 2	1.46E-06	1.31E-06	5.42E-06	5.24E-07	4.32E-06	8.18E-05	9.41E-06	4.70E-07
Jan 18	3.42E-07	1.02E-07	1.44E-06	1.83E-07	1.06E-07	ND	3.29E-07	2.31E-07
Jan 28	3.36E-07	9.12E-08	1.15E-06	1.43E-07	1.17E-07	4.76E-07	3.83E-07	1.64E-07
Feb 8	6.80E-07	1.13E-07	2.08E-06	2.03E-07	1.82E-07	1.11E-06	4.60E-07	2.18E-07
Feb 9	2.92E-07	1.14E-07	1.44E-06	1.66E-07	1.25E-07	8.41E-07	3.38E-07	2.35E-07
Feb 28	7.81E-07	1.15E-07	2.69E-06	2.87E-07	2.25E-07	1.42E-06	6.08E-07	2.83E-07
Mar 2	5.84E-07	2.74E-07	2.81E-06	3.38E-07	2.22E-07	2.53E-06	6.95E-07	5.02E-07
Mar 20	3.71E-07	1.26E-07	1.85E-06	2.23E-07	1.00E-07	7.42E-07	4.01E-07	3.78E-07
Apr 1	4.18E-07	1.55E-07	2.52E-05	2.66E-07	1.30E-07	1.39E-06	6.08E-07	4.78E-07
Apr 19	3.18E-06	1.07E-06	8.96E-05	1.25E-06	1.22E-06	5.79E-06	2.25E-06	9.19E-07
May 2	3.83E-07	9.42E-08	1.85E-05	3.00E-07	1.80E-07	1.70E-06	4.71E-07	1.74E-07
May 13	ND	5.42E-08	6.72E-06	1.28E-07	ND	7.38E-07	3.19E-07	1.11E-07
Jun 1	4.81E-07	1.21E-07	1.71E-05	2.61E-07	1.02E-07	8.91E-07	6.30E-07	3.09E-07
Jun16	3.36E-07	8.88E-08	7.09E-06	1.45E-07	ND	4.07E-07	4.71E-07	2.21E-07
Jun 30	1.79E-07	7.41E-08	7.21E-06	1.42E-07	ND	6.98E-07	3.69E-07	2.27E-07
Jul 7	ND	1.90E-08	4.30E-07	2.97E-08	ND	ND	1.28E-07	7.36E-08
Jul 23	8.85E-07	3.67E-07	2.75E-06	4.24E-07	2.23E-07	2.23E-06	5.09E-07	ND
Aug 8	2.45E-06	5.91E-07	5.74E-06	8.06E-07	6.53E-06	4.24E-06	1.21E-06	4.34E-07
Aug 23	2.61E-06	1.42E-06	6.63E-06	1.48E-06	8.63E-06	9.53E-06	2.72E-06	6.08E-07
Oct 3	ND	ND	4.97E-07	ND	7.53E-07	ND	8.01E-07	7.27E-07
Nov 16	3.49E-07	1.43E-07	8.06E-07	1.63E-07	1.10E-06	8.58E-06	2.78E-06	8.12E-08
Nov 24	2.87E-07	6.71E-08	7.79E-07	1.12E-07	9.50E-07	5.33E-06	4.21E-06	1.20E-07
Dec 6	ND	2.05E-08	2.35E-07	3.34E-08	6.01E-08	2.01E-07	9.57E-08	7.21E-08
Dec 13	1.02E-05	1.94E-06	3.31E-05	3.34E-06	6.65E-06	1.71E-05	5.77E-06	3.16E-06
Dec 25	ND	3.17E-08	3.45E-07	4.13E-08	5.70E-08	ND	1.19E-07	8.22E-08
Minimum	ND	ND	2.35E-07	ND	ND	ND	9.57E-08	ND
Maximum	1.02E-05	1.94E-06	3.31E-05	3.34E-06	6.65E-06	8.18E-05	9.41E-06	3.16E-06
Average*	1.08E-06	3.44E-07	9.66E-06	4.44E-07	1.30E-06	5.93E-06	1.44E-06	4.15E-07
Count	25	25	25	25	25	25	25	25
Units	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$
Detect. limit	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Limit of Quant.	2.00E-07	2.00E-07	2.00E-07	2.00E-07	2.00E-07	2.00E-07	2.00E-07	2.00E-07
Detect. Freq.	80%	96%	100%	96%	84%	84%	100%	96%
Sample Time	24h	24h	24h	24h	24h	24h	24h	24h

* This average was calculated using ½ LOQ for the non-detect (ND) results.

CASE STUDY 4 — Methylene Chloride and Ethylbenzene Contamination in Water

Teaching Points

- Demonstrates the basic drinking water risk assessment process.
- Handles non-detect analytical results.
- Performs a forward-looking chronic assessment based on data collected to-date.
- Involves organic compounds and a potential contamination source concern.

1. BACKGROUND

This is a hypothetical case study designed to illustrate the TG 230 risk assessment process. The military population assigned to base camp Alpha in South America is drinking treated well water. The treated well water has been used at the camp since August 2007 and will likely continue for 15 months, until October 2008. A water source sanitation survey concluded that the ground water source was adequate and that potential sources of pollution and evidence of contamination was not found prior to use of the water. The water is treated by a reverse osmosis water purification unit (ROWPU) and PVNTMED personnel have certified that the ROWPU-generated water is potable in accordance with the Tri-Service Field Water Standards and other requirements found in TB MED 577 (December 2005). Follow-on water inspections have occurred monthly since August 2007.

2. DEFINE THE PURPOSE OF THE RISK ASSESSMENT

Refer to TG 230 Section 3.4.1 for guidance. Appendix G provides a process flow-chart.

The PVNTMED unit supporting base camp Alpha routinely collects samples of the treated well water and submits them to a CONUS laboratory for analysis. Methylene Chloride and Ethylbenzene were detected in the samples, so you have been asked to determine any health risks to personnel based on this sampling data. The purpose of this risk assessment is to provide information to the commander of the base camp on the risk to personnel assigned to base camp Alpha based on the collected samples. It is now January 2008 and the time period of interest is one deployment cycle, the 15 months from August 2007–October 2008.

3. COLLECT DATA AND DESCRIBE EXPOSURE SETTING

Refer to TG 230 Section 3.4.2 for guidance.

3.1 Data Sampling Summary

Include a description of who collected the data and how data were collected (i.e. sampling method).

The drinking water was sampled on six different occasions by local PVNTMED technicians using standard sampling procedures. Water samples were submitted to supporting Army Medical Laboratories for analysis. All collected water data meet the TB MED 577 water quality standards.

CASE STUDY 4 — Methylene Chloride and Ethylbenzene Contamination in Water

3.2 Available sampling data and statistics

Sample Date	Methylene Chloride mg/L	Ethylbenzene mg/L
08-10-2007	0.21	0.3
09-12-2007	0.12	ND
10-01-2007	0.72	0.5
11-03-2007	0.62	ND
12-03-2007	0.27	0.01
12-27-2007	0.31	2.0
Minimum	0.12	ND
Maximum	0.72	2.0
Count	6	4
Detection Limit	0.05	0.0001
Limit of Quantitation	0.1	0.0005
Detection Frequency	100%	66%
Sample Time	Grab	Grab

3.3 MEG Tables

Methylene Chloride (75-09-2) in Drinking Water (mg/L)

	7 day	14 day	1 yr
NEG 15L/day	4.67	0.933	0.28
NEG 5 L/day	1.4	2.8	0.84

Ethylbenzene (100-41-4) in Drinking Water (mg/L)

	7 day	14 day	1 yr
NEG 15L/day	14	1.4	0.7
NEG 5 L/day	42	4.2	1.4

3.4 Chemical information

Provide general information about the chemical(s) and the general source(s) in the environment.

Methylene chloride: The Agency for Toxic Substances and Disease Registry (ATSDR) has a publically available ToxFAQ™ and Toxicological Profile for this chemical. What follows is general information obtained from these sources.

Methylene chloride is a colorless liquid with a mild, sweet odor. Another name for it is **dichloromethane**. Methylene chloride does not occur naturally in the environment. Methylene chloride is used as an industrial solvent and as a paint stripper. It may also be

found in some aerosol and pesticide products and is used in the manufacture of photographic film. Exposure to methylene chloride occurs mostly from breathing contaminated air, but may also occur through skin contact or by drinking contaminated water. Methylene chloride does not easily dissolve in water, but small amounts may be found in drinking water. If you breathe in large amounts of methylene chloride you may feel unsteady, dizzy, and have nausea and a tingling or numbness of your finger and toes. A person breathing smaller amounts of methylene chloride may become less attentive and less accurate in tasks requiring hand-eye coordination. Skin contact with methylene chloride causes burning and redness of the skin. The EPA has determined that methylene chloride is a probable cancer-causing agent in humans.

Ethylbenzene: The Agency for Toxic Substances and Disease Registry (ATSDR) has a publically available ToxFAQ™ and Toxicological Profile for this chemical. What follows is general information obtained from these sources.

Ethylbenzene is a colorless liquid found in a number of products including gasoline and paints. It is naturally found in coal tar and petroleum and is also found in manufactured products such as inks, pesticides, and paints. Ethylbenzene can move through soil into groundwater. Ethylbenzene is not often found in drinking water. Higher levels may be found in residential drinking water wells near landfills, waste sites, or leaking underground fuel storage tanks. Breathing very high levels can cause dizziness and throat and eye irritation. Breathing lower levels has resulted in hearing effects and kidney damage in animals. The International Agency for Research on Cancer (IARC) has determined that ethylbenzene is a possible human carcinogen.

3.5 Describe the Exposure Setting

Refer to TG 230 Section 3.4.2 for guidance. The description should answer as many of the pre-assessment key questions from Worksheet G.2 as possible. If an answer is unavailable, then indicate that information is missing.

- What is the population at risk?
- What is the timeframe under consideration?
- What is the exposure event or ambient environmental condition under consideration?
- What is known about the source of the chemicals?
- What are the exposure pathways?
- What else is known about the exposure setting?
- What are the activity patterns of the population at risk?
- Where are the sampling locations relative to where exposure occurs?
- Is there adequate data quality to conduct a chronic assessment?

The population at risk is the entire population of Base Camp Alpha during a 15-month deployment from August 2007 through October 2008. The potential hazards being assessed are from the chemicals found in the drinking water supply (treated well water), so ingestion is the primary exposure route of concern. Personnel on base are involved in heavy physical labor, digging defensive positions, carrying and lifting of heavy loads, and foot patrols through marsh/swamp land. Drinking rates average around 8L/day per individual for the camp.

CASE STUDY 4 — Methylene Chloride and Ethylbenzene Contamination in Water

The camp is located near a river in South America downstream from a large agricultural area. On the other side of the riverbank is an oil refining/chemical complex owned and operated by the host country. It is assumed that the Ethylbenzene originated from activities at a recently discovered local garage and paint shop. The source of the Methylene chloride may be from the same shop or from activities related to the oil refining/chemical complex.

The six samples appear to provide enough data for a chronic risk assessment; the samples cover about five months and the water source is ground water, which is typically less variable than surface water sources. While there may be reason to believe that Ethylbenzene levels are not yet well characterized (see the high hit in December), this knowledge can be incorporated into the assessment.

4. PRESCREEN

Refer to TG 230 Section 3.4.3 and Worksheet G.3 for guidance. Enter the results into the table below.

Chemical Name	Maximum Sample Concentration	1 Year 15L/d Negligible MEG	Result
Methylene chloride	0.72 mg/L	0.28 mg/L	Retain as a hazard
Ethylbenzene	2.0 mg/L	0.7 mg/L	Retain as a hazard

5. GENERATE THE RISK ASSESSMENT DATA SET

Refer to TG 230 Section 3.4.4 and Worksheet G.4 for guidance. Enter the results into the table below.

Chemical Name	Acute Exposure		Chronic Exposure
	Peak PEPC	Average PEPC	Average PEPC
Methylene chloride	0.72 mg/L	0.38 mg/L	0.38 mg/L
Ethylbenzene	2.0 mg/L	0.47 mg/L	0.47 mg/L

5.1 Acute PEPCs

The acute peak PEPC is the highest sample concentration for both chemicals. The acute average PEPC for Methylene chloride is the arithmetic average of all the sample concentrations. However, the average PEPC for Ethylbenzene incorporates samples with non-detects. To calculate this average, the samples with non-detects were set equal to ½ the Limit of Quantitation (LOQ) for the purposes of calculating the average.

5.2 Chronic PEPCs

The chronic average PEPC is an estimate of the average concentration across the duration of use of the water source, which for this scenerio is 15 months. However, the calculated averages from the data set are based on data collected over approximately 6 months and there

are 10 future months that have yet to pass. For the purposes of conducting a chronic assessment right now, it must be assumed that the calculated averages are reasonable estimates of what the 15-month average will be. While a water source sanitation survey concluded that the ground water source was adequate and free of significant pollution, there was a high hit of Ethylbenzene at the last sampling event at the end of December 2007. There may or may not be a new source contributing to the mass of Ethylbenzene in the water. In order to move forward, it was assumed that the calculated averages are fairly good approximations of expected chronic exposure. The variability in the Ethylbenzene concentrations can be incorporated into the assessment later, when hazard probability is ranked. Note that the calculated chronic average PEPC for Ethylbenzene incorporated results less than the LOQ, just as in the calculation of the acute average PEPC.

6. ACUTE RISK ASSESSMENT

Refer to TG 230 Section 3.4.5 for guidance.

6.1 Screen for Acute Hazards

Refer to TG 230 Section 3.4.5.1 and Worksheet G.3 for guidance to perform screen for acute hazards. Enter the results into the table below.

Chemical Name	Peak PEPC	Screening MEG		Result
Methylene chloride	0.72 mg/L	0.933 mg/L	14d 15L/d NEG	Exclude as an acute hazard
Ethylbenzene	2.0 mg/L	1.4 mg/L	14d 15L/d NEG	Retain as an acute hazard

6.2 Rank Acute Hazard Severity

Refer to TG 230 Section 3.4.5.2 for guidance. The peak and average PEPC across the selected exposure duration are used to select a hazard severity for each PEPC using Worksheet G.5 (airborne exposures) or Worksheet G.6 (water exposures).

Chemical Name	PEPC		Comparison MEG		Hazard Severity
Ethylbenzene	Peak	2.0 mg/L	4.2 mg/L	14d 5L/d NEG	Negligible
	Average	0.47 mg/L	4.2 mg/L	14d 5L/d NEG	Negligible

Based on the duration of use of the water—longer than 14 days, the 14-day water MEGs are the appropriate short-term MEGs for comparison purposes. Based on the estimated consumption rate in the field of about 8L/day, the 5L/day MEGs are the most appropriate to use (see the appropriate severity ranking chart). The severity ranking chart recommends a Negligible severity rank when a PEPC is less than the 14d Negligible MEG.

CASE STUDY 4 — Methylene Chloride and Ethylbenzene Contamination in Water

6.3 Rank Acute Hazard Probability

Refer to TG 230 Section 3.4.5.3 for guidance. Assess the hazard probability for each PEPC using Worksheet G.5 (airborne exposures) or Worksheet G.6 (water exposures).

Acute Peak PEPC scoring for Ethylbenzene

Acute Peak PEPC		Hazard Probability Scoring					Hazard Probability
		Degree of exposure	Represent-ativeness of field data	Duration of exposure	Rate of exposure	Total Score	
Ethylbenzene	2.0 mg/L	1	2	2	3	8	Occasional

The following text explains the rationale underlying the scoring.

- Factor 1 (Degree of exposure). The acute PEPC is actually lower than the comparison MEG used to rank severity, which is the 14d, 5L/d Negligible MEG of 4.2 mg/L. Method B is used because the PEPC is less than the MEG. This scores as a 1.

- Factor 2 (Representativeness of field data). All analytical results appear to be valid. There is no specific information mentioned that would cause us to believe that the samples over or underestimate exposure. The one peak sample did occur at the end of the sampling period, which could indicate that the Ethylbenzene levels are increasing. This means the true peak could be much higher and these samples underestimate that, or it could simply be a single elevated result. Without further data however this factor should be scored as a 2.

- Factor 3 (Duration of exposure). The duration of exposure to an acute peak water PEPC based on grab samples can be fairly undefined. In this scenario, personnel use this water supply for 15 months. However, concentrations can change over time as water quality varies. It is assumed that a sample represents the condition of the water supply until another sample is collected and shows different results. We can see from the samples collected about once per month over a 6-month period that the concentration of ethylbenzene changed at least every month (we are not able to tell if it changed more frequently). Therefore, it is assumed that the population exposure duration for the peak PEPC is 30 days. The exposure duration associated with the comparison short-term MEG is 14 days. The ratio is 30/14, which is about 2.1. This scores as a 2.

- Factor 4 (Rate of exposure). A 5L/d MEG is used and the water is consumed at an estimated rate of 8L/day. This scores as a 3.

CASE STUDY 4 — Methylene Chloride and Ethylbenzene Contamination in Water

Acute Average PEPC scoring for Ethylbenzene

Acute Average PEPC		Hazard Probability Scoring					Hazard Probability
		Degree of exposure	Represent-ativeness of field data	Duration of exposure	Rate of exposure	Total Score	
Ethylbenzene	0.47 mg/L	1	2	2	3	8	Occasional

The following text explains the rationale underlying the scoring.

- Factor 1 (Degree of exposure). The average PEPC is actually lower than the comparison MEG used to rank severity, which is the 14d, 5L/d Negligible MEG of 4.2 mg/L. Method B is used because the PEPC is less than the MEG. This is scored as a 1.

- Factor 2 (Representativeness of field data). The six samples were collected from August 2007 to October 2008. All analytical results appear to be valid. There is reason to believe that Ethylbenzene levels are not yet well characterized due to the relatively high concentration in the sample collected on 27 December 2007. It is not known whether the average acute PEPC calculated from the data from these 6 months will overestimate or underestimate (in other words, would measured concentrations of Ethylbenzene in the remaining 9 months of the 15-month time period cause the average acute PEPC to be significantly higher or lower) the average acute PEPC for the entire 15-month period. This is scored as a 2.

- Factor 3 (Duration of exposure). The duration of exposure in the field for an acute average water PEPC based on grab samples can be fairly undefined. As described in the acute peak PEPC assessment, each sample in the data set represents about a month. Therefore, it is assumed that the population exposure duration for the acute average PEPC is 30 days. The exposure duration associated with the comparison short-term MEG is 14 days. The ratio is 30/14, which is about 2.1. This scores as a 2.

- Factor 4 (Rate of exposure). A 5L/d MEG is used and the water is consumed at an estimated rate of 8L/day. This scores as a 3.

CASE STUDY 4 — Methylene Chloride and Ethylbenzene Contamination in Water

6.4 Estimate of Tactical Risk and Level of Confidence

Refer to TG 230 Section 3.4.5.4 for guidance. Use the risk assessment matrix in Table G-2 to combine the hazard severity and hazard probability selections to derive a Risk Level. Use the guidance in Worksheet G.8 to set levels of confidence.

Acute Hazard		Severity	Probability	Risk Level	Confidence
Ethylbenzene	Peak	Negligible	Occasional	LOW	High
	Average	Negligible	Occasional	LOW	High

Conclusion statement

Additional detail is provided in the overall Risk Characterization section at the end.

Based on current data, use of this ROWPU-treated well water for drinking water at the base camp poses a Low tactical risk.

Rationale for confidence levels

Consider all of the information at hand and communicate to the decision maker the level of confidence they have in the risk level being presented. Use the guidance in Worksheet G.8 to set levels of confidence.

The confidence in the acute risk estimates is high. The 6 months are relatively well characterized, and since the peak acute PEPC is below the 14-day 5 L/day MEG, there is high confidence that the risk is LOW for those 6 months. Little variability in water quality is expected since the source water is from a well and it is assumed the ROWPU is properly maintained and operated. This assessment is based on the best available data, however, the assessment is based on 6 consecutive months of data for a 15-month deployment and there is no way to know what might impact the water supply in the remaining 9 months of the deployment and how it would ultimately effect the risk.

7. CHRONIC RISK ASSESSMENT

Refer to TG 230 Section 3.4.6 for guidance.

7.1 Screen for Chronic Hazards

Refer to TG 230 Section 3.4.6.1. Screen for hazardous exposures that may lead to long term health effects. Use the chronic screening criteria described in Worksheet G.3 and enter the results in the table below.

Chemical Name	Chronic PEPC	1 Year 15L/d Negligible MEG	Frequency of Detection	Result
Methylene chloride	0.38 mg/L	0.28 mg/L	100 %	Retain as a hazard
Ethylbenzene	0.47 mg/L	0.7 mg/L	66 %	Exclude as a hazard

For both chemicals the detection frequency is greater than 5%, however only the PEPC for Methylene chloride is greater than the 1 year 15L/day Negligible MEG.

CASE STUDY 4 — Methylene Chloride and Ethylbenzene Contamination in Water

7.2 Rank Chronic Hazard Severity

Refer to TG 230 Section 3.4.6.2 for guidance. The average PEPCs across the selected exposure duration are used to select a hazard severity for each PEPC using Worksheet G.7.

Chemical Name	Chronic PEPC	Comparison MEG		Hazard Severity
Methylene chloride	0.38 mg/L	0.84 mg/L	1yr 5L/d NEG	Negligible

Based on the estimated field consumption rate of 8L/day, the most appropriate MEGs are the 5L/day MEGs. The ranking chart indicates that the hazard should be ranked at the Negligible severity level when the PEPC is less than the Negligible MEG.

7.3 Rank Chronic Hazard Probability

Refer to TG 230 Section 3.4.6.3 for guidance. Assess the hazard probability for each PEPC using Worksheet G.7

Chronic Average PEPC scoring for Methylene chloride

Chronic Average PEPC		Hazard Probability Scoring					Hazard Probability
		Degree of exposure	Represent-ativeness of field data	Duration of exposure	Rate of exposure	Total Score	
Methylene chloride	0.38 mg/L	1	2	2	3	8	Occasional

The following text explains the rationale underlying the scoring.

- Factor 1 (Degree of exposure). The average PEPC is actually lower than the comparison MEG used to rank severity, which is the 1yr, 5L/d Negligible MEG of 0.84 mg/L. Method B is used. Since the PEPC is actually less than the MEG it scores as a 1.

- Factor 2 (Representativeness of field data). The six samples were collected from August 2007 to October 2008. All analytical results appear to be valid. There is reason to believe that Ethylbenzene levels are not yet well characterized due to the relatively high concentration in the sample collected on 27 December 2007. As these six samples represent a 6 month time period the concentrations of chemicals in the water for the remaining 9 months of the deployment remain unknown. Without further information these six samples must be assumed to be representative of the chemical concentrations in the water for the entire 15 month deployment duration for the chronic assessment. There is no reason to believe these results are biased high or low, therefore, this scores as a 2.

- Factor 3 (Duration of exposure). For a chronic assessment the PEPC should be selected that best represents the average concentration across the exposure period. For this assessment the exposure period is equal to the deployment length (15 months). The chronic average PEPC is an estimate of the average concentration across the duration of

use of the water source, which for this scenerio is 15 months. The MEG is based on an exposure duration of 12 months. The ratio is 1.25, which scores as a 2.

- Factor 4 (Rate of exposure). A 5L/d MEG is used and the water is consumed at an estimated rate of 8L/day. This scores as a 3.

7.4 Estimate of Lifecycle Risk and Level of Confidence

Refer to TG 230 Section 3.4.6.4. Use the risk assessment matrix in Table G-2 to combine the hazard severity and hazard probability selections to derive a Risk Level. Use the guidance in Worksheet G.8 to set levels of confidence.

HAZARD	Severity	Probability	Risk Level	Confidence
Methylene chloride	Negligible	Occasional	LOW	High

Conclusion statement

Additional detail is provided in the overall Risk Characterization section at the end.

Based on current data, use of this ROWPU-treated well water for drinking water at the base camp poses a Low lifecycle risk.

Rationale for confidence level

Consider all of the information at hand and communicate to the decision maker the level of confidence they have in the risk level being presented. Use the guidance in Worksheet G.8 to set levels of confidence.

The confidence in the risk estimate is high. The 6 months are relatively well characterized, and since the peak acute PEPC is below the 14-day 5 L/day MEG, there is high confidence that the risk is LOW for those 6 months. Little variability in water quality is expected since the source water is from a well and it is assumed the ROWPU is properly maintained and operated. This assessment is based on the best available data, however, the assessment is based on 6 consecutive months of data for a 15-month deployment and there is no way to know what might impact the water supply in the remaining 9 months of the deployment and how it would ultimately effect the risk.

CASE STUDY 4 — Methylene Chloride and Ethylbenzene Contamination in Water

8. RISK CHARACTERIZATION SUMMARY

Refer to TG 230 Section 3.4.7 and tables G-2 through G-6 for guidance.

8.1 Summary Table

The summary should present the risk level(s), associated anticipated impacts to the tactical and lifecycle missions, and the level of confidence associated with the assessments. Recommended actions should be presented.

OEH Hazard		Tactical Risk Estimate	Lifecycle Risk Estimate	Current Recommended Actions
Media/ Source	**Chemical**	(acute effects)	(chronic effects)	
ROWPU-treated Well Water used as a Drinking Water Source	**Methylene chloride**	**No tactical risk**	**Low** No specific medical action required. *Documentation of environmental data in designated DoD archive.* Confidence in the assessment is high on a low-medium-high scale.	Continue routine monitoring Document data in designated DoD archive.
	Ethyl-benzene	**Low** Expected losses have little or no impact on accomplishing the mission. *Little to no in-theater medical resources anticipated for protection and treatment. However, a summary of any negative or low level sampling results should be documented and archived particularly if some personnel express concerns.* Confidence in the assessment is high on a low-medium-high scale.	**No lifecycle risk**	Continue routine monitoring. If additional high hits are found, then re-assess the risk and search for the source of the chemical. Document data in designated DoD archive.

8.2 Potential Health Effects

Refer to the tables in TG 230 Appendices B, C, D, and E. Additional information is also available in RD 230. This section should present the potential health effects that are relevant in the final assessments. When risk levels are Moderate or higher, the identification of potential health effects should be based on consultations with appropriately trained subject matter experts at USAPHC (Prov) or other such service organization.

Methylene chloride

- **Chronic exposure**: Based on current data, no acute health effects are expected.

CASE STUDY 4 — Methylene Chloride and Ethylbenzene Contamination in Water

Ethylbenzene

- **Acute exposure**: Based on current data, no acute health effects are expected.

8.3 Answers to Key Post-Risk Assessment Questions

Refer to Worksheet G.2. These questions should be considered when preparing a risk assessment. The case study answers provide teaching points.

- Has the risk assessment incorporated any of the unique considerations identified in TG 230 Section 3.5? There are no unique considerations in TG-230 section 3.5 that apply to this assessment.

- Is data quality adequate to base risk management decisions on the risk assessment? Yes. There is almost six months worth of data and the water source is ground water, which is typically less variable than surface water sources. All analytical results appear to be valid. There may be reason to believe that the time-concentration profile for Ethylbenzene is not yet well characterized due to the high hit in December. However, since there are several months of data and the high hit is very recent, there is adequate data to make decisions now.

- Is it worth collecting additional data to increase the confidence in the risk assessment conclusion? Yes, drinking water sources must be monitored monthly according to TB MED 577 and additional data is needed to determine if concentrations of Ethylbenzene are increasing or if the high hit in December was a minor deviation from the average concentrations found in the ground water. It would be useful to determine the source of these organics in the ground water, especially if monitoring results indicate that concentrations are increasing over time.

- Are there readily available exposure control measures that can be implemented? As both of these chemicals are volatile organics, air stripping towers and carbon filters should reduce the amount of each in the water supply. Methylene chloride has a high vapor pressure so air stripping towers should be effective, while carbon filtration would be a better choice for Ethylbenzene because of its low solubility in water. Carbon filtration would also work well for Methylene chloride.

8.4 Bottom-line-up-front briefing statements (BLUF Statements)

Refer to TG 230 Section 4 for over-arching risk communication guidance. The following bullets should represent succinct case-study specific points that should be emphasized when communicating to stakeholders.

- This assessment evaluated chemicals contained in the drinking water supply, which is ROWPU-treated well water.

- Methylene chloride and Ethylbenzene were detected in the treated water during nearly six months of sampling. Both organic compounds may be coming from the same source.

CASE STUDY 4 — Methylene Chloride and Ethylbenzene Contamination in Water

Methylene chloride is used as an industrial solvent and paint stripper, and is found in some aerosol and pesticide products. Ethylbenzene is naturally found in coal tar and petroleum, and is also found in gasoline, paints, inks, and pesticides.

- Ethylbenzene poses a potential acute health hazard, but at the detected concentrations, the risk due to acute health effects is LOW. Confidence in this assessment is high.

- Methylene chloride poses a potential chronic health hazard, but at the detected concentrations, there is a low risk that follow-on medical monitoring or treatment will be necessary for personnel after the deployment. TG 230 defines this as a LOW LIFECYCLE RISK. Confidence in this assessment is high.

- Continued, routine monitoring of the treated water quality is encouraged. Special attention should be paid to the results for organic compounds to see if concentrations increase over time. If so, the risk assessment should be re-evaluated.

CASE STUDY 4 — Methylene Chloride and Ethylbenzene Contamination in Water

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CASE STUDY 5 — Arsenic Contamination in Drinking Water from Different Water Sources

Teaching Points

- Illustrates a risk assessment of two different sources of drinking water for a population.
- Involves a chemical with MEGs and TB MED 577 standards.
- Performs a risk assessment for a 30 day mission in context of a longer deployment.
- Demonstrates USAPHC (Prov) SME input into the process.

1. BACKGROUND

This is a hypothetical case study designed to illustrate the TG 230 risk assessment process. It is the end of March and the 24th Transportation Company has a 30 day mission in April to provide daily logistical support from Camp A to Camp B. Every day two squads of the unit convey from Camp A to Camp B and therefore Soldiers are consuming water from both Camps. Camp A is their home base and where Soldiers consume an estimated 11 L/day from bottled water. The water source at Camp B is treated well water and Soldiers consume approximately 2 L/day from that source.

PVNTMED personnel have certified that the bottled water from camp A is potable in accordance with the Tri-Service Field Water Standards and other requirements found in TB MED 577.

Camp B is located in an active combat zone where the Commander has determined that long-term water portability standards must be waived for the foreseeable future. For the purposes of this assessment, it is assumed that this waiver is in place for the company's entire 30 day mission.

2. DEFINE THE PURPOSE OF THE RISK ASSESSMENT

Refer to TG 230 Section 3.4.1 for guidance. Appendix G provides a process flow-chart.

The supporting PVNTMED team detected Arsenic during routine drinking water surveillance. You have been asked to evaluate the health risk to the unit associated with drinking these two water sources during their 6 month rotation, which includes the 30 day mission to Camp B.

3. COLLECT DATA AND DESCRIBE EXPOSURE SETTING

Refer to TG 230 Section 3.4.2 for guidance.

3.1 Data Sampling Summary

Include a description of who collected the data and how data were collected (i.e. sampling method).

The bottled water from Camp A was sampled every two weeks for 3 months (January–March) by the Veterinary Detachment and submitted to the laboratory for analysis.

The ROWPU-treated well water at Camp B was sampled on six different days (all in January) by local PVNTMED technicians using their standard sampling procedures for treated water. Water

samples were submitted to the supporting laboratory for analysis. Similar samples were collected in February and March, but the laboratory lost the samples, so that data is available.

3.2 Available Arsenic sampling data and statistics

Camp A	bottled water
Date	**Arsenic (mg/L)**
Jan 10	0.009
Jan 24	0.02
Feb 3	0.01
Feb 17	0.01
Mar 1	0.009
Mar 16	0.02
Minimum	0.009
Maximum	0.02
Count	6
Detection Limit	0.001
Limit of Quantitation	0.003
Detection Frequency	100 %
Sample Time	Grab

Camp B	treated well water
Date	**Arsenic (mg/L)**
Jan 4	0.15
Jan 5	0.1
Jan 6	0.34
Jan 7	0.2
Jan 8	0.25
Jan 9	0.3
Minimum	0.1
Maximum	0.34
Count	6
Detection Limit	0.001
Limit of Quantitation	0.003
Detection Frequency	100 %
Sample Time	Grab

3.3 MEG Tables

Arsenic (7440-38-2) (mg/L)

	7 day	14 day	1 yr
NEG 15L/day	0.1	0.02	0.02
NEG 5 L/day	0.3	0.06	0.06

3.4 Chemical information

Provide general information about the chemical(s) and the general source(s) in the environment.

Arsenic: The Agency for Toxic Substances and Disease Registry (ATSDR) has a publically available ToxFAQ™ and Toxicological Profile for this chemical. The following is general information obtained from these sources.

> Arsenic is a widely distributed naturally occurring element. Inorganic arsenic compounds are mainly used to preserve wood. Copper chromated arsenate (CCA) is used to make “pressure-treated” lumber. CCA is no longer used in the U.S. for residential uses; it is still used in industrial applications. Organic arsenic compounds are used as pesticides, primarily on cotton fields and orchards. Ingesting very high levels of arsenic can result in death. Exposure to lower levels can cause nausea and vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and a

sensation of “pins and needles” in hands and feet. Several studies have shown that ingestion of inorganic arsenic can increase the risk of skin cancer and cancer in the liver, bladder, and lungs. The Department of Health and Human Services and the EPA have determined that inorganic arsenic is a known human carcinogen.

3.5 Describe the Exposure Setting

Refer to TG 230 Section 3.4.2 for guidance. The description should answer as many of the pre-assessment key questions from Worksheet G.2 as possible. If an answer is unavailable, then indicate that information is missing.

- What is the population at risk?
- What is the timeframe under consideration?
- What is the exposure event or ambient environmental condition under consideration?
- What is known about the source of the chemicals?
- What are the exposure pathways?
- What else is known about the exposure setting?
- What are the activity patterns of the population at risk?
- Where are the sampling locations relative to where exposure occurs?
- Is there adequate data quality to conduct a chronic assessment?

The population at risk is the 24th Transportation Company (n = 120 Soldiers) during a six month mission at Camp A, which includes 30 days of daily logistical support from Camp A to Camp B. The potential hazard being assessed is Arsenic in bottled water from camp A and in treated well water from Camp B. The primary exposure route of concern is ingestion of the water.

Every day two squads of the unit convey from Camp A to Camp B and therefore Soldiers are consuming water from both Camps. Camp A is their home base and where Soldiers consume an estimated 11 L/day from bottled water. The water source at Camp B is treated well water and Soldiers are expected to consume approximately 2 L/day from that source during the short 30-day mission for Camp B. While driving M1081 standard cargo trucks requires minimal physical labor, the climate is hot and dry. This is why drinking rates are so high.

There appears to be enough data for a chronic risk assessment for the Camp A water source because the data set is a good representation of results across a number of months. The data set for Camp B is 6 days in one week and exposure to Camp B will only last 30 days, so a chronic assessment for the Camp B water source is not appropriate.

CASE STUDY 5 — Arsenic Contamination in Drinking Water from Different Water Sources

4. PRESCREEN

Refer to TG 230 Section 3.4.3 and Worksheet G.3 for guidance. Enter the results into the table below.

Arsenic Source	Maximum Sample Concentration	1 Year 15L/d Negligible MEG	Result
Camp A – bottled	0.02 mg/L	0.02 mg/L	Exclude as a hazard
Camp B – treated well	0.34 mg/L		Retain as a hazard

Note that the Camp A source is excluded as posing a hazard because the maximum concentration is equal to the screening MEG. As presented in TG 230 Section 3.4.3 and Worksheet G.3, the concentration must be greater than the MEG to be retained as a hazard.

5. GENERATE THE RISK ASSESSMENT DATA SET

Refer to TG 230 Section 3.4.4 and Worksheet G.4 for guidance. Enter the results into the table below.

Arsenic Source	Acute Exposure		Chronic Exposure
	Peak PEPC	Average PEPC	Average PEPC
Camp B – treated well	0.34 mg/L	0.22 mg/L	0.22 mg/L

The acute peak PEPC is the highest sample concentration from the source. The acute and chronic average PEPCs are the arithmetic averages. The average PEPC is an estimate of the average concentrations across the duration of use of the water source, which for this scenerio is 30 days. Here, the calculated average is based on data collected only 6 days (the other samples were lost). For the purposes of conducting an assessment, it must be assumed that the calculated average is a 'reasonable' estimate of what the ultimate 30-day average will be to which the population will be exposed. Our confidence in this decision can be incorporated into the assessment downstream in the process, in the hazard probability ranking and the risk assessment confidence level.

6. ACUTE RISK ASSESSMENT

Refer to TG 230 Section 3.4.5 for guidance.

6.1 Screen for Acute Hazards

Refer to TG 230 Section 3.4.5.1 and Worksheet G.3 for guidance to perform screen for acute hazards. Enter the results into the table below.

Arsenic Source	Peak PEPC	Screening MEG		Result
Camp B – treated well	0.34 mg/L	0.02 mg/L	14d 15L/d NEG	Retain as an acute hazard

CASE STUDY 5 — Arsenic Contamination in Drinking Water from Different Water Sources

6.2 Rank Acute Hazard Severity

Refer to TG 230 Section 3.4.5.2 for guidance. The peak and average PEPC across the selected exposure duration are used to select a hazard severity for each PEPC using Worksheet G.5 (airborne exposures) or Worksheet G.6 (water exposures).

Arsenic Source	PEPC		Comparison MEG		Hazard Severity
Camp B – treated well	Peak	0.34 mg/L	0.06 mg/L	14d 5L/d NEG	Negligible*
	Average	0.22 mg/L			

* Note that a standard protocol for setting these severity levels is unavailable because there are no 14d Marginal MEGs (see TG 230 Figure 3-4). In these situations, it is recommended that USAPHC (Prov) be contacted in order to validate, or determine, the severity ranking.

Based on the duration of use of the water—longer than 14 days, the 14 day water MEG is the appropriate short-term MEG for comparison purposes. The 5L/d MEG is most appropriate at camp B based on the estimated consumption rate of about 2 L/d from the treated water supply.

When a PEPC is greater than the corresponding Negligible MEG and no Marginal MEG is available, then the severity determination for this exposure needs to be site-specific and be determined by a qualified subject matter expert.

Note: These exposure estimates require that USAPHC (Prov) subject matter experts, or other qualified medical/health professionals, be consulted in order to rank hazard severity.

USAPHC (Prov) Opinion for this Hypothetical Case Study:

The average exposure is below the 7d 5L/d Negligible MEG and the peak exposure is just above this MEG. However, these exposure concentrations are about 5-times the comparison 14d MEG and exposure is expected to last 30 days. It is known that water consumption will be only 2L/d from this water source, so the 5L/d Negligible MEGs are “overly protective” if the exposure were to be 14 days.

This water would be considered potable for a 7 days of use based on TB MED 577, where the standard is 0.3 mg/L. However, it would not be considered potable for uses more than 7 days. The 14d MEGs were set to equal the 2005 >7d TB MED standard for Arsenic.

The key question in this case is whether this exposure level (0.22 – 0.34 mg/L) represents higher than an acute Negligible hazard severity. Exposures less than a Marginal MEG would constitute a Negligible severity; however, there is no publically available exposure guideline that would approximate this threshold for what would be considered a Marginal severity. However, the ATSDR toxicological profile for Arsenic provides a review of intermediate (15-365 days), oral exposure studies that suggest that serious health effects have been observed in humans at doses above 0.05 mg/kg-d (see Figure 3-3 on p. 119 of the 2007 profile). This dose level can represent a point of departure for consideration of what level may represent a Marginal MEG. Plugging this dose level into a simple exposure equation for a 2L/d consumption rate results in a water concentration of 1.75 mg/L. Clearly, the field exposures from the camp B water source are less than this. Therefore, the severity level associated with this exposure is

ranked as Negligible.

6.3 Rank Acute Hazard Probability

Refer to TG 230 Section 3.4.5.3 for guidance. Assess the hazard probability for each PEPC using Worksheet G.5 (airborne exposures) or Worksheet G.6 (water exposures).

Acute Peak PEPC scoring for Arsenic in Treated Well Water at Camp B

Arsenic Exposure		Hazard Probability Scoring					Hazard Probability
		Degree of exposure	Represent-ativeness of field data	Duration of exposure	Rate of exposure	Total Score	
Camp B – treated well	0.34 mg/L	2	3	1	1	7	Seldom

The following text explains the rationale underlying the scoring.

- Factor 1 (Degree of exposure). Since a formal Marginal MEG is unavailable, method B is used to score this factor. The acute PEPC is greater than the 14d 5L/d Negligible MEG. This scores as a 2.

- Factor 2 (Representativeness of field data). The field data were collected in January and it is now the end of March. While well water sources are typically less variable than surface water, there remains uncertainty of whether these past data are good representations of current conditions. In order to provide a health-protective risk estimate, it is assumed that the January data may underestimate exposure. This decision scores as a 3.

- Factor 3 (Duration of exposure). The duration of exposure in the field for a peak water PEPC based on grab samples can be fairly undefined. Each sample in the data set represents one day, since samples are taken every day for six days. Therefore, it is assumed that the population exposure duration for the peak PEPC is 1 day. The exposure duration associated with the comparison short-term MEG is 14 days. The ratio is 1/14, which is much less than 1. This scores as a 1.

- Factor 4 (Rate of exposure). A 5L/d MEG is used and the water is consumed at an estimated rate of 2L/day. This scores as a 1.

CASE STUDY 5 — Arsenic Contamination in Drinking Water from Different Water Sources

Acute Average PEPC scoring for Arsenic in Treated Well Water at Camp B

Arsenic Exposure		Hazard Probability Scoring					Hazard Probability
		Degree of exposure	Represent-ativeness of field data	Duration of exposure	Rate of exposure	Total Score	
Camp B – treated well	0.22 mg/L	2	3	2	1	8	Occasional

The following text explains the rationale underlying the scoring.

- Factor 1 (Degree of exposure). Since a formal Marginal MEG is unavailable, method B is used to score this factor. The acute PEPC is greater than the 14d 5L/d Negligible MEG. This scores as a 2.

- Factor 2 (Representativeness of field data). The field data were collected in January and it is now the end of March. While well water sources are typically less variable than surface water, there remains uncertainty of whether these past data are good representations of current conditions. In order to provide a health-protective risk estimate, it is assumed that the January data may underestimate exposure. This decision scores as a 3.

- Factor 3 (Duration of exposure). The duration of exposure in the field for an average water PEPC based on grab samples can be fairly undefined. The data set average represents a six-day average, since samples are taken every day for six days. However, the exposure is 30 days and the six-day average is the current best estimate of the 30-day average. The exposure duration associated with the comparison short-term MEG is 14 days. The ratio is 30/14, which is 2.14. This scores as a 2.

- Factor 4 (Rate of exposure). A 5L/d MEG is used and the water is consumed at an estimated rate of 2L/day. This scores as a 1.

6.4 Estimate of Tactical Risk and Level of Confidence

Refer to TG 230 Section 3.4.5.4 for guidance. Use the risk assessment matrix in Table G-2 to combine the hazard severity and hazard probability selections to derive a Risk Level. Use the guidance in Worksheet G.8 to set levels of confidence.

Acute Hazard		Severity	Probability	Risk Level	Confidence
Arsenic in Camp B – treated well	Peak	Negligible	Seldom	LOW	Low
	Average	Negligible	Occasional	LOW	Low

CASE STUDY 5 — Arsenic Contamination in Drinking Water from Different Water Sources

Conclusion statement
Additional detail is provided in the overall Risk Characterization section at the end.

Based on current data, use of this ROWPU-treated well water for drinking water at the base camp B poses a Low tactical risk.

Rationale for confidence levels
Consider all of the information at hand and communicate to the decision maker the level of confidence they have in the risk level being presented. Use the guidance in Worksheet G.8 to set levels of confidence.

The rational for the Low confidence level for the assessment of the acute/short-term exposure is primarily based on the fact that the data set is out of date. The treated well water data was collected three months ago. While the exposure levels are greater than the existing 14d Negligible MEG and there is no formal Marginal MEG, USAPHC (Prov) subject matter experts were consulted to determine the severity level of the hazard.

7. CHRONIC RISK ASSESSMENT

Refer to TG 230 Section 3.4.6 for guidance.

As stated in case study Section 3.5, there appears to be enough data for a chronic risk assessment for the Camp A water source because the data set is a good representation of results across a number of months. However, the Camp A bottled water source does not contain any identified hazards (see the Prescreen results in case study Section 4).

The data set for Camp B is 6 days in one week and exposure to Camp B will only last 30 days, so a chronic assessment for the Camp B water source is not appropriate.

CASE STUDY 5 — Arsenic Contamination in Drinking Water from Different Water Sources

8. RISK CHARACTERIZATION SUMMARY

Refer to TG 230 Section 3.4.7 and tables G-2 through G-6 for guidance.

8.1 Summary Table

The summary should present the risk level(s), associated anticipated impacts to the tactical and lifecycle missions, and the level of confidence associated with the assessments. Recommended actions should be presented.

OEH Hazard		Tactical Risk Estimate	Lifecycle Risk Estimate	Current Recommended Actions
Media/ Source	**Chemical**	(acute effects)	(chronic effects)	
ROWPU-treated Well Water used as a Drinking Water Source at Camp B	**Arsenic**	**Low *** Expected losses have little or no impact on accomplishing the mission. *Little to no in-theater medical resources anticipated for protection and treatment. However, a summary of any negative or low level sampling results should be documented and archived particularly if some personnel express concerns.* Confidence in the assessment is low on a low-medium-high scale.	**No lifecycle hazards identified**	Collect water samples during the mission. Document data in designated DoD archive.

*This summary prepared in consultation with USAPHC (Prov) subject matter experts.

8.2 Potential Health Effects

Refer to the tables in TG 230 Appendices B, C, D, and E. Additional information is also available in RD 230. This section should present the potential health effects that are relevant in the final assessments. When risk levels are Moderate or higher, the identification of potential health effects should be based on consultations with appropriately trained subject matter experts at USAPHC (Prov) or other such service organization.

Arsenic in drinking water

- **Acute exposure**: Exposure to low levels of arsenic can cause nausea and vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and a sensation of “pins and needles” in hands and feet.
- **Chronic exposure**: Not applicable.

CASE STUDY 5 — Arsenic Contamination in Drinking Water from Different Water Sources

8.3 Answers to Key Post-Risk Assessment Questions

Refer to Worksheet G.2. These questions should be considered when preparing a risk assessment. The case study answers provide teaching points.

- Has the risk assessment incorporated any of the unique considerations identified in TG 230 Section 3.5? There are no unique considerations in TG-230 section 3.5 that apply to this assessment.

- Is data quality adequate to base risk management decisions on the risk assessment? Yes. There appears to be adequate data to make decisions now.

- Is it worth collecting additional data to increase the confidence in the risk assessment conclusion? Yes, drinking water sources must be monitored monthly according to TB MED 577 and additional data is needed to determine if concentrations of Arsenic in the treated-well water are different from those measured three months ago in January.

- Are there readily available exposure control measures that can be implemented? The possibility of transporting bottled water into camp B could need to be considered in context of the other combat-oriented mission requirements.

8.4 Bottom-line-up-front briefing statements (BLUF Statements)

Refer to TG 230 Section 4 for over-arching risk communication guidance. The following bullets should represent succinct case-study specific points that should be emphasized when communicating to stakeholders.

- This assessment evaluated Arsenic in bottled water from camp A and ROWP-treated well water from camp B. Arsenic is naturally occurring and is also used to preserve wood and is used in some pesticide formulations.

- Arsenic was detected in both water sources but only the levels of arsenic in the treated water from camp B pose a health hazard. It is not clear why the treatment did not remove the arsenic.

- Arsenic in camp B well water poses a LOW TACTICAL AND LIFECYCLE RISK. Confidence in this assessment is low because the data are old.

- Continued, routine monitoring of the treated water quality is encouraged.

CASE STUDY 6 — Naphthalene and Bis(2-Ethylhexyl)Adipate Contamination in Non-Drinking Water

Teaching Points

- Shows how water can be evaluated for personal hygiene exposures.
- Deals with chemicals with some samples results reported as not detected.
- Demonstrated how incomplete data coverage over time can be used to assess exposure.
- Demonstrates USAPHC (Prov) SME input into the process.

1. BACKGROUND

This is a hypothetical case study designed to illustrate the TG 230 risk assessment process. The military population assigned to base camp Zulu uses well water to supply the field showers supporting the camp. The supporting PVNTMED team detected Naphthalene and Bis (2-Ethylhexyl) Adipate during routine water surveillance.

Note: The water MEGs were derived based on ingestion exposures and did not factor in other routes of exposure (i.e., inhalation and dermal exposures). It is recognized that bottled water is usually the primary drinking source in recent deployments, and field water is commonly used for non-drinking purposes such as showering, laundering, cooking, and other activities requiring potable water. Development of water MEGs for assessing non-drinking exposures was considered for the current TG 230 revision, but was not performed (see RD230 for more details). Until hygiene or cooking water MEGs are established, USAPHC (Prov) recommends an interim approach to identify potential chemicals of concern for hygiene and cooking activities. This case study demonstrates this approach. See TG 230 Section 3.5.2 for more information.

Note: According to military doctrine, potable water, including that used for non-consumptive purposes must still meet military field drinking water standards as described in TB MED 577.

2. DEFINE THE PURPOSE OF THE RISK ASSESSMENT

Refer to TG 230 Section 3.4.1 for guidance. Appendix G provides a process flow-chart.

Evaluate the health risk to military population at Camp Zulu associated with using well water for personal hygiene during a 6 month deployment (November 2007 – April 2008). This water source is not used for drinking, as bottled water is supplied for that purpose. Acute and chronic health risks need to be addressed.

CASE STUDY 6 — Naphthalene and Bis(2-Ethylhexyl)Adipate Contamination in Non-Drinking Water

3. COLLECT DATA AND DESCRIBE EXPOSURE SETTING

Refer to TG 230 Section 3.4.2 for guidance.

3.1 Data Sampling Summary

Include a description of who collected the data and how data were collected (i.e. sampling method).

The camp's well water was sampled on six different days by local PVNTMED technicians using their standard sampling procedures for tap water. Water samples were submitted to the supporting laboratory for analysis.

3.2 Available sampling data and statistics

Naphthalene

Date	mg/L
8 Dec 07	ND
11 Dec 07	8.0
2 Jan 08	ND
25 Jan 08	3.0
14 Feb 08	4.0
18 Mar 08	2.5
Minimum	ND
Maximum	8.0
Count	6
Detection Limit	0.08
Limit of Quantitation	0.2
Detection Frequency	66%
Sample Time	NA

Bis(2-Ethylhexyl)Adipate

Date	mg/L
8 Dec 07	6.5
11 Dec 07	3.6
2 Jan 08	2.9
25 Jan 08	ND
14 Feb 08	2.9
18 Mar 08	3.8
Minimum	ND
Maximum	6.5
Count	6
Detection Limit	0.02
Limit of Quantitation	0.08
Detection Frequency	83%
Sample Time	NA

3.3 MEG Tables

Naphthalene (91-20-3) (mg/L)

	7 day	14 day	1 yr
NEG 15L/day	NA	NA	0.93
NEG 5 L/day	NA	NA	2.8

Bis(2-Ethylhexyl)Adipate (103-23-1) (mg/L)

	7 day	14 day	1 yr
NEG 15L/day	9.3	9.3	2.8
NEG 5 L/day	28	28	8.4

CASE STUDY 6 Naphthalene and Bis(2-Ethylhexyl)Adipate Contamination in Non-Drinking Water

3.4 Chemical information

Provide general information about the chemical(s) and the general source(s) in the environment.

Naphthalene: The Agency for Toxic Substances and Disease Registry (ATSDR) has a publically available ToxFAQ™ and Toxicological Profile for Naphthalene. The following is general information obtained from these sources.

> Naphthalene is a white solid that evaporates easily. Fuels such as petroleum and coal contain naphthalene. It is also called white tar, and tar camphor, and has been used in mothballs and moth flakes. Burning tobacco or wood produces naphthalene. It has a strong, but not unpleasant smell. The major commercial use of naphthalene is in the manufacture of polyvinyl chloride (PVC) plastics. Its major consumer use is in moth repellents and toilet deodorant blocks. Naphthalene enters the environment from industrial and domestic sources, and from accidental spills. Exposure to naphthalene happens mostly from breathing air contaminated from the burning of wood, tobacco, or fossil fuels, industrial discharges, or moth repellents. Naphthalene can dissolve in water to a limited degree and may be present in drinking water from wells close to hazardous waste sites and landfills. Naphthalene can become weakly attached to soil or pass through soil into underground water. Exposure to large amounts of naphthalene also cause nausea, vomiting, diarrhea, blood in the urine, and a yellow color to the skin. Large exposures may also damage or destroy some of your red blood cells. This could cause you to have too few red blood cells until your body replaces the destroyed cells. This condition is called hemolytic anemia. Some symptoms of hemolytic anemia are fatigue, lack of appetite, restlessness, and pale skin. Animals sometimes develop cloudiness in their eyes after swallowing high amounts of naphthalene. It is not clear whether this also develops in people.

Bis(2-Ethylhexyl)Adipate: The Environmental Protection Agency has a publically available Ground Water and Drinking Water Consumer Fact Sheet for Bis(2-Ethylhexyl)Adipate. The following general information was obtained from this source. Note that this chemical is often referred to as Adipate.

> Adipate is a light-colored, oily liquid with an aromatic odor. It is used in making plastics. It is also used as a solvent; in aircraft lubricants; as a hydraulic fluid; as a plasticizer or solvent in the following cosmetics: bath oils, eye shadow, cologne, foundations, rouge, blusher, nail-polish remover, moisturizers and indoor tanning preparations; in meat wrapping operations. Adipate is released in fly ash from municipal waste incineration, wastewater effluent from sewage treatment plants and chemical manufacturing plants. Since adipates are known to leach from plumbing made of PVC plastic, they have been recognized as a potential drinking water contaminant. If released to soil or water, adipate is expected to be broken down by microbes. It will adhere to sediments in water bodies and will not leach through soil to ground water. Adipate is not known to cause any health problems when people are exposed to it at levels above the Maximum Contaminant Level (MCL) of 0.4 mg/L for relatively short periods of time. Adipate has the potential to

CASE STUDY 6 Naphthalene and Bis(2-Ethylhexyl)Adipate Contamination in Non-Drinking Water

cause the following effects from a lifetime exposure at levels above the MCL: reduced body weight and bone mass; damage to liver and testes; cancer.

3.5 Describe the Exposure Setting

Refer to TG 230 Section 3.4.2 for guidance. The description should answer as many of the pre-assessment key questions from Worksheet G.2 as possible. If an answer is unavailable, then indicate that information is missing.

The population at risk is the entire population (n~600) at the base camp from November 2007 – April 2008, a 6 month period. This well water is used primarily to supply the field showers for personal hygiene use. The potential chemical hazards are waterborne in showers, so dermal contact, vapor and aerosol inhalation, and incidental ingestion are the primary exposure routes of concern.

- What is the population at risk?
- What is the timeframe under consideration?
- What is the exposure event or ambient environmental condition under consideration?
- What is known about the source of the chemicals?
- What are the exposure pathways?
- What else is known about the exposure setting?
- What are the activity patterns of the population at risk?
- Where are the sampling locations relative to where exposure occurs?
- Is there adequate data quality to conduct a chronic assessment?

There is no particular exposure event. The PVNTMED personnel have no knowledge of the source of chemicals at this time.

A large proportion of Camp Zulu Soldiers are engaged in light physical labor as they occupy prepared defensive positions and perform administrative functions. Bottled water is supplied and used for consumption.

The camp's well water was sampled on six different days from December – March from the field shower heads. There is adequate data quality to conduct a chronic assessment—this is a well source and there is no reason to believe the concentrations will have significant variability.

4. PRESCREEN

Refer to TG 230 Section 3.4.3 and Worksheet G.3 for guidance. Enter the results into the table below.

Chemical Name	Maximum Sample Concentration	2.5 × 1yr 5L/d Negligible MEG	Result
Naphthalene	8.0 mg/L	7.0 mg/L	Retain as a hazard
Bis(2-Ethylhexyl)Adipate	6.5 mg/L	21 mg/L	Exclude as a hazard

For non-drinking water, the prescreening method compares the peak concentration to 2.5 times the 1 year Negligible MEG for the 5 L/day consumption rate. The applicable pre-screening MEGs are 2.8 mg/L (Naphthalene) and 8.4 mg/L (Bis(2-Ethylhexyl)Adipate). The table shows the adjusted values.

CASE STUDY 6 — Naphthalene and Bis(2-Ethylhexyl)Adipate Contamination in Non-Drinking Water

5. GENERATE THE RISK ASSESSMENT DATA SET

Refer to TG 230 Section 3.4.4 and Worksheet G.4 for guidance. Enter the results into the table below.

Chemical Name	Acute Exposure		Chronic Exposure
	Peak PEPC	Average PEPC	Average PEPC
Naphthalene	8.0 mg/L	3.0 mg/L *	3.0 mg/L *

*See text.

5.1 Acute PEPCs

The acute peak PEPC for a water source is simply the maximum detected concentration. Since there is no known "exposure event" (such as a spill or major storm impacting ground water), the acute average PEPC is an estimate of the average concentration across the duration of use of the water source. The calculated average value from the data set is based on data collected over 4 months, but actually represents an estimate of the 6-month average because that is the exposure duration.

The calculated average value also incorporated results less than the detection limit. There were 2 out of 6 samples flagged as not detected. For the purposes of calculating the average PEPC, the ND values were assigned surrogate values based on the method described in TG230 Section 3.4.4.3. In this case, ½ of the Limit of Quantitation (LOQ) was used.

5.2 Chronic PEPCs

The chronic average PEPC is an estimate of the average concentration across the duration of use of the water source. The calculated average value from the data set is based on data collected over 4 months, but actually represents an estimate of the 6-month average because that is the exposure duration. This assumption is reasonable because there is no known "exposure event" (such as a spill or major storm impacting ground water) and this is a well source and there is no reason to believe the concentrations will have significant variability. The calculated average value also incorporated results less than the detection limit, just as in the calculation of the acute average PEPC.

CASE STUDY 6 — Naphthalene and Bis(2-Ethylhexyl)Adipate Contamination in Non-Drinking Water

6. ACUTE RISK ASSESSMENT

Refer to TG 230 Section 3.4.5 for guidance.

6.1 Screen for Acute Hazards

Refer to TG 230 Section 3.4.5.1 and Worksheet G.3 for guidance to perform screen for acute hazards. Enter the results into the table below.

Chemical Name	Peak PEPC	Screening MEG		Result
Naphthalene	8.0 mg/L	7 mg/L	2.5 x 1yr NEG 5L/d	Retain as an acute hazard

NA – not available

There is no 14d Negligible MEG for Naphthalene at this time. Therefore, Naphthalene was screened with 2.5 times the 1yr Negligible MEG for the 5L/d rate. It was retained as an acute hazard because it was greater than this comparison MEG.

6.2 Rank Acute Hazard Severity

Refer to TG 230 Section 3.4.5.2 for guidance. The peak and average PEPC across the selected exposure duration are used to select a hazard severity for each PEPC using Worksheet G.5 (airborne exposures) or Worksheet G.6 (water exposures).

Chemical Name	PEPC		Comparison MEG		Hazard Severity
Naphthalene	Peak	8.0 mg/L	7 mg/L	2.5 x 1yr NEG 5L/d	Negligible*
	Average	3.0 mg/L	7 mg/L	2.5 x 1yr NEG 5L/d	Negligible

* See below

The standard acute hazard severity ranking method requires a 14d Negligible MEG, which is unavailable. The comparison to the adjusted 1yr MEG can be used to rank the acute average PEPC as Negligible because it is less than the comparison value. However, since the acute peak PEPC is greater than this, USAPHC (Prov) should be contacted for assistance.

Note: The guidance recommends that USAPHC (Prov) be contacted for assistance in these situations.

USAPHC (Prov) Opinion for this Hypothetical Case Study:

The acute peak PEPC (8 mg/L) is just above 2.5 times the 5L/d 1yr Negligible MEG (7 mg/L) and the exposure duration for the peak – about one month, see the sampling data table – is much shorter than 1-year. Therefore, an acute hazard severity rank of Negligible is a reasonable decision for the acute peak PEPC.

CASE STUDY 6 Naphthalene and Bis(2-Ethylhexyl)Adipate Contamination in Non-Drinking Water

6.3 Rank Acute Hazard Probability

Refer to TG 230 Section 3.4.5.3 for guidance. Assess the hazard probability for each PEPC using Worksheet G.5 (airborne exposures) or Worksheet G.6 (water exposures).

Acute Peak PEPC scoring for Naphthalene

Acute Average PEPC		Hazard Probability Scoring					Hazard Probability
		Degree of exposure	Represent-ativeness of field data	Duration of exposure	Rate of exposure	Total Score	
Naphthalene	8.0 mg/L	2	2	1	2	7	Seldom

The following text explains the rationale underlying the scoring.

- Factor 1 (Degree of exposure). In this case, there is no directly relevant MEG. However, 2.5 times the 5L/d 1yr Negligible MEG was used as the comparison MEG to rank severity. Therefore, this factor should be scored relative to that criterion. Method B is used because the the next higher severity MEG for the time-frame is unavailable. Since the peak PEPC is greater than the comparison value, it scores as a 2.

- Factor 2 (Representativeness of field data). Since there is no known "exposure event" and this is a well source, there is no reason to believe the concentrations will have significant variability. Therefore, the calculated peak value from the data set is based on data collected over 4 months is an adequate estimate of true highest peak concentration over the 6-month average concentration. This scores as a 2.

- Factor 3 (Duration of exposure). Since the duration of exposure is 6 months and the duration associated with the MEG used to rank severity is 1 year, the ratio (180d/365d) is about 0.5. This scores as a 1.

- Factor 4 (Rate of exposure). Based on the water use in field showers and the Worksheet chart, it is assumed that there will be moderate water contact or incidental consumption of water (e.g., temporary facilities with centralized small unit showers). This scores as a 2.

CASE STUDY 6 — Naphthalene and Bis(2-Ethylhexyl)Adipate Contamination in Non-Drinking Water

Acute Average PEPC scoring for Naphthalene

Acute Average PEPC		Hazard Probability Scoring					Hazard Probability
		Degree of exposure	Represent-ativeness of field data	Duration of exposure	Rate of exposure	Total Score	
Naphthalene	3.0 mg/L	1	2	1	2	6	Unlikely

The following text explains the rationale underlying the scoring.

- Factor 1 (Degree of exposure). In this case, there is no directly relevant MEG. However, 2.5 times the 5L/d 1yr Negligible MEG was used as the comparison MEG to rank severity. Therefore, this factor should be scored relative to that criterion. Method B is used because the PEPC is actually less than the criterion – so it scores as a 1.

- Factor 2 (Representativeness of field data). Since there is no known "exposure event" and this is a well source, there is no reason to believe the concentrations will have significant variability. Therefore, the calculated average value from the data set is based on data collected over 4 months is an adequate estimate of the 6-month average concentration. This scores as a 2.

- Factor 3 (Duration of exposure). Since the duration of exposure is 6 months and the duration associated with the MEG used to rank severity is 1 year, the ratio (180d/365d) is about 0.5. This scores as a 1.

- Factor 4 (Rate of exposure). Based on the water use in field showers and the Worksheet chart, it is assumed that there will be moderate water contact or incidental consumption of water (e.g., temporary facilities with centralized small unit showers). This scores as a 2.

6.4 Estimate of Tactical Risk and Level of Confidence

Refer to TG 230 Section 3.4.5.4 for guidance. Use the risk assessment matrix in Table G-2 to combine the hazard severity and hazard probability selections to derive a Risk Level. Use the guidance in Worksheet G.8 to set levels of confidence.

Acute Hazard		Severity	Probability	Risk Level	Confidence
Naphthalene	Peak	Negligible	Seldom	LOW	HIgh
	Average	Negligible	Unlikely	LOW	High

CASE STUDY 6 — Naphthalene and Bis(2-Ethylhexyl)Adipate Contamination in Non-Drinking Water

Conclusion statement
Additional detail is provided in the overall Risk Characterization section at the end.

Use of this well water for personal hygiene and the field showers poses a Low tactical risk. Given the severity and probability ranks, the potential for any health effects is very low and probably non-existent.

Rationale for confidence levels
Consider all of the information at hand and communicate to the decision maker the level of confidence they have in the risk level being presented. Use the guidance in Worksheet G.8 to set levels of confidence.

The overall confidence in the assessment is High. There are a fair amount of samples, more than typical for field water supplies. While there is no known source of the chemicals in the well water, there is also no known "exposure event" (such as a spill or major storm impacting ground water) and there is no reason to believe the concentrations will have significant variability. The health-based criteria used in the assessment (i.e., the modified MEGs) are conservative (health-protective).

7. CHRONIC RISK ASSESSMENT
Refer to TG 230 Section 3.4.6 for guidance.

7.1 Screen for Chronic Hazards
Refer to TG 230 Section 3.4.6.1. Screen for hazardous exposures that may lead to long term health effects. Use the chronic screening criteria described in Worksheet G.3 and enter the results in the table below.

Chemical Name	Chronic PEPC	2.5 × 1yr 5L/d Negligible MEG	Frequency of Detection	Result
Naphthalene	3.0 mg/L	7.0 mg/L	66 %	Exclude as a hazard

The estimated chronic exposure to Naphthalene in the water does not pose a chronic health hazard; therefore, further assessment is not needed. Additional analysis for the chronic risk assessment is not required.

CASE STUDY 6 Naphthalene and Bis(2-Ethylhexyl)Adipate Contamination in Non-Drinking Water

8. RISK CHARACTERIZATION SUMMARY

Refer to TG 230 Section 3.4.7 and tables G-2 through G-6 for guidance.

8.1 Summary Table

The summary should present the risk level(s), associated anticipated impacts to the tactical and lifecycle missions, and the level of confidence associated with the assessments. Recommended actions should be presented.

OEH Hazard		Tactical Risk Estimate	Lifecycle Risk Estimate	Current Recommended Actions
Media/ Source	**Chemical**	(acute effects)	(chronic effects)	
Field Shower Water	**Naphthalene**	**Low *** Expected losses have little or no impact on accomplishing the mission. *Little to no in-theater medical resources anticipated for protection and treatment. However, a summary of any negative or low level sampling results should be documented and archived particularly if some personnel express concerns.* Confidence in the assessment is high on a low-medium-high scale.	**No lifecycle risk**	Document data in designated DoD archive.

*This summary prepared in consultation with USAPHC (Prov) subject matter experts.

8.2 Potential Health Effects

Refer to the tables in TG 230 Appendices B, C, D, and E. Additional information is also available in RD 230. This section should present the potential health effects that are relevant in the final assessments. When risk levels are Moderate or higher, the identification of potential health effects should be based on consultations with appropriately trained subject matter experts at USAPHC (Prov) or other such service organization.

Naphthalene

- **Acute exposure**: No health effects expected.
- **Chronic exposure**: No health effects expected.

CASE STUDY 6 Naphthalene and Bis(2-Ethylhexyl)Adipate Contamination in Non-Drinking Water

8.3 Answers to Key Post-Risk Assessment Questions

Refer to Worksheet G.2. These questions should be considered when preparing a risk assessment. The case study answers provide teaching points.

- Has the risk assessment incorporated any of the unique considerations identified in TG 230 Section 3.5? The TG 230 Section 3.5 identifies one consideration that is relevant to this case study. This assessment addresses the assessment of water for purposes other than consumption.

- Is data quality adequate to base risk management decisions on the risk assessment? Yes. Confidence in the assessment is ranked high and the risk level of Low does not warrant special risk control measures.

- Is it worth collecting additional data to increase the confidence in the risk assessment conclusion? No, however routine PVNTMED water surveillance should continue.

- Are there readily available exposure control measures that can be implemented? None are required.

8.4 Bottom-line-up-front briefing statements (BLUF Statements)

Refer to TG 230 Section 4 for over-arching risk communication guidance. The following bullets should represent succinct case-study specific points that should be emphasized when communicating to stakeholders.

- This assessment evaluated chemicals contained in well water used in the field showers.

- Naphthalene and Bis(2-Ethylhexyl)Adipate were detected in the water during 4 months of sampling. Both compounds are used to manufacture of polyvinyl chloride (PVC) plastics.

- Only naphthalene poses a potential acute health hazard. The TACTICAL RISK IS LOW for Naphthalene. Confidence in the assessment is high.

- Neither chemical poses a chronic exposure hazard at the concentrations found in the water.

CASE STUDY 6 Naphthalene and Bis(2-Ethylhexyl)Adipate Contamination in Non-Drinking Water

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Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel

U.S. Army Public Health Command (Provisional)