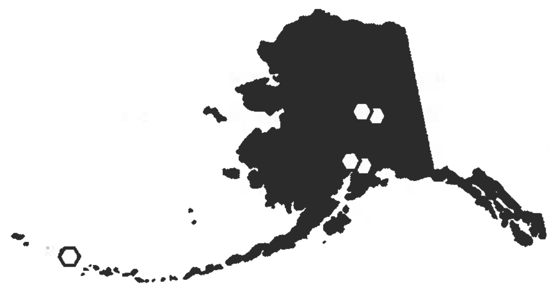
Overview of Key Issues



Environmental Justice at Alaska Military Superfund Sites
an accompaniment to individual site reports

This document serves as a supplement to individual **Superfund*** site reports, published by Alaska Community Action on Toxics. In it, we discuss issues that are relevant to all the sites, an overview of the most predominant contaminants, and environmental justice. This report aims to educate the general public about issues found in common at Department of Defense (DoD) Superfund sites in Alaska. The complete administrative record for each Superfund site contains many volumes, which can be examined at public repositories in the state, listed at the end of this report.

While sites on the **National Priority List** (**NPL**) for Superfund represent the most contaminated sites in the country, it's also important to point out that few contaminated sites actually make it on the NPL. In Alaska, military activities have contaminated nearly seven hundred different locations, yet only five of these sites have been designated for Superfund clean up. It is our hope that this report will serve not only as an overview for existing Superfund sites, but will serve as a community alert for how to hold public agencies more accountable at future sites.

A Superfund Primer

The **Comprehensive Environmental Response, Compensation and Liability Act**, or **CERCLA**, was passed in 1980. An extremely powerful law, it gives the **Environmental Protection Agency** (**EPA**) authority and funding to clean up the nation's most dangerous abandoned hazardous waste sites. It also gives EPA authority for site regulation and for holding polluters financially liable.

How Superfund Works

Once a hazardous site is reported, EPA determines if it constitutes an emergency, requiring immediate cleanup. Whether the site requires immediate action or not, the next step is site threat evaluation. In this step, EPA performs a **preliminary assessment** of potential hazards. During this **site inspection**, evidence is gathered, including past known activities, samples of soil, water and air, and the presence of hazardous waste, such as leaking drums or a landfill. EPA then uses a scoring method called the **Hazard Ranking System** to assess the potential threat to human health and the environment. Only sites that receive a high enough score are proposed to be added to the National Priorities List (NPL) and be cleaned up from a hazardous waste trust fund, the "Superfund." The process of evaluation and Superfund determination can take many months.

The **Agency for Toxic Substances and Disease Registry** (**ATSDR**) is in charge of human health issues at Superfund sites. The Agency is a division of the Centers for Disease Control, not EPA. Other governmental agencies are also involved in Superfund sites, depending on the type of site. In Alaska, all military Superfund sites were active installations at the time of their designation. In addition, there are nearly 700 contaminated sites from former military activities; these are called Formerly Used Defense Sites (FUDS). At this time, there are no FUDS that are Superfund sites, though there may be in the future. The **Army Corps of Engineers**, a division of the U.S. Army, is most often the agency responsible for formerly used defense sites. Active military installations that are placed on the NPL take the lead for those sites. In these instances, the Army, Air Force, or Navy (in Alaska) partners with EPA. The Alaska State Department of Environmental Conservation (DEC) is also involved. A document called a **Two-Party** or **Third-Party Agreement** and/or **Federal Facilities Agreement** details responsibilities and cleanup agreements at each individual site. Because CERCLA does not address all toxic substances, such as the petroleum, oils, and lubricants found at all military Superfund sites in Alaska, these additional agreements are necessary to delineate responsibility for that portion of the cleanup.

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* Words in **bold** signify terms used in the world of Superfund.

Once listed, the site goes through a five-phase process with the ultimate goal of permanent cleanup, which can take many years. The first phase is **remedial investigation**, in which the extent of contamination is investigated. Second, EPA studies the range of possible cleanup remedies in the **feasibility study**. Third, the cleanup remedy is chosen through a **Record of Decision (ROD)**. Fourth, the cleanup remedy is planned in the **remedial design**. Lastly, cleanup is performed through **remedial action**.

In the remedial investigation phase, areas that have been identified as contaminated (**source areas**) are further broken down into **operable units**. These "OUs" are defined by the EPA as units "in which similar types of contamination sources have been grouped together, based on similarities in types of contaminants present, source locations, or types of remedial actions anticipated."

The law requires the public be given opportunity to comment on the proposed cleanup. A comment period of at least 30 days is given after the **remedial investigation/feasibility study** (RI/FS) during which public hearings are held and either written or verbal comments are accepted. By law, all concerns brought forward by the public must be addressed in the ROD.

At each Superfund site, a **Community Relations Plan** is developed. The CRP documents the community relations history and the issues of community concern. In theory, these are supposed to include affected communities, Tribes, and any individual comments of concern noted throughout the process. They are intended to identify concerns and plan techniques that will address those concerns when planning any technical work at the affected site.

A **Restoration Advisory Board** is generally established at each site; all Superfund sites in Alaska have established them. RABs include a representative from each involved public agency, as well as members of the public, including local communities and Tribes that may be affected by the contamination. Department of Defense (DoD) policy sets forth the requirements under which the military must set up a RAB. Only one of the following criteria must be met: when closure of the installation involves transfer of property to the community (such as at Adak); when 50 citizens petition for a RAB; when federal, state, or local government requests the formation; or when the military installation determines a RAB is needed.[1]

Under Presidential Executive Order[2] the EPA has a trust responsibility to Tribes, which includes an obligation for formal consultation and government-to-government relations. In response to the Executive Order, DoD developed the "Department of Defense American Indian and Alaska Native Policy" directives[3] that specifically support tribal self-governance and mandate government-to-government relations between DoD and Tribes. What this means is that local Tribes should be included in all aspects of CERCLA activities; for example, consultation with regard to site investigation and remedial action plans, risk assessment review, assignment of a Tribal Liaison, and so forth. Instead, as is further discussed in the Environmental Justice section, the administrative record shows that Tribes were more often thought of only at the stage of inviting them to participate on the RAB. Tribes have the right to insist they be included in CERCLA reviews.

In theory, CERCLA is a powerful law that protects human health and the environment from polluters. Unfortunately it doesn't work as well as intended. The EPA, which governs CERCLA regulations, is often under tremendous pressure to maintain an NPL list that is small, giving the appearance that there are not as many heavily polluted sites in the country. For example, Northeast Cape on St. Lawrence Island met criteria to be designated for Superfund, yet was not listed. And, even if a site is listed, it doesn't necessarily mean it will be cleaned up to the point where a potential threat to human health or the environment is prevented, as is the case at the Open Burning/Open Detonation site at Fort Richardson, which, deplorably, was determined through a risk assessment process not to present a threat.

In Alaska the DoD has approximately 700 formerly used defense sites (FUDS), all of which are polluted with a variety of toxic contaminants. Most have never been assessed under CERCLA; the Army Corps of Engineers is responsible for contaminated military sites, yet the EPA has become more involved as the Corps has made little significant effort at clean up of these sites. The EPA will complete an inventory of Alaska FUDS by the end of 2003, and then systematically assess each one under CERCLA. This is good news for Alaska, since military activities have polluted a significant amount of Alaska's land, water and air. It also means communities and Tribes have an important opportunity to become involved and push for better clean up standards.

According to the report *Defend Our Health: A Peoples Report to Congress*,[4] the Department of Defense produces a disproportionate share of the federal government's pollution and environmental liability. The DoD controls 34% of federal facilities and only 3% of federal lands. However, DoD sites comprised 81% of federal sites on the Superfund National Priorities List (or 129 of 160 sites) as of August 1995.[5] In Alaska, these heavily contaminated sites are often in close proximity to densely populated areas and/or lands used traditionally to hunt and gather food. These sites are degrading our environment and harming our health.

Clearly, there must be a better way. And there is. Ultimately, the only way to stop the poisoning of our water, air and food is to stop the sources of pollution at all levels: production, proliferation, use and disposal. The military simply must stop poisoning the people it is sworn to protect. The Precautionary Principle[6] outlines exactly how to do just that. In essence, it states: "When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically, and that affected communities must be involved at each level of decision-making."[7]

Alaska's northern location, the reliance of its residents on traditional, subsistence foods, and the fragility of its arctic and sub arctic landscape make protection of our air and waters from toxic pollution particularly critical. Until the burden of proof shifts to polluters so they must demonstrate that their discharges are safe, Alaska will be unduly vulnerable to pollution created within and outside of its boundaries. DoD sites pose a threat because of the military's use of persistent and toxic chemicals. The DoD must clean up their toxic waste and cause no further harm.

Military Superfund in Alaska

Alaska currently has six sites on the National Priorities List. Five are military installations, four of which are still active bases; they are Adak Naval Air Station (the one inactive installation), Elmendorf Air Force Base, Ft. Richardson Army Base (both near Anchorage), Eielson Air Force Base, and Ft. Wainwright Army Base (both outside Fairbanks). The sixth site, Arctic Surplus in Fairbanks, was a salvage yard used extensively by the military. Two other Superfund sites have been deleted from the list: Alaska Battery in Fairbanks was deleted in 1996; Standard Steel & Metals Salvage in Anchorage was deleted in 2002. (There is disagreement as to whether they have been "cleaned" and whether they should have been removed from the NPL list.)

Contaminants of Concern

A wide number of contaminants are found at Alaska's five military Superfund sites. Below are listed the major groups of chemicals found most often at the sites. The categories in which different chemicals are included are confusing and often overlapping. For the purposes of this report, categories are those used throughout Alaska military Superfund sites. (Definitions of all chemicals found at Alaska Superfund sites are listed at the **Agency for Toxic Substances and Disease Registry** (ATSDR) website under **ToxFAQs** at http:// www.atsdr.cdc.gov/.

Contaminants most common to military Superfund sites in Alaska include: **POLs** (petroleum, oils, and lubricants); **VOCs** (volatile organic chemicals), including benzene and trichloroethylene (TCE); **SVOCs** (semi-volatile organic chemicals), including phenol and naphthalene; **POPs** (persistent organic pollutants), including pesticides such as dieldrin and DDT, dioxins, and PCBs (polychlorinated biphenyls); **heavy metals**, such as cadmium, lead and arsenic; and **munitions-associated chemicals**, including white phosphorus, propellants, DNT, and RXD.

Each class of chemicals includes numerous individually identifiable chemicals, which are often closely related. Because of this, understanding one chemicals relationship to another can be quite complicated. We provide a very general overview only. More specific information can be found on-line at the website given above.

POLs (Petroleum, Oils, and Lubricants) – includes a variety of petroleum products such as gasoline, motor oils, anti-freeze, and diesel fuels. These contaminants are not addressed under CERCLA, which governs the Superfund process. Instead, they are dealt with separately under Two-Party or Third Party Agreements between the State of Alaska and the U.S. Army. Although POLs contain volatile organic chemicals (VOCs), which are governed under CERCLA, at sites where petroleum product is the main contaminant, they are dealt with under these agreements. When only VOCs are found, the site remains under the jurisdiction of Superfund.

According to ToxFAQs, petroleum products are toxic. Inhaling or swallowing large amounts of gasoline can cause death. Inhaling high concentrations of gasoline is irritating to the lungs when breathed in and irritating to the lining of the stomach when swallowed. Gasoline is also a skin irritant. Breathing in high levels of gasoline for short periods or swallowing large amounts of gasoline may also cause harmful effects on the nervous system. Serious nervous system effects include coma and the inability to breathe, while less serious effects include dizziness and headaches.

Short-term health effects of fuel oils include nausea, eye irritation, increased blood pressure, headache, light-headedness, loss of appetite, poor coordination, and difficulty concentrating. Long-term effects of fuel oil vapors include kidney damage, and decreased blood-clotting ability. Exposure to jet fuels from breathing in the vapor caused poor coordination and convulsions in animals, and depressed activity level. Other effects seen in animals were skin and eye irritation, changes in liver cells, and decreased numbers of white blood cells. Long-term effects in humans have not been well defined, and it is undetermined whether jet fuels have reproductive effects; they are not considered to cause cancer in humans.

A cluster of childhood leukemia near a naval airbase in Nevada has raised concerns about a new kerosene-rich fuel, JP-8 or Jet A, introduced in the 1990s. The fuel's low volatility means it stays on skin and clothes longer. Little is yet known about the human health effects, but animal tests have shown it can cause lung, kidney and liver damage, and is highly toxic to the immune system. When pregnant mice were exposed, up to 70 percent of offspring died. At this time, the U.S. military plans to universally use JP-8 or Jet A until 2025.[8]

Volatile Organic Chemicals – VOCs have boiling point *below* that of water and can easily vaporize or volatilize. They are among the main constituents of petroleum products and gasoline, as well as commonly used solvents, degreasers, paint thinners, lacquer thinner, and dry cleaning fluids (the bulk of Ft. Wainwright's contamination). They include substances containing carbon and different proportions of other elements such as hydrogen, oxygen, fluorine, chlorine, bromine, sulfur, or nitrogen; these substances easily become vapors or gases.These specific chemicals are differentiated from the presence of gasoline and diesel fuels, and other contaminants described as POLs because they are distinctly identifiable in the environmental receptors of concern, that is, soil and water - particularly groundwater. They readily volatilize (evaporate and become a gas) and dissolve in water (highly soluble). As a result, these chemicals also tend to travel through groundwater and soil into waters used for drinking, which can result in long-term, chronic, low-dose exposure, and in some cases, serious health effects.

According to federal agencies, the presence of VOCs "in water is of national concern because of their relatively high aqueous solubility [ability to dissolve in water], mobility, and persistence [long-lasting presence], because many are known or suspected carcinogens [cancer-causing], because of their widespread use, and because they have been found in drinking-water supplies."[9]

Many of the chemicals listed at Alaska's military Superfund sites are VOCs. Two examples include:

- Benzene: Benzene is lipophilic, meaning it can dissolve or combine with fatty tissues and is not easily dissolved by water. Because of this, it was widely used as a solvent, and in paints, thinners, degreasers and industrial cleaners. It ranks as in the top 20 chemicals for production volume in the U.S and has been found in over half of the nation's Superfund sites.[10] It is present at all military Superfund sites in Alaska.

  In humans, benzene tends to concentrate in the bone marrow and in tissue that has a high fat (lipid) content. It primarily affects the central nervous system, the formation of blood and blood cells, and may affect the immune system. Breathing very high levels of benzene can result in death, while high levels can cause drowsiness, dizziness, rapid heart rate, headaches, tremors, confusion, and unconsciousness. Ingestion (consuming contaminated foods or water) can cause vomiting, irritation of the stomach, dizziness, sleepiness, convulsions, rapid heart rate, and death. According to ATSDR, zero benzene concentration in drinking water is the ideal goal that would allow an adequate margin of safety for the prevention of adverse effects.[11]

The Department of Health and Human Services has determined that benzene is a known human carcinogen.[12] The major exposure pathway of concern for benzene is contamination of groundwater, which can result in contamination of drinking water. However, benzene in the air can attach to rain or snow and be carried back down to the ground.[13] At the military Superfund sites in Alaska, underground storage tanks are a major source of benzene contamination.

- Trichloroethylene (TCE): TCE dissolves easily in water and can remain for decades in the environment, which is particularly problematic if it migrates to groundwater used as a drinking water source. TCE is also found as an air vapor because it evaporates quickly from surface waters such as rivers. In soil, TCE can stick to individual soil particles where it also remains for decades. If these particles end up in water and become sediment, TCE remains in the water as part of the sediment load. TCE is not known to accumulate in plants and animals in a significant way.[14]

  TCE is not classified as a human carcinogen by the International Agency for Research on Cancer (IARC), but is considered a probable human carcinogen by the EPA. Chronic low-dose exposure (for example, drinking small amounts for long periods) may cause liver and kidney damage, nervous system effects, impaired immune system function, and impaired fetal development in pregnant women, although according to ATSDR the extent of some of these effects is not yet clear.[15]

Semi Volatile Organic Chemicals - SVOCs are somewhat similar to VOCs. They can also be differentiated from the presence of gasoline and diesel fuels, and other contaminants described as POLs. They are distinguished from VOCs in that they have a boiling point *above* that of water (VOC's boiling point is *below* that of water). They can volatilize (evaporate and become a gas) when exposed to temperatures above room temperature.[16] As a result, these chemicals also tend to travel through groundwater and soil into waters used for drinking, which can result in long-term, chronic, low-dose exposure, and in some cases, serious health effects. Two examples include:

- Nitrobenzene: Nitrobenzene is produced in large quantities for use in industry. It is used mainly as an intermediate to produce another chemical, such as aniline, an octane booster in gasoline. Nitrobenzene is also used in the production of lubricating oils, such as those used in motors, machinery, and munitions.

  The major exposure pathway of concern for nitrobenzene is contamination of groundwater, which can result in contamination of drinking water.

  According to ToxFAQs, small amounts of nitrobenzene can cause mild irritation if it contacts the skin or eyes directly. Repeated exposures to a high concentration can result in methemoglobinemia, a condition in which the blood's ability to carry oxygen is reduced. This causes the skin to turn a bluish color and causes nausea, vomiting, and shortness of breath. Effects such as headache, irritability, dizziness, weakness, and drowsiness may also occur. There is also some evidence that breathing high concentrations of nitrobenzene may damage the liver. The International Agency for Research on Cancer (IARC) has determined that nitrobenzene is possibly carcinogenic to humans.[17]

- Polycyclic aromatic hydrocarbons – PAHs include over 100 chemicals found in tar, oil, creosote, person care products, dyes, plastics, and pesticides. They are produced through the incomplete combustion of fossil fuels and other materials.[18]

  The major exposure pathways of concern for PAHs are contamination of groundwater and air. PAHs can occur in air attached to dust particles. Some PAH particles can readily evaporate into the air from soil or surface waters. Most PAHs do not dissolve easily in water. They stick to solid particles and settle to the bottoms of lakes or rivers. In soils, PAHs are most likely to stick tightly to particles; certain PAHs move through soil to contaminate underground water. PAH contents of plants and animals may be much higher than PAH contents of soil or water in which they live.[19]

  Health effects from PAHs are not well known. Mice that were fed high levels of one PAH during pregnancy had difficulty reproducing and so did their offspring. These offspring also had higher rates of birth defects and lower body weights. It is not known whether these effects occur in people. The Department of Health and Human Services (DHHS) has determined that some PAHs may reasonably be expected to be carcinogens. Some people who have breathed or touched mixtures of PAHs and other chemicals for long periods of time have developed cancer.[20]

Persistent Organic Pollutants (POPs) – these are organic chemical compounds that are highly toxic, persist in the environment, bio-accumulate in fatty tissues of living organisms, travel long distances, and naturally migrate toward colder climates. POPs at Alaska military Superfund sites include pesticides (such as dieldrin and DDT and its metabolites such as DDE from historical storage and use), dioxins, and PCBs. POPs have a wide range of extremely adverse human health effects, including effects on the nervous system and reproduction and development. POPs have also been linked to cancer, genetic impacts, and behavioral disorders.[21]

Recent research demonstrates that some of these chemicals, such as dioxin, have no safe threshold for which adverse health effects do not occur.[22] Some are developmental toxins, which means they affect the fetus during its prenatal development. Some are endocrine disruptors, meaning the chemicals interfere with the body's ability to respond and regulate itself hormonally, which can result in hormonal disruptions, such as thyroid activity. POPs are long lasting in the environment and bioaccumulate, meaning they intensify in concentration as they move up the food chain. This is why humans, bears, and birds of prey, which are at the top of the food chain, often have high levels of POPs in their fatty tissue. Because the marine food chain is longer, humans who eat marine mammals are at highest risk for exposure to POPs from ingestion. (For more information about POPs, see www.pen.org)

White Phosphorus – The U.S. military has used white phosphorus in pyrotechnics and incendiary munitions. It is found in both water and sediments, and reacts rapidly with oxygen in the air. It also reacts with oxygen in water, and does not persist longer than a few days once it is exposed to oxygen. In water with low oxygen, it may degrade to a highly toxic compound called phosphine, which eventually evaporates to the air where it changes to less harmful chemicals. White phosphorus is somewhat persistent in fish that live in contaminated lakes or streams. It is also somewhat persistent in soils where it may affix itself before it degrades, usually within a few days. In deep soil or sediments with little oxygen, however, white phosphorus can persist unchanged for many years. It is this context in which white phosphorus is most threatening to the wildlife and waterfowl with whom it comes into contact. Acute, short-term (immediate) exposure through food sources is known to be deadly to waterfowl based on studies conducted at Fort Richardson. Its effects on other wildlife with long-term exposures are not as well understood.[23]

Little is known, either, about long-term health effects in humans exposed to white phosphorus. Breathing white phosphorus for short periods is known to cause coughing and irritation of the throat and lungs. Breathing white phosphorus for long periods may cause a condition known as phossy-jaw, which involves poor, wound healing of the mouth and breakdown of the jawbone. Contact with the skin while burning may cause burns and liver, heart, and kidney damage. White phosphorus causes reproductive effects. Inhalation of vapors may irritate the nose, throat, lungs, skin, eyes, and mucous membranes. Ingestion may cause liver, heart, or kidney damage, as well as vomiting and death. Based on current information, white phosphorus is not believed to cause cancer in humans.[24]

Environmental Fate and Transport: Pathways of Exposure

The implications of such widespread contamination at these Superfund sites can be better understood with awareness of how humans and animals become exposed to these chemicals of concern (**routes and pathways of exposure**) and how these chemicals travel through and operate in the environment (**fate and transport**). Critical to both these factors are the geological and geographical contexts into which the contaminants have been released. The terms in bold are those used in risk assessment.

Routes and pathways of exposure and exposure media For humans, there are three basic routes of exposure:

- *Dermal absorption*: absorption of the chemical through the skin. The primary occurrence is through exposure to contaminated soil and/or water.
- *Inhalation*: breathing in contaminants that are in the air. This is a very important pathway in the case of chemicals that volatilize easily (transformation into gases or vapors, like steam), such as PCBs, or which attach onto very small particles of dust easily breathed in during normal respiration. Chemicals present in household water are easily absorbed both dermally and through inhalation from volatilization during bathing, cooking, and washing.
- *Ingestion*: eating food or drinking beverages that are contaminated, or swallowing particles of dirt or dust to which contaminants have attached themselves. Food can be contaminated in two significant

ways. The contaminant can be in the food itself, such as fish or mammals which have themselves eaten prey contaminated with a chemical, dairy products made with contaminated milk, produce that has been treated with pesticides, herbicides or fungicides that are taken up systemically into the plant, or food that has been grown in contaminated soil. The contaminant can also be on the food, such as residues that remain from spraying with pesticides or herbicides or contaminated dust that has settled onto the plant.

Exposure pathways refer to routes by which chemicals travel from the sources of the contamination into the environment where humans and animals become exposed. The three most common pathways are through environmental media such as air, water (surface water or groundwater), and soil.

In reviewing Alaska Superfund administrative records, most agency documents address soil and water contamination exclusively, even though air migration is also a relevant pathway. This is a gross oversight if historical practices at the site resulted in significant emissions into the air, which can travel miles as a result of air deposition (tiny particles of toxins that travel though the air to be deposited at an entirely new location).

This is also true with the volatilization of chemicals when exposed to the air. Although once considered insoluble in water and not susceptible to volatilization, recent research has demonstrated that PCBs and other persistent organic pollutants do in fact volatilize. When this happens, they are transported on air streams north to colder climates where they are redeposited into water bodies and snow, where they migrate up the food chain. Once in the arctic environment, they move up the food chain, from small aquatic organisms, to fish, and then to seals, bears, or whales, where they concentrate in the blubber of these animals. Because PCBs lodge in fatty tissue, they become more concentrated with each successive movement up the food chain. When humans eat these animals, the PCBs are transferred again, ending up in human fat and blood, and concentrating in the breast milk of human mothers who then transfer these chemicals in a more concentrated form to their nursing infants. Yet, the impacts of air contamination, both on humans and in the environment, are not factored into damage evaluations or risk assessments related to these Superfund sites. They should be.

The EPA's decision not to address air pollution and deposition as a pathway of contamination is a problem for accurately assessing impacts to humans and the environment. This is particularly relevant for potential contamination that extends beyond the boundaries of a Superfund site to nearby or downstream areas. At several sites reviewed for this document, no investigation was made to determine whether traditional hunting and fishing areas within site vicinity were contaminated by air deposition, potentially affecting river water, sediments, flora and fauna. This omission seriously jeopardizes the adequacy of the risk assessment and subsequent chosen remedy for remediation. Moreover, it casts serious doubt on the adequacy of the environmental justice analysis for several of the sites.

Risks and Remediation:

Risk Assessment

The risk assessment process is one of the most important aspects of the Superfund cleanup effort. EPA's stated policy is that remedies for each site are driven by what will maximize protection of human health and the environment. Yet, there are many problems associated with the risk assessment and with the methods used by EPA.

Risk assessment is based on the premise that a certain number of human and non-human deaths and a certain amount of environmental degradation are acceptable. In this model, activities that are known to cause harm are accepted, as long as the harm is not too great. How is the degree of harm calculated? Through a complicated process called "quantitative risk assessment," which is described below. Basically, it is the process of estimating how much damage may occur if a certain activity or if a certain amount of exposure to a chemical takes place. Risk assessment isolates certain activities, individual chemicals, and the age, weight and diet of people in order to estimate this damage. Yet, life does not take place in such isolation. Life is a complex web that depends on the health of all its members in order to be healthy as a whole. As scientist Mary O'Brien points out, "it is not acceptable for people to tell you that the harms to which they will subject you and the world are safe or insignificant. You deserve to know good alternatives to those harms, and deserve to help decide which alternative will be chosen."[25] This is what we advocate, alternatives to risk – that is, alternatives to activities or chemicals that are known to cause harm.

Other problems are also inherent in risk assessment. Guidance documents used to determine risk are based on outdated information, from the 1980s and earlier. In the past decade, tremendous advances in research have revealed much more about known and suspected health effects from different chemicals. For example, little was known or understood about persistent organic pollutants, such as dioxin and PCBs in the 1980s. Current understanding is that risks from these chemicals are far more dangerous and far more subtle than previously thought. A Dutch study has shown exposure to PCBs can adversely affect not only physical health, but also intelligence, cognitive development, and other behaviors, such as over-aggressiveness.[26] None of these data are integrated into current risk assessments. Additional faults are discussed in more depth below.

EPA outlines several objectives for risk evaluations carried out during the remedial investigation phase:

- to help determine whether additional response action is necessary at the site
- to provide a basis for determining residual chemical levels that are adequately protective of public health
- to provide a basis for comparing potential health impacts of various remedial alternatives, and
- to help support selection of the no action remedial alternative (where appropriate)

In order to meet these objectives, two types of risk assessments are done: Human Health and Ecological.

Human Health Risk Assessment
This consists of a cancer risk assessment and a non-cancer hazard determination. Emphasis of this assessment is on the probability of developing cancer, although an equation for determining other risks is also included. According to the EPA, the cancer assessment is to provide an estimate of the excess lifetime cancer risk, which is the incremental probability of an individual developing cancer over a lifetime as a result of exposure to cancer-causing chemicals at a source area. In this scenario, the EPA considers an average lifetime to be 70 years and excess lifetime cancer risks between 1 in 1 million (1×10^{-6}) and 1 in 10,000 (1×10^{-4}) to be within the generally acceptable range. This means agency decisions as to the degree of clean up at each site is based on the risk of more than 1 in 10,000 people getting cancer over their lifetimes from exposure to the contamination.

The second part of the human health risk assessment is called a **hazard risk index**. This is done for chemicals believed to be non-carcinogenic. Acceptable levels of exposure are determined for a single chemical in a single medium (that is, one chemical at a time, looked at in one medium at a time), which does not adversely affect humans over their expected lifetime, with a built-in margin of safety, according to the EPA. The margin of safety is supposed to assure that members of vulnerable populations, children, the elderly, pregnant and nursing women, and the ill or infirm, are adequately protected. The margin of safety is also supposed to compensate for uncertainties in knowing exactly what dose may cause what is called an adverse effect. The non-cancer hazard assessment is very problematic for a number of reasons. The key problem is both the data and methods available for doing the assessment are extremely narrow and in many cases outdated and inadequate for accurately predicting true risks. In addition, it is unclear what approach is taken when a chemical is carcinogenic and has non-cancer effects.

In both types of human health assessments, the risks from each chemical are calculated one by one, for each substance found in the remedial investigation at the site. Two main problems arise from this approach.
Additivity: the risk of each chemical added to the risks of all the other chemicals of concern. The EPA clearly states additivity is considered in the non-cancer hazard assessment, however the same language does not appear in the cancer risk assessment, leaving the public with an unclear understanding of the Agency's approach.
Synergism: the risk that might occur from interactions between different chemicals, including carcinogens and non-carcinogens. Synergism is not evaluated at all because no method currently exists for doing so. However, frequent documented interactions have been found to be of significance in epidemiological studies. Smoking, for example, is known to interact with benzene inhalation exposure to increase the risk of lung cancer. Unfortunately for the communities exposed, these types of issues are considered outside the purview of the Superfund risk assessment context.

Ecological Risk Assessment
This assessment focuses on impacts from the contaminated site to animals and the environment. This is of particular importance in Alaska, where military activities often encompass thousands of acres, rendering the potential for impacts on wildlife, including fish and birds, and large animals used for subsistence, significant.

An **ecological hazard index** is calculated, similar to the calculation for risk to human health. In this one though, specific animals, called indicator species, are selected to determine the potential exposure and effects in these species from chemicals in the source areas. The lack of synergistic effects and compound exposures is also a problem in this type of assessment.

Because the mathematical methodologies used in these assessments are quite complicated, this document will focus on the more important aspects of Superfund risk assessments. Discussions will focus on the methods and criteria used to carry out the risk assessments at the Alaska military sites, the conclusions, and the implications of the decisions that were made as a result.

Methods

The methodology used by EPA to do risk analysis at Superfund sites is called **quantitative risk assessment** (QRA). QRA follows five fundamental steps to derive the risk assessment estimates:

- Identification of the chemicals of concern
- Exposure assessment, what are the pathways and routes of exposure
- Toxicity assessment of the chemicals of concern
- Risk characterization, a synthesis of the first three steps
- Analysis of uncertainties which identifies all the factors that mitigate the accuracy of the risk assessment

1. ***Identification*** of the **chemicals of concern** is done at the beginning of the Superfund process at any site, during both the preliminary site evaluation and again in the remedial investigation. Identification is based on knowledge of what activities occurred at the site and what chemicals were used, (or, in the cases of landfills, who used the site and what wastes went into it). Finally, the most important method of identifying contaminants at a site is testing samples of various media from various locations at the site and comparing contaminant levels found in these samples to levels which are considered background levels. Agencies may use background levels to excuse themselves from the necessity of clean up, though, as was the case at Fort Richardson Open Burning/ Open Detonation pit. The unlined pit was used for years to openly burn a variety of fuels, munitions and other items for which the Army no longer had a use. Although high levels of heavy metals were detected at the pit, no further action was deemed necessary for clean up because background levels of the nearby Eagle River Flats were no higher. Its highly likely the background levels at Eagle River Flats were high due to leaching from the pit, located at a site both uphill and in highly porous gravel. This misuse of risk assessment leaves one to question the Army's commitment and integrity with regard to clean up at the other sites on the base. (See the report *Fort Richardson Army Base Fact Sheet*)

2. Next step is the ***exposure assessment***, which determines by what pathways nearby human populations and the environment (including wildlife) may come in contact with the contaminants. For example, suppose drums leaking a toxic substance are found buried at a site yet the area in which they are found has no contact with either groundwater or surface water, and they're buried under several feet of soil far removed from regular human use. Suppose further that in this urban setting there is little wildlife. Because of all these conditions, even though the chemicals may be extremely toxic, the exposure risk may be assessed as very low. The rationale would be its very unlikely there would be significant human or animal contact with these chemicals through the air, water, or from the soil. This low-risk assessment would be an important factor in determining the cleanup remedy which, in this case, might well be fencing and monitoring access to the area, a remedy called institutional controls. Geography, hydrology, and physical setting of the site are very important in this step.

This step also includes the **quantification of exposure**, meaning how much of the contaminant is available for exposure and absorption through one of the routes of exposure previously described (skin, lungs, gut). Determining this involves figuring out at what concentration the contaminant is present, identifying the maximum exposure level, based on the routes and pathways of exposure, and determining the toxicity of the contaminant - which may be also related to how persistent they are.

The EPA uses several different methods to determine these values for the risk assessment. Two important ones are NOAEL, or the **no observable adverse effect level** and **maximum contaminant level** or MCL. NOAEL is the level below which no effects are seen (based on animal testing in a laboratory and in some cases, human epidemiological studies). If contaminants are found below these levels, they are not considered to present a significant risk. MCL refers to the highest level of any given contaminant that either U.S. EPA or the state agency considers acceptable in the water, soil, or air. It is not referred to a safe level, but rather as the highest level that can be allowed for which the risk of harm is acceptable under the regulatory structure.

Part of the problem with these methods is dependence on the assumption that all chemicals strictly follow what is called the traditional dose-response effect. This is a fundamental precept of toxicology, based on the belief that the higher the dose, the greater the effect. In reality however, very little is known about how numerous chemicals – both carcinogens and noncarcinogens (cancer-causing and non-cancer-causing) – actually act in the human body, other than at extremely high doses. The assumption that lower doses over a long period of time (chronic exposure) pose less of a risk than higher doses over a short period of time (acute exposure), yet this assumption is currently being challenged by research related to endocrine-disrupting chemicals. These studies suggest that very short-term, quick exposures to very low levels of certain persistent organic chemicals may be enough to disrupt the development of key systems in children and fetuses. In addition, studies now indicate that the timing of exposure is very critical. Children, pregnant and nursing mothers, chronically ill people, and the elderly are much more vulnerable to exposure than other segments of the population.

3. The ***toxicity assessment*** plugs in the measure of how toxic the chemicals are to the affected community. This takes into account concentration of the contaminant, how toxic the particular contaminant is, and any uncertainties that may exist. For example, it is well known that steel mill workers who labor in the coke ovens where coal is turned into fuel are exposed to high levels of benzene. This puts them at a higher risk than the general population for certain cancers. However, if these workers also smoke, those cancer risks are increased ten times. This is called synergism. This opens the door to many questions: Is there an even greater risk from being exposed to benzene and other volatile organic chemicals (VOCs) at the same time? Is there an increased risk from being exposed to heavy metals such as lead or nickel while also being exposed to VOCs? What happens if a person is exposed to multiple chemicals and is taking medications? Very little is known about these synergistic effects, yet it is the risk assessor's job to make assumptions to cover these gaps, or uncertainties, so that a quantitative risk number (the level of acceptable risk) can be arrived at.

4. After all the information has been gathered and analyzed, calculations are done to determine the ***risk characterization***. The purpose is to look at all the different factors which influence the risk: the risk of the chemicals themselves, the amounts of the chemicals at the site, the pathways and routes of exposures, the way the chemicals behave in the environment, the characteristics of the populations and environments at risk, and the assumed future uses of the area being evaluated. The risk characterization is a key step, because the decisions made at this step drive all cleanup decisions that follow.

Implications of the risk assessor's assumptions are significant. If there are highly toxic chemicals at a site, yet the risk assessor determines there are no significant pathways by which human or animal populations will be exposed, the level of cleanup will be very different than if it had been determined the toxins were more readily available. These decisions are greatly influenced by the assessors level of knowledge and understanding of the history and geography of the site and its surrounding environs; site activities and chemical usage, wildlife migration routes, and areas used for traditional hunting all form a complex web that, if not well understood, will result in the perpetuation of environmental injustices. Local knowledge from Tribes must be included on equal par with government agencies. In Alaska there are many risk assessment aspects to consider that are different from other regions in the country. For example, a large percentage of Alaska Native peoples rely on marine mammals, wildlife, fish, and birds for subsistence food sources. These animals travel vast distances and may be taken from areas not directly adjacent to a Superfund site. In addition, many of the pollutants from Alaska's military Superfund sites include those that are environmentally persistent and bioaccumulate in the far north, the very region where there is more reliance on subsistence activities.

5. The final step in risk assessment is the acknowledgement of uncertainties in the process: the ***analysis of uncertainties***. At all five Superfund sites, these uncertainties are listed. Using the Fort Wainwright Operable Unit-1 Ecological Risk Assessment as an example, the EPA lists no less than ten significant uncertainties which may have overestimated or underestimated the risk. These include:

- No pesticide data were available for down gradient Chena River sediment sampling locations;
- No organic [i.e., plants, biota, etc.] data were collected for surface water samples;
- Speculative assumptions were made to generate tentative toxicity reference values for inhalation by burrowers. It is unknown whether these assumptions underestimated or overestimated exposures; and
- Although no significant risks were indicated with the measured surface water concentrations in the Chena

River, the collection of only one surface water sample [emphasis added] allows for only limited analysis of potential impacts due to potential transport of chemicals of potential ecological concern from the source area.

Considering that potential transport of chemicals from the source area is a key environmental justice concern, and a crucially important aspect of determining whether there are downstream impacts from a Superfund site, the implications of the uncertainties involved in the risk assessment process cannot be underestimated. The most important criticism of the quantitative risk assessment method is its inadequacy for assessing risk for all affected populations. This is particularly true in terms of risks to children and other more vulnerable populations. Most risk assessments are based on risks to an average adult male who weighs 70 kilos. According to a 1999 article in the National Institute of Environmental Health Services monthly publication, *Environmental Health Perspectives*, however:

> Three to 4 million children and adolescents in the United States live within 1 mile of a federally designated Superfund hazardous waste disposal site and are at risk of exposure to chemical toxicants released from these sites into air, groundwater, surface water, and surrounding communities. Because of their patterns of exposure and their biological vulnerability, children are uniquely susceptible to health injury resulting from exposures to chemical toxicants in the environment.[27]

The current method of addressing the risk to children is to increase the level of acceptable risk by one magnitude in the risk characterization process, but as Landrigan points out:

> Children form a unique subgroup within the population who require special consideration in risk assessment. Children are not little adults. Their tissues and organs grow rapidly, developing and differentiating. These development processes create windows of great vulnerability to environmental toxicants. Furthermore, the exposure patterns of children to environmental chemicals are very different from those of adults.[28]

The combination of uncertainties inherent in quantitative risk assessment are compounded at the Alaska's military Superfund sites by the fact that there may be a significant population who rely for subsistence on fish and wildlife which may have been contaminated by the sites. Not only are these populations likely to eat a greater range of animals than recreational hunters, but also consume far higher levels. Finally, unlike the population of sport and recreational hunters and fishers, subsistence users include significant numbers of children and adolescents. Current risk assessment methods do not adequately address any of these factors, yet are fundamental in order to render environmental justice and to ensure protection of human health, as is mandated under CERCLA.

Important to note are some of the unique qualities of Alaska's population. First, a high percentage of all Alaskans supplement their diet with food they have hunted, fished or gathered. Second, many rural and non-rural Alaska Natives still rely on traditional foods for a large part of their diet. These communities are often using the same land and water for hunting, fishing and gathering that the military has used for strategic defense sites. Assessments used by the EPA, which use foods consumed elsewhere in the United States for their evaluation, give an inaccurate picture of the risks faced by Alaskans in general and Alaska Native peoples in particular.

Many risk assessment assumptions, therefore, are made based on average circumstances which may or may not reflect the reality at the site itself. Often, decision-makers lack the scientific data to assure confidence of no harm. Especially if Tribes have not been included as an equal partner in the process, assessors run the danger of lack of critical information, such as the location and use of traditional grounds. Risk assessments also do not account for the cumulative threat of long-range transport of contamination in addition to local sources. People in the north are more likely to be more exposed to contaminants such as POPs, which accumulate in northern environments, wildlife and people. Studies of populations such as the Inuit, who rely on marine animals as part of their subsistence diet, demonstrate that their blood PCB levels are high, and Inuit women have some of the highest levels of PCBs in their breast milk of any population in the world.

Many scientists, environmental health and justice activists, and public health officials believe that the methodology that should be used instead of quantitative risk assessment is the precautionary principle, which includes providing a range of alternatives to risk. The precautionary principle dictates an emphasis on prevention of harm, rather than on limitation of effects, which is the underlying construct of quantitative risk assessment.

This discussion of some of the ideas and principles of risk assessment methodologies used by EPA has been included in an effort to give affected communities a basis on which to judge whether proposed and on-going cleanup activities at sites are acceptable to them. When evaluating various cleanup remedies, the questions to keep in mind are how protective is it? How permanent is it? And is the amount of money being spent on it going to be worth the degree of confidence that risk has been reduced when it is finished?

Cleaning up the site removal and remediation

Superfund cleanup mandates do not return the contaminated site to zero. In the United States, the environmental regulatory framework does not eliminate chemical contamination, but only attempts to control and manage it. In many instances contaminants may be found at a site and cleanup does not actually occur. The CERCLA approach looks at each chemical separately and independently of the others, and incorporates no mechanism for their aggregate effects. Each risk assessment is conducted as if it were being done on a blank slate where no other exposures occur. In the real world multiple exposures often occur. All risk assessments using this method are fraught with uncertainties that underestimate actual exposures, and the risks associated with them.

Superfund legislation also limits the parameters of the cleanup to include only chemicals which meet EPA's definition of "hazardous." A partial list of chemicals exempted from Superfund are: fly ash and bottom ash from burning fossil fuel, cement kiln dust, radioactive waste, waste oil and waste burned as fuel, and recycled waste. In order to understand the remediation decisions made under Superfund, it is important to remember that if a substance is not officially considered hazardous it does not factor into the risk assessment.

Criteria and types of remedial action

The National Contingency Plan mandates that nine criteria be used to evaluate all remediation alternatives considered for any hazardous waste site. The first two are considered threshold criteria, which means they must be met by all cleanup alternatives:

- Overall protection of human health and the environment
- Compliance with applicable or relevant and appropriate requirements (known as ARARs); that is, compliance with all relevant state and federal regulations. The source(s) of releases in all media must be adequately controlled so as to reduce or eliminate, to the extent practicable, further releases of hazardous wastes (including hazardous constituents) that could threaten human health or the environment.

The next five criteria are called balancing criteria, which means they are used to compare different alternatives:

- Long-term effectiveness; that is, maintenance of reliable protection of human health and the environment effectively and permanently once cleanup goals are met
- Reduction of toxicity, mobility, or volume of wastes and contaminants through treatment
- Short-term effectiveness, that is, how long does it take and how protective is it while cleanup activities are being carried out
- Implementability, that is, that the alternative is technically and administratively feasible with the availability of the materials and services needed to effect the solution
- Cost

The last two criteria are called modifying criteria, which means that they are considered on the basis of the public comment:

- Acceptable to the state
- Acceptable to the affected community or communities.

Alternatives for Cleanup

For each source area at a Superfund site, several cleanup alternatives are proposed, ranging from no action to the use of a variety of engineering and remediation (cleanup) technologies, often in combinations. The determination of what is called the **preferred alternative** is based on how well the alternatives meet the above criteria.

The EPA describes the **no action alternative** as a baseline that reflects current conditions without any cleanup effort. This alternative is used for comparison to each of the other alternatives and does not include any type of monitoring or institutional controls. Other proposed alternatives may include **institutional controls, natural**

attenuation, and a variety of other active technologies that address the specific type of contamination; these are often referred to as "engineering measures." The different types of cleanup remedies are described below.

Institutional controls are non-engineering measures intended to prevent exposure to hazardous waste or hazardous constituents by limiting the use of land (including soil, groundwater, surface water or sediments) to specified activities. Institutional controls often mean fencing or posting "no trespassing" signs. According to law however, institutional controls are not a substitute for active or permanent corrective measures that are available and practical. Further, institutional controls are not intended to be the sole remedial action, even though they have been used as such at many military Superfund sites in Alaska.

Natural attenuation is a combination of the no action alternative with soils, air or water monitoring for the presence and concentration of the chemical for a specified length of time. It relies on the natural breakdown of contaminants *in situ* (that is, in their natural or original place) without additional treatment. The way natural attenuation (or reduction) occurs over time is dilution (less concentrated), biological and chemical processes, and volatilization (evaporation). It may be an extremely slow process, which can take 100 years to reach health-based cleanup levels. This includes air, water or soil sampling to determine whether or not the contaminant plume is expanding, and contaminant levels increasing over time.

A backup contingency treatment plan, such as **soil vapor extraction**, is frequently part of the natural attenuation alternative, should it prove ineffective based on monitoring. The length of the monitoring commitment is therefore critical to assure that contaminant levels are decreasing, and that they are not migrating. Natural attenuation is most acceptable in situations where the contaminants of concern have a relatively short half-life, meaning that they tend to break down in the environment in a relatively short time, and more importantly, where they are not readily available for transport through a pathway of exposure that would bring them into contact with the environment, including human and animal populations.

Active and complete cleanup measures are always preferable to leaving contamination in place. Instead, with natural attenuation, the EPA leaves the contaminants in place and relies on time and dilution for cleanup. Two additional drawbacks are it allows cleanup to proceed at a slow pace over a very long time, and relies on institutional controls under conditions for which those controls may be inadequate, such as institutional controls in a floodplain, as is the case as Ft. Wainwright. (See the report *Fort Wainwright Army Base Fact Sheet*, Operable Unit 3) What happens after 20 years if contaminants are still present in the groundwater and soil? Who will be responsible for monitoring and remediation at that point? What will happen if the military is no longer in charge of this site in ten, twenty, or one hundred years? Better alternatives, though more costly, need to found to eliminate this contamination permanently, rather than to expend resources on monitoring it for the next century.

Engineering measures and remediation technologies are site-specific alternatives are used in situations where permanent remediation is necessary to protect human health and the environment, and the chemicals must be removed from the source area or treated on-site with the goal of permanent elimination. Technologies include the following:

Excavation This is the removal of soils, buried materials, barrels, tanks, or all of the above. Where an *initial* removal action usually removes only the top layers of the soil and the visible or shallowly buried barrels, *excavation* typically removes soils as far down as possible. At Fort Wainwright, for example, one alternative for Operable Unit 1 is to excavate soil and barrels down to as much as 15 feet below the surface. Options for disposing of the soil include on-site or off-site treatment or disposal in a regulated landfill.

Alternative remediation methods include using hydrogen peroxide to break down contaminants to harmless elements. An added benefit is soils need not be disrupted to the degree they are when excavated.

Soil vapor extraction and air sparging Often referred to as **SVE**, this process physically separates contaminants from soil, the only medium (the surrounding environment; air, water or soil) in which it works. The chemicals are separated, or extracted, from the soil in the form of a gas. The vapor (gas) is then treated using a variety of methods including carbon adsorption (where the gases adhere to the carbon), incineration, or condensation. This is a very frequently used technology because it is cost-effective and relatively simple to implement. It has an additional benefit of stimulating natural bioremediation when oxygen is introduced. A companion process, called air sparging, is used when the contaminants are in a water-saturated medium, such as tundra. A potential drawback of this process is if inadequate incineration or filtering were used, it would then just transfer the contaminants from the original medium to the atmosphere. In general, however, this technology seems adequate for treatment of VOCs, although it does not seem to capable of completely eliminating all contaminants, which are then left to be addressed through natural attenuation and dilution.

Bioventing This process introduces oxygen to the subsurface soil environment. The presence of oxygen stimulates natural microbes (small organisms) in the soil that carry out biological degradation of petroleum contaminants in the soil. Sometimes bioventing is also effective in breaking down thin layers of floating petroleum products. Bioventing is used to prevent further leaching of contaminants from soil into groundwater.

No further action At several of the Alaska military Superfund sites, several source areas were eliminated from the evaluation process and designated as no further action sites. In general, this designation was based on one of three situations. In the first, a source area had already undergone a previous remediation process, either before the Superfund process began, or as part of an initial removal action in the early stages of the Superfund evaluation. If no further contamination was discovered at the site, it was decided that the earlier actions had been sufficient remediation. The second situation is one that occurred at several source areas at all the Alaska Superfund sites covered by this report. Source areas initially identified on the basis of anecdotal evidence, old documents or photographs were included in the list of source areas in order to undergo a CERCLA preliminary evaluation to determine whether any contamination actually existed, and if so, to what extent. In many instances the result was that no evidence of current or past contamination could be found, either because of earlier cleanup actions years earlier, or because the initial information was apparently incorrect. The third situation is one in which levels of contamination at the source site were found to be no higher than background levels of adjacent areas, as took place, for example, at the Open Burning/Open Detonation pit on Fort Richardson.

It is important that communities carefully review remediation options and not necessarily accept the choices provided by DoD or the EPA. Many effective cleanup technologies are being developed that may offer more complete, less harmful ways to address contamination problems. A website that provides information on alternative technologies is www.cpeo.org.

Environmental Justice and Military Superfund Sites in Alaska

Historically, reports show that low-income and minority communities in the United States bear a disproportionate burden of pollution in our society. Hazardous and other waste facilities, mining and other forms of resource extraction, nuclear plants and testing, and military activities are much more likely to occur in these communities. In Alaska, this is particularly true of military actions; the majority of their 700 or so installations and contaminated sites are in or adjacent areas where traditional subsistence activities take place.

For years minority communities have worked to bring the concept of environmental justice into public dialogue. Over the last 10 years, the federal government finally recognized the impacts of environmental injustice and put forward policies seeking to remedy the problem.

In 1994, President Clinton issued an Executive Order emphasizing that all communities and persons across this nation should live in a safe and healthful environment. He declared that remedying this environmental justice problem was a national priority and directed federal agencies to make environmental justice an integral part of their missions. As mandated by the "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," all U.S. agencies whose activities have environmental impacts were required to develop environmental justice implementation strategies specific to their activities. This included the Department of Defense (DoD), whose installations and activities, as noted throughout this report, have had a significant impact on Alaska's environment and its peoples. In 1998, President Clinton issued an additional Memorandum[29] that specifically ordered consultation with Indian/Native Tribal governments in the development of regulatory practices on Federal matters that significantly or uniquely affect their communities.

It has to be recognized that much of the work done at the various sites was completed before these Executive Orders. Still, much of the cleanup operations at Alaska's military Superfund sites have occurred after these Executive Orders and to the DoD's environmental justice policies in 1995. How, then, has DoD's approach to Tribes changed once these policies were instituted? A short review of Alaska reveals two key factors fundamental to the disposition of land rights and ownership in Alaska. First is the deeply held and long-institutionalized belief in a system of private property and the supremacy of the individual landowner in determining land use. Historically unrecognized is that the current land-ownership belief system is entirely culturally based, and is vastly divergent from that held by Native peoples in Alaska. The historical record of appropriation of Indian/Native lands in Alaska by the U.S. military is an integral aspect of the history of the U.S. military's presence in Alaska, which has a significant impact on the implementation of environmental justice initiatives.

Ownership and land use exclusively to the benefit of a single entity, such as a corporation or the military, was not introduced into Alaska and did not begin to achieve dominance until Russian occupation of Alaska in the late 1700s. Prior to that, lands were held in common, as a shared resource, very much the same as other indigenous peoples in North America before the arrival of Europeans to the continent. Even we may not agree with much of the Alaska Native Settlement Claims Act of 1971, nonetheless this pattern of lands held in common is retained in its modern form with the boundaries of Alaska Native corporations.

Although some efforts were made by Alaska Natives to win back their lands in the early 1900s, with the passage of the Native Allotment Act of 1906, the U.S. did not acknowledge Native sovereignty over their lands in any form until 1971 with the passage of ANSCA. By this time, however, the U.S. government had unilaterally taken over millions of acres of land for military installations established throughout the state.Second is the practice of EPA and its CERCLA program to define as narrowly as possibly the population(s) that has been affected by the contaminated site(s). This practice severely limits the extent of investigation and assessment undertaken, which then affects the scope of remediation activities. Because EPA considers the population who may be affected as those who are immediately neighboring the Superfund site, downstream communities are frequently excluded from consideration.

Consistent with this historical practice, of Alaska's five military Superfund sites, only one (Adak) looked beyond its boundaries. The other four military (Eielson, Elmendorf, Ft. Richardson, and Ft. Wainwright) narrowly defined the primary population of concern as the military and civilian populations living or working in the main base area in closest proximity to where the operable units are located. In the event that the contaminated sites are considered remote from those population centers, the affected populations have been considered workers at the site or potential future residential or occupational inhabitants. In only one instance were off-base impacts considered, in a situation in which churches close to installation boundaries used well water from the Chena River. In not a single instance, however, was the potential for downstream impacts from on-base contamination acknowledged or discussed, nor was there any acknowledgement or discussion of Alaska Native interests or potential impacts on Alaska Natives, their lands, or their hunting and fishing grounds downstream of the contamination sources but outside of base boundaries.

If the military had previously investigated whether there were Native allotments or other Alaska Native lands upon which there may have been impacts from the contamination, no documentation of such was available. It is important to acknowledge this narrow interpretation of the Superfund mandate is not limited to military applications. Still, it is crucial to recognize that by imposing the narrowest interpretation of population and environmental impacts on the Superfund process, an inherent and irreconcilable barrier to meaningful implementation of environmental justice has been created.

Environmental justice goes unacknowledged in all the Superfund records available for this analysis. For all intents and purposes, the issue of Alaska Natives as a population that may be uniquely affected is entirely absent, which is a direct violation of the Executive Order and DoD's own policy mandates, which are listed below.*Department of Defense Strategy on Environmental Justice*:

- Affected communities will be partners in the process to address these concerns; together we will build a foundation that reflects an awareness and understanding of environmental justice issues. . .
- DOD will improve existing outreach and communication systems to include environmental justice stakeholders. . .
- DOD installations will . . . increase the use of . . . non-traditional news organizations that may be primary sources of information for minority and low-income populations . . .
- Identify the patterns of consumption for, and communicate the health risks to, populations who principally rely on fish and/or wildlife for subsistence at DOD U.S. installations . . .
- Encourage stakeholder participation in the implementation of the Executive order. Improve existing outreach and communication systems to include Environmental Justice stakeholders.[30]

From *Department of Defense American Indian and Alaska Native Policy*:

> These principles are based on tribal input, federal policy, treaties and federal statues. The DOD policy supports tribal self-governance and government-to-government relations between the federal government and tribes.[31]

Two articles of the *American Indian and Alaska Native Policy* are particularly relevant to this discussion. The first is Article III, which recognizes a "unique and distinctive political relationship" between the U.S. and tribes that requires the DoD to "provide affected tribes an opportunity to participate in the decision-making process" in any situations in which tribal lands are affected. This consultation is to occur on a government-to-government basis, occur with timely notice, in good faith, with the objective of developing and maintaining effective communications, coordination and cooperation with tribes. In Article IV, entitled "Natural and Cultural Resources Protection", the first point states that the DoD will undertake actions and manage DoD lands "consistent with the conservation of protected tribal resources and in recognition of Indian treaty rights to fish, hunt, and gather resources at *on and off-reservation locations*."[32] [emphasis added]

Unfortunately, based on a review of its own public documents, there is little indication the military recognizes that any of its operations which resulted in CERCLA remediation had or have a potentially on-going environmental impact on Alaska Native lands or subsistence fishing, hunting or gathering resource areas. Nor is there indication that it has been necessary to include tribal governments in negotiations related to the disposition of these sites since at least 1994.

Further complicating the assurance of environmental justice can be lack of revealing relevant information. For example, beluga whales, which have been hunted by local tribes for centuries, were in serious decline in the 1990s. The National Marine Fisheries Service (NMFS) has monitored beluga counts and conducted studies in order to determine the cause of decline. Throughout, the Army never revealed sightings by their biologists in Eagle River Flats. This information came to light only through discovery after Alaska Community Action on Toxics brought suit against the Army for their failure to adequately address white phosphorus contamination at the CERCLA site. This is significant in a number of ways; first, contamination at Eagle River Flats may have contributed to beluga decline, yet without this information NMFS would not know to test the whales for toxics present at the site. Second, without fulfilling their obligation to include Alaska Native peoples on a level on par with other involved agencies, remedial action decisions at Eagle River Flats may be inadequate. Third, had local Tribes been involved since the beginning, they would likely have had the historical knowledge about beluga feeding patterns, which could have made a significant contribution to risk assessment and remedial action decisions.

This illustrates what may be considered the most egregious and offensive violation of the environmental justice policies by the military at these Alaskan sites – the consistent failure to include tribal governments as equals in multilateral agreements regarding cleanup decisions. Although the policies are very explicit that in all multi-party governmental negotiations, tribal governments must be included on an equal basis, there was not a single instance in which this occurred. The multi-party agreements at the sites are agreements between the state of Alaska and the federal government, or the state and the military and the federal government.

Defining the scope of cleanup within specific military base boundaries further compounds the invisibility of tribal interests. This is one of the issues brought forward in "Inventory of Environmental Impacts to Indian Lands Resulting from Former Military Activities in Interior Alaska", a 1997 report by the Tanana Chiefs Conference. The report clearly documents the lack of communication and inclusion by the military in remedial action decisions. The mandate that tribal governments be included in the decision-making process from the beginning has yet to be part of the equation In Alaska; the entire CERCLA (Superfund) process is assumed to be completely independent of Alaska Native interests or empowerment.

At the time of this writing, EPA Region 10 is conducting an inventory of Formerly Used Defense Sites (FUDS) in Alaska, which they expect to be complete by the end of 2003. Each site will then have a CERCLA review conducted. Many of these sites are heavily contaminated and affecting nearby communities, such as the Northeast Cape site on St. Lawrence Island, or the FUDS in Galena. It would be extremely interesting to see what the response would be to tribal government efforts to become equal partners in future cleanup processes, and to gain standing in the current reevaluation processes occurring every five years. Undoubtedly, there will be ample opportunity.

This review reveals there have been serious deficiencies throughout the CERCLA process in implementing environmental justice policy at four of Alaska's five military Superfund sites. Even in the Final Community Relations Report for the Environmental Restoration Program at Elmendorf Air Force Base, released in 2000, there is no section or discussion devoted to environmental justice. While it may be true, as one representative from Eielson Air Force told the authors by phone, no Native lands were, in fact, affected by military contamination at any of the sites reviewed by ACAT. However, the repeated failure of the military to explicitly discuss environmental justice concerns within the context of its larger analysis of contamination and remediation at any of these sites, violates both the spirit and word of the environmental justice executive order, subsequent policy directives, and the DoD's own policies. More importantly, it is an indication that this failure is not the result of the actions of a particular individual at the community relations or technical implementation level; to the contrary, it represents an institutional failure to address the issue in any meaningful way, and originates at the highest levels of command. Finally, it is important to reiterate that an executive order is, unfortunately, not a regulatory document and is therefore not illegal to ignore. Thus, until policies are enacted into law, there is little reason to believe the institutions will change. What can cause this shift, though, is continued pressure from affected communities and tribes, grassroots organizing efforts, and independent scientific review by advocacy groups.

If community members or tribes have an issue or complaint about environmental justice being served, and neither DoD nor EPA is responding, Region 10 has an Ombudsman office that may be able to assist. Either call EPA toll free at 800.424.4372 and leave a message for the ombudsperson, or call directly at 208.378.5761.

<u>Glossary of Terms:</u>

ATSDR: Agency for Toxic Substances and Disease Registry; a division of the Centers for Disease Control and the agency in charge of human health issues at Superfund sites; www.atsdr.cdc.gov

CERCLA: Comprehensive Environmental Response, Compensation and Liability Act of 1980; official name for Superfund; www.epa.gov/superfund/whatissf/cercla.htm

CERCLIS: Comprehensive Environmental Response, Compensation and Liability Information System; lists abandoned hazardous waste sites the EPA considers for clean up; www.epa.gov/enviro/html/cerclis

EPA: Environmental Protection Agency; www.epa.gov

HRS: Hazard Ranking System; a scoring system that determines whether or not a CERLIS site makes it to the NPL; the current scoring is 28.5 out of a possible 100

NPL: National Priority List; the most contaminated sites in the country, these are the only ones that qualify for remedial action

Removal Action: more common type of Superfund action; immediate, short-term responses, often to an emergency spill or potential contamination to groundwater

Remedial Action: type of clean up reserved for the most heavily contaminated sites in which long term actions take place, can also refer to the phase in which actual clean up takes place

Remedial Action Terms:

PA/SI: Preliminary Assessment and Site Inspection; the first two phases in which EPA determines whether or not the site will be listed on the National Priorities List

RI/FS: Remedial Investigation and Feasibility Study; if EPA decides to clean up the site, this is the phase in which the agency determines how

ROD: Record of Decision; document that officially announces how the site will be cleaned up; public is given a specified time in which to make comments; follows the feasibility study

RD/RA: Remedial Design and Remedial Action; the actual clean up – design, construction and clean up

RCRA: Resource Conservation and Recovery Act of 1976; agency that tracks hazardous waste from its creation to its disposal

TAG: Technical Assistance Grant; monies a community may request in order to hire an expert to assist interpreting the technical aspects of clean up

Footnotes:

[1] *RAB Resource Book, Forming a RAB*, www.dtic.mil/envirodod/Policies/RAB/forming_rab.htm

[2] Executive Order 12898, Federal Actions To Address Environmental Justice In Minority Populations And Low-Income Populations, president William J. Clinton, 1994, www.fs.fed.us/land/envjust.html

[3] "Department of Defense American Indian and Alaska Native Policy," October 20, 1998, William S. Cohen, Secretary of Defense, www.bauuinstitute.com/Articles/DOD1998.html

[4] *Defend Our Health: The U.S. Military's Assault on Communities, A People's Report to Congress,* a joint report by the Military Toxics Project and Environmental Health Coalition, May 2001

[5] Ibid

[6] The Precautionary Principle has appeared in various forms since the Wingspread Statement on the Precautionary Principle; full text at www.sehn.org. As agreed upon in the Declaration on Environment and Development (United Nations Environmental Summit, Rio de Janero, 1992), the precautionary principle states that where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

[7] Ibid

[8] http://www.eces.org/earth_crash/showarticle.php?id=291#sources

[9] Lapham, W and Tadayon, S, "Plan for Assessment of the Occurrence, Status, and Distribution of Volatile Organic Compounds in Aquifers of the United States," 1996, United States Geological Survey, National Water-Quality Assessment Program, http://wwwsd.cr.usgs.gov/nawqa/pubs/ofr/ofr96.199/body.html

[10] Benzene Fact Sheet, ToxFAQs: www.atsdr.cdc.gov/toxfaq.html

[11] ToxFAQs: www.atsdr.cdc.gov/toxfaq.html

[12] Benzene Fact Sheet

[13] Ibid

[14] ToxFAQs: www.atsdr.cdc.gov/toxfaq.html

[15] Ibid

[16] www.epa.gov/reg3hwmd/bfs/regional/analytical/semi-volitile.htm

[17] Nitrobenzene Fact Sheet, ToxFAQs: www.atsdr.cdc.gov/toxfaq.html

[18] Polycyclic Aromatic Hydrocarbon Fact Sheet, ToxFAQs: www.atsdr.cdc.gov/toxfaq.html

[19] Ibid

[20] Ibid

[21] Weisglas-Kuperus, N, S Patandin, GAM Berbers, TCJ Sas, PGH Mulder, PJJ Sauer and H Hooijkaas. 2000. *Immunologic Effects of Background Exposure to Polychlorinated Biphenyls and Dioxins in Dutch Preschool Children*

[22] "The Inventory of Sources of Dioxin in the United States," U.S. EPA, 1998, Office of Research and Development, EPA/600/P-98/002Aa, External Review Draft, April

[23] ToxFAQs: www.atsdr.cdc.gov/toxfaq.html

[24] Ibid

[25] O'Brien, M, MIT Press, Cambridge, Massachusetts, 2002, *Making Better Environmental Decisions: An Alternative to Risk Assessment*

[26] Weisglas-Kuperus, et al

[27] Landrigan PJ; Suk WA; Amler RW. Chemical wastes, children's health, and the Superfund Basic Research Program. Environ Health Perspect 1999 Jun;107(6):423-7.

[28] Landrigan PJ. Risk assessment for children and other sensitive populations. Ann N Y Acad Sci 1999;895:1-9

[29] Government-to-Government Relations With Native American Tribal Governments, April 29, 1994, President William J. Clinton

[30] Department of Defense "Strategy on Environmental Justice," March 24, 1995, web.dandp.com/enviroweb/asn/ejletter.htm

[31] "Department of Defense American Indian and Alaska Native Policy"

[32] Ibid

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