

The Cold War's Environmental Costs: An Assessment from the United States*

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Examining the Cold War period today, some two decades since the fall of the Berlin Wall in 1989, it is hard not to view it as an era of waste: wasted funds on enormous military arsenals, wasted resources diverted away from domestic uses toward military ends and, perhaps most lingering and intractable of all, millions of acres of wasted, ravaged land and groundwater contaminated by toxic chemicals and radioactive waste.

In the United States, the most costly and concerted effort of the Cold War era was surely the development and maintenance of enormous nuclear arsenals. The U.S. government spared no expense in the top-secret Manhattan Project during World War II, an effort that remains one of the most expensive government programs ever undertaken.¹ Long since those initial costs, the job of amassing and maintaining the vast U.S. nuclear arsenal has continued to be tremendously expensive as well. In his 1998 study for the Brookings Institution, Stephen I. Schwartz calculated that 29 percent of all U.S. military spending between 1940 and 1996 went toward the development and maintenance of the nation's nuclear arsenal, amounting to a total of \$5.5 trillion in constant 1966 dollars, or an average of \$21,646 per U.S. citizen.² The vast majority of these expenditures occurred during the Cold War and derived from the central calculus of secrecy and "deterrence at any cost" that drove U.S. governmental decisionmaking during the period.

Still, even Schwartz's immense price tag fails to fully account for the environmental consequences of the U.S. military's nuclear program. Problems of serious radioactive contamination continue to fester today at each of the 17 major nuclear

* presented at an international conference on "The Economic and Ecological Consequences of the Cold War," sponsored by the Hamburg Institute for Social Research, Hamburg, Germany, September 2009.

facilities in the United States. The costs to clean up this lingering radioactive contamination are projected to exceed \$250 billion and the job will likely stretch out for decades more to come.³ This paper will examine the case of the Hanford Nuclear Reservation in Washington state as an example of such environmental consequences. As the case study illustrates, the cost projection above does not take into account the health effects known to have already occurred as workers and neighboring communities have been exposed to dangerous levels of radiation. In addition, it does not account for the continuing, looming technological hurdles that throw any projections into further doubt. At Hanford, for example, the key method proposed by the U.S. Department of Energy to remediate the site's liquid high-level nuclear waste site remains entirely unproven at the scale proposed.⁴

For all the attention the nuclear production facilities such as Hanford have received, however, they are dwarfed in numbers by another kind of environmental devastation, less sensational and publicly known but far more widespread and insidious: namely, the run-of-the-mill toxic contaminants that were carelessly dumped into the ground at virtually every U.S. military installation during the Cold War.⁵ Below vistas that are now often eerily quiet and clean looking, plumes of toxic chemicals such as solvents, heavy metals and explosive compounds have tainted soil and groundwater across the country on a truly shocking scale. By the Pentagon's own count, some 20,000 sites of contamination resulted from military activities that reached their zenith during the Cold War era.⁶ In fact, by almost any measure, the U.S. Defense Department is the single largest polluter in the U.S. For instance, the government agency is responsible for more than one tenth of the nation's 1,200 worst toxic sites listed on the so-called "Superfund" National Priorities List—far more toxic sites than have been created by any other single polluter.⁷ At these many locations across the country, millions of tons of toxic wastes have fouled thousands of square miles of soil and polluted the air and groundwater in nearby communities. While some of the military's thousands of polluted sites have been cleaned up, many of the most contaminated sites have yet to be fully remediated. In addition, as I will discuss in the case study involving the U.S. Army's Jefferson Proving Ground in Indiana, some facilities will likely never be adequately cleaned up, left instead to be written off as de facto "national sacrifice zones."⁸

It should be noted, of course, that the problem of pollution caused by the U.S. military long predates the Cold War. Some U.S. military arsenals and munitions factories, for instance, can trace heavy metal contamination to the production of Civil War-era munitions.⁹ Nonetheless, the bulk of the U.S. military's current environmental problems result from activities during the Cold War. This Post-WWII period marked a significant increase in the scale and intensity of heavy industrial practices at U.S. military facilities. It also coincided with a period of concerted environmental regulation in the U.S. beginning in the late 1950s—including the founding of the Environmental Protection Agency in 1970 and the establishment in 1980 of the so-called “Superfund” law for the cleanup of the nation's most serious hazardous waste sites¹⁰—during which the U.S. military, focused on Cold War imperatives, chose to simply ignore environmental laws. The prevailing view in the military during this period is exemplified in the oft-repeated quip by a U.S. Army base commander in Virginia speaking to a neighborhood group in 1984. The U.S. military, he explained is “in the business of protecting the nation, not the environment.”¹¹

It is no accident, then, that the extent of the U.S. military's long-neglected environmental problems began to surface publicly only as the Cold War wound to a close. The dire environmental picture came clearer in early in 1990, for example, when the National Governors' Association issued a particularly virulent condemnation of the federal government's handling of toxic wastes. In it, the states' executive officers expressed their collective outrage at the federal government's “blatant disregard” for its own environmental laws, and at a “hamstrung” EPA “forced to sit by as basic environmental statutes and regulations were routinely ignored” by military and other federal facilities.¹²

“Virtually every state has within its borders federally owned or operated facilities with environmental violations and compliance problems,” the report noted, adding that the U.S. government's facilities across the country operate “at health and environmental standards below the standards it mandates for private firms.”¹³ The report addressed all federally owned facilities, and criticized the reckless contamination wrought at the nation's 17 nuclear weapons production facilities run by the Department of Energy. Overall, though, for the breadth of its violations, the report singled out the U.S. Defense Department as the worst federal offender of all.¹⁴

Since the 1990s, a significant shift in public attitudes about environmental matters has occurred in the United States and the U.S. military has gradually acknowledged and recognized the scale of the problem as the cleanup process has ramped up. After years of study and delay, the U.S. Defense Department over the past decade has spent some \$42 billion on environmental cleanup efforts, averaging some \$2 billion annually for the past several years.¹⁵ The Defense Department will need to spend many billions more to complete the job but there is no question that some significant progress has been made in this period. Despite the progress, however, many intractable, complex, and dangerous toxic sites remain.¹⁶ Serious groundwater contamination continues in hundreds and likely thousands of communities neighboring U.S. military facilities. It has now come to light that, in many of these cases, the U.S. the military knew during the Cold War years that its pollution had migrated in groundwater to threaten neighboring communities' wells but still waited for years or even decades before notifying neighboring citizens of the imminent danger.¹⁷ Even today, amid a significant cleanup effort, the Pentagon has frequently continued to fight environmental regulation.¹⁸

Hanford Nuclear Reservation: Case Study of Radioactive Contamination

The Hanford Nuclear Reservation, a vast, 586-square-mile facility in the southeastern corner of Washington state, was established in 1943 as a top-secret installation to manufacture material for the Manhattan Project's atomic bomb.¹⁹ It has stood ever since as a monument to the Cold War's urgency, secrecy, and folly. Almost overnight, the U.S. government relocated a rural community of a few hundred homesteaders and imported some 20,000 employees from around the country—virtually none of whom had an inkling of the project's overall mission.²⁰ Laboring at a furious pace at this vast sagebrush desert reservation, these workers soon produced the world's first significant quantities of plutonium—the earth shattering and deadly substance used in the bomb the U.S. dropped on Nagasaki, Japan in 1945.

Today, more than sixty years since Hanford opened, the facility represents one of the most daunting environmental catastrophes the world has ever known. The Hanford installation, like the rest of the United States' nuclear production complex, is run by the Department of Energy—an outgrowth of U.S. efforts at the dawn of the atomic age to

place nuclear weapons technology under civilian control. Nonetheless, while these nuclear facilities lie outside Pentagon jurisdiction, the fact cannot obscure their unmistakably central military mission in the development of atomic weapons and in the fulfillment of the U.S. government's military policy goals during the Cold War era.

In addition to Hanford, another sixteen major facilities comprise the core of the United States' ongoing effort to amass and maintain its huge nuclear arsenal. Throughout the Cold War at these large, secret installations, nuclear material was produced and processed, nuclear weapons built and tested. Some of the facilities—like the weapons laboratories Los Alamos in New Mexico and Lawrence Livermore in California—specialize in research and engineering. Others, like Hanford or Oak Ridge in Tennessee, supplied the plutonium or enriched uranium—the materials that fuel the weapons' devastating explosive power. Today, some of these facilities have been forced shut due to the environmental dangers they present. A few, such as Rocky Flats in Denver, Colorado have undertaken substantial cleanup efforts already.²¹ But dire environmental problems remain at virtually all of them²², although, arguably, no other site quite matches the scale of the problems at Hanford.

In an unparalleled environmental nightmare, at least 750,000 gallons of deadly, high-level radioactive waste are believed to have leaked from Hanford's underground storage "tank farm" over the past few decades.²³ The liquid wastes, byproducts of the process of splitting uranium atoms to make plutonium, are among the world's most dangerous and highly radioactive substances.

Ironically, Hanford's tank farm was intended to provide only temporary storage for the highly radioactive liquid wastes generated from the processing of plutonium. In the nuclear weapons program's early years, no one was quite sure what to do with the unwanted bits of uranium left from the manufacturing process. As plutonium is produced, these fragments become so-called radioactive isotopes, unstable elements such as cesium-137, strontium-90, and iodine-129.²⁴ These byproducts emit large amounts of radiation as they try to regain a more stable form. Sixty years since the government began to dump these wastes in Hanford's tanks, however, no permanent solution has been found to the disposal problem posed by the liquid wastes.

The Energy Department began to build one-million gallon, double-shell tanks below ground starting in the 1970s. The agency acknowledges today that nearly half of the 149 single-shell tanks built prior to this time have breached.²⁵ The tanks' leaks

represent a piece of the cleanup quandary that still remains technically unresolved. The entire area surrounding the underground tank farm is devastated and dangerous. And the single-shell tanks themselves are still filled with corroding, highly radioactive sediment.²⁶

Of all the travesties that have recently come to light about the handling of radioactive materials at the Energy Department's facilities around the country, Hanford's underground tanks may be the most egregious. But they have much competition. At the Savannah River Plant in South Carolina, to name just one example, some 30 million gallons of radioactive liquids were dumped into the ground every year during the Cold War.²⁷ At this facility strontium-90—a known carcinogen—has been found in surface water at levels 43,000 times above federal government drinking water standards.²⁸ Drinking water in Atlanta, Georgia is also threatened by the Savannah River site.²⁹

In the aftermath of the Cold War, findings surfaced about the fact that Hanford officials covered up releases of radioactivity that threatened the health of the installation's workers and neighbors. In one of the most dramatic cases, documents released in 1986 after a court battle showed that Hanford officials knowingly and purposefully released enormous amounts of radiation into the air without warning or notifying anyone in the area.

In the aftermath of the national press coverage of the releases, a special independent panel was established by the Energy Department in 1988. After reviewing a total of nearly 60,000 pages of documents from Hanford, most of which had been previously classified, the panel concluded that the most dangerous airborne releases occurred between 1944-1947 when Hanford officials knowingly allowed *some 400,000 curies* of radioactive iodine-131 to spew into the atmosphere.³⁰ By comparison, the well-known 1979 accident at the Three Mile Island nuclear reactor in Harrisburg, Pennsylvania released *less than 30 curies*.³¹

The 1940s releases, the largest uncovered to date in the United States, took place during the reprocessing of uranium, when radioactive fuel rods were dissolved in acid to extract plutonium for use in nuclear weapons. Although the process continued at Hanford for decades, Energy Department officials maintain that changes in the technology and filtration systems used prevented further releases of similar magnitude.³²

Using a combination of investigative and statistical techniques, the panel's experts studied the releases to "reconstruct" the dose received by people in the area. Although iodine-131 decays to harmless levels within a few months, the panel determined that it would have been consumed by residents in milk from cows that grazed on contaminated grasses in the vicinity of the Hanford installation. According to the panel's findings, over this three year period, roughly five percent of the 270,000 residents—or some 13,500 people living in the vicinity—accumulated doses of radiation in excess of 1,300 millisieverts (mSv).³³ To put these releases in context, the current level of airborne radiation considered safe by the U.S. government for civilians living near nuclear facilities is 1 mSv per year.³⁴ Workers in nuclear power plants in the U.S. are limited to 50 mSv exposure per year to their entire body.³⁵

Since the panel's assessment, the U.S. Department of Energy has officially acknowledged that many thousands of citizens were unknowingly subjected to "significant" doses of radiation as a result of these secret airborne emissions.³⁶ It is a piece of the Cold War legacy that merits close consideration. Jack Geiger, a professor of medicine at the City University of New York Medical School who served as part of a task force studying Hanford's contamination, notes that Hanford's airborne releases "were not made out of ignorance." Rather, he says, "the exposures were the result of policy decisions that gave nuclear weapons production, at any cost, priority over the lives of the citizens whom the bombs were supposed to protect."³⁷ Geiger and others rightly fault Hanford officials' "irresponsible" judgment at the time. But there is little doubt that the government's deliberate endangerment of U.S. citizens is greatly compounded by its suppression of the information for four decades during the Cold War.

In the spring of 1989, officials from the Department of Energy signed a landmark cleanup agreement for Hanford with Booth Gardner, then governor of Washington.³⁸ The agreement, while laudable in intent, was most notable for dramatizing to the world the extent of Hanford's environmental woes. At the time, the projected costs of the 30-year cleanup program envisioned for this single facility were estimated at a staggering \$57 billion.³⁹ The enormous sum reflected the amount of waste involved—an estimated 30 million cubic feet of nuclear waste and perhaps as much as one hundred times that amount of contaminated soil. The government estimates that some 200 billion gallons of radioactive wastewater have been poured into the ground here, creating a plume of radioactive groundwater that stretches at least six miles to the Columbia River. Already,

levels of highly radioactive strontium-90 have been found to contaminate the massive river at levels 500 times federal standards.⁴⁰

During the 1940s, the team at Hanford initially built three plutonium production reactors, three chemical processing plants, 64 underground storage tanks, and a complete town with 4,000 new homes. The government spent some \$350 million on the entire effort. Restoring this facility today, if it is actually undertaken, will cost taxpayers roughly one hundred times the price of the installation's initial construction, even discounting for future inflation.⁴¹

Now in its 17th year, Hanford's cleanup effort, the nation's largest and most complex environmental remediation project, is costing many billions of dollars more than expected and will continue far longer than experts predicted. Ironically, the problems are actually welcomed by many local residents. When Hanford's plutonium production halted in 1989, residents in the so-called Tri-Cities area around the facility feared that their towns could not survive if Hanford lost its mission and shed workers. But cleaning up Hanford's contamination has so far proven to be at least as lucrative for residents as plutonium production. Michele S. Gerber, a Cold War historian who has written a critical history of Hanford and now works for one of the private contractors cleaning up the site, notes that the remediation efforts offer a more stable engine for job creation, housing construction and business investment than making plutonium did after the Manhattan Project's heyday. Given the scale of the work ahead, Gerber says she wouldn't be surprised to see the cleanup effort "last a hundred years."⁴²

At Hanford, the latest technological difficulties center around a vast proposed factory intended to transform high-level waste into glass logs suitable for long-term storage. The plant has already cost \$3.4 billion but has yet to process a single gallon of the 53 million gallons of deadly high-level waste stored in 177 underground tanks.⁴³ Instead, construction halted recently when the Energy Department discovered that factory designers had underestimated the health and environmental risks posed by the facility in the event of an earthquake. Now, department officials say the earliest the plant can open is 2019, by which time it will have cost \$12.2 billion, more than double the initial estimate.⁴⁴ At that rate as noted recently in the *Washington Post*, "children now in kindergarten will be graduate chemists employed in this enormous project before it's finished."⁴⁵

Jefferson Proving Ground: Case Study of Unexploded Ordnance

The U.S. Army's Jefferson Proving Ground sits in the middle of the American heartland in the southeastern corner of Indiana near the Ohio and Kentucky borders, amid miles of rolling pastures and cornfields. Enclosed behind the facility's 48-mile, ten-foot-tall chain-link perimeter fence are one hundred square miles of Indiana: an area larger than Manhattan and the District of Columbia combined. It is an area that Indiana former Senator Dan Coats has described, probably accurately, as the "largest contiguous contaminated area in the U.S."⁴⁶

Here, at Jefferson Proving Ground, the Army tested huge quantities of conventional munitions since World War II. For fifty years, Army personnel shot off some 23 million rounds of ordnance, littering the land with more than 1.5 million unexploded bombs, mines, and artillery shells lying on the surface or buried as deep as thirty feet underground.⁴⁷ Some of the buried ordnance are white phosphorus shells that JPG officials say are certain to ignite if they are dug up and exposed to air. Other bombs explode unexpectedly from time to time; many more surely would if the Army tried to remove them. JPG is also home to low-level radioactive contamination, toxic sludge, and pesticide residue. But overshadowing all other environmental problems here are the unexploded bombs.

During its heyday, JPG tested 85 percent of the Army's conventional munitions, firing some 80,000 rounds each year—some 40 rounds every hour the facility operated, earning the facility's hometown of Madison, Indiana the moniker of "Boomville" as early as the mid-1940s.⁴⁸

While the Army estimates that 1.5 million unexploded rounds are interred at JPG, it also acknowledges that another 6.9 million bombs and shells scattered throughout the site have "explosive potential."⁴⁹ Among the unexploded ordnance are FASCAM—the Army's acronym for its family of sophisticated, scatterable mines. During the Cold War, JPG was the only facility where many of these mines were tested. In 1989, the U.S. government decided to close the sprawling Jefferson Proving Ground. Today, decades since the military left, the land remains uninhabitable, a minefield, littered with unexploded bombs from decades of Army tests.

The Army recognized early on that to fully clean up JPG would be a mammoth, dangerous, and costly undertaking. The cleanup costs were so high, in fact, and the work so dangerous, that the Army effectively decided to simply to abandon the site, fencing it off for perpetuity, permanently isolated from human contact like a quarantined victim with a contagious and terminal disease.

To make matters worse, when the military's base closure commission decided to close the facility in 1989, it overlooked the facility's millions of unexploded bombs in its base closure cost calculations. The commission budgeted roughly \$30 million to shut JPG which they figured would suffice to cover the decontamination of the facility's buildings. Then, the commission said, the base's land could be sold to nearby farmers for \$25 million, and the Army would almost break even.⁵⁰

Since the 1989 base closure order, however, a dismal picture emerged that justifiably festers among the neighbors of the facility. As Morris Wooden, the former mayor of Madison, Indiana told me, "The Army's handling of JPG's closure is the kind of thing that makes the Pentagon's \$600 toilet seats look good."⁵¹

After officials studied the environmental cleanup situation, they determined that to remove all the bombs, most of JPG's wooded and bombed-out land would have to be stripped down to the level of the buried ordnance—as deep as thirty feet below the current surface—using special armored bulldozers. Aside from the issue of where to put the contaminated earth, the job is environmentally devastating and almost unthinkable in magnitude. One estimate projected the total cost of such an undertaking at \$13 billion.⁵² A report commissioned by the state of Indiana determined that even a so-called "limited" cleanup could cost as much as \$5 billion and still leave JPG unsafe for unrestricted human contact.⁵³

In a macabre sort of way, though, JPG's lack of human presence has fostered an extraordinary nature preserve. Indeed, the area boasts far more wildlife today than it did fifty years ago when it was predominantly farmland. Bobcats, coyotes, red foxes, deer and even some endangered reptiles, happily make the facility their home—aside from occasionally getting blown up.⁵⁴ In the latest turn of events, despite the lack of remediation of the site, the U.S. Fish and Wildlife Service agreed to list some 50,000 acres of the former JPG as a so-called "overlay refuge," still owned by the military but now designated as the "Big Oaks National Wildlife Refuge," the largest wildlife refuge in Indiana. The catch, of course, is that visitation is very risky. To handle the problem,

the Fish and Wildlife Service requires that any prospective visitors view a safety video and sign an “acknowledgement of danger” liability waiver before they are allowed to enter.⁵⁵

Liability issues aside, however, reminders of the explosive danger of buried ordnance often fatally resurface. In just one example, two children were killed in 1985 when an old artillery shell accidentally went off a few yards from their home at a former military artillery range in San Diego county, California. Fifteen years prior to the incident, the military had sold the land as surplus property and transferred it to housing developers after completing two separate cleanup efforts at the site.⁵⁶ More recently, in 2009, the discovery of hundreds of unexploded bombs on the grounds of a middle school in Florida has led to a lawsuit against the U.S. Army Corps of Engineers for allowing the school to be sited on a former bombing range; thankfully, the unexploded ordnance was discovered before anyone was killed or injured.⁵⁷

Unexploded ordnance like that at JPG is a particularly intractable problem at scores of current and former U.S. military installations. It is vexing because this type of contamination is obviously dangerous and tremendously expensive to clean up. Making matters worse, test facilities like JPG are often located in remote areas giving them understandably lower visibility and priority. But unexploded ordnance is just one part of a very big picture. The national military toxic burden remains a figurative minefield just as JPG is a literal one. Like JPG, the nationwide military toxic waste problem continues to be one of monumental proportion that is not easy to clean up.

A Vast Industrial Enterprise

To understand the extent of the problem it is helpful to appreciate the truly vast industrial enterprise that the U.S. military comprises. Consider, for instance, that every year the Pentagon purchases nearly 135 million barrels of fuel oil—a toxic material itself.⁵⁸ Stacked end to end, the barrels used in a year by the U.S. military could wrap around the earth more than three times. The huge quantity of fuel they would contain is enough, according to the privately funded Center for Defense Information, to run the nation's entire public transit system for a decade.⁵⁹

Because of the diverse missions of the U.S. armed forces, one can almost pick a product at random and discover that military usage dwarfs that of other large entities.

The truth is, the military generates hazardous byproducts through innumerable facets of its daily work. Huge quantities of toxic waste are generated in the routine operation and maintenance of the military's prodigious collection of vehicles, tanks, planes, ships, and missiles. Producing ammunition—a vast and varied endeavor itself—also leaves behind an enormous quantity of hazardous byproducts, as do the testing and storage of these munitions. And finally, a wide array of industrial practices—ranging from electroplating to milling and machining parts in the military's research and development facilities—create immense amounts of hazardous wastes.

Each branch of the military has its own characteristic environmental quagmires. For the Air Force, Perhaps the main contributor to the military's toxic waste problems is the sheer volume of solvents used in its operations, especially TCE—trichloroethylene—seen decades ago as a “miracle solvent” and strongly suspected today to cause cancer. Of the one hundred military facilities that sit atop the National Priority List (the Superfund Program's listing of the nation's worst polluted lands), more than one fourth are Air Force bases contaminated primarily with solvents like TCE.⁶⁰ Military personnel have poured many millions of gallons of solvents like TCE into the ground at installations across the country over the past half century. High-ranking Air Force officials freely concede that virtually every one of their bases at home and abroad is contaminated with solvents.

But it is the scale of the contamination that is hardest to comprehend. Consider, for instance, the case of the Wright-Patterson Air Force Base near Dayton, Ohio, for example, headquarters for the Air Force's Logistics Command, responsible for maintaining approximately 20,000 aircraft, 53,000 jet engines and 1,000 ballistic missiles.⁶¹ Part of the standard maintenance regime at Wright-Patterson, like that at virtually every Air Force base, involves spraying planes liberally with solvents to clean and de-ice them. Historically, the runoff has been allowed to seep directly into the ground. In addition, another large-scale misuse of solvents is part of Wright-Patterson's toxic history. For decades, when planes flew in for maintenance, Air Force personnel would dip the engine parts into huge vats of solvents to remove grease and grime from them before undertaking repairs. As the solvent baths quickly became dirty, workers would take the vats and dump the toxic contents into unlined pits, letting the chemicals drain into the ground. At Wright-Patterson, this routine dumping took place for

decades at many of the base's 62 unlined waste disposal areas now identified as toxic waste sites.⁶²

The U.S. Navy, among many other problems, is plagued by toxic contamination resulting from electroplating, which requires the routine use of acids and degreasers, is a process used primarily to combat rust. Those in logistics and engineering commands point out that military hardware often sits idle outdoors for long periods, but must function flawlessly in a crisis. Everything from nuts and bolts to large industrial machine parts is routinely plated with non-corrosive metals like copper, silver, or gold. The ensuing wastes products include acids, cyanides, and the residue of hazardous heavy metals. And the Navy's historically careless disposal of paints and paint strippers has contaminated most of its shipyards and the nation's coastal waters as well.⁶³

The U.S. Army has contamination from solvents and electroplating wastes as well, but perhaps its worst environmental problems lie at its ammunition plants—mostly from explosive compounds disposed of improperly. From rifle bullets to ballistic missiles and artillery shells containing chemical agents, the production of ammunition has devastated the environment at virtually every site at which it has been undertaken. By the military's own accounting, at least forty ammunition plants have serious environmental problems.⁶⁴ At one of these, the Cornhusker Army Ammunition Plant in Grand Island, Nebraska, for instance, the U.S. Army knew that high levels of dangerous explosive compounds were migrating beyond the borders of the base with certainty in 1980 but waited four more years to notify neighboring residents at which time extremely elevated levels of these toxins were found more than half of wells tested as far as three miles from the base.⁶⁵

In all these cases, it is important to note that the overwhelming majority of these hazardous byproducts are not the result of some devious, errant base commander dumping toxic wastes illegally after dark. Rather, the bulk of the military's toxic wastes originate from decades of standard daily operating procedures during the Cold War. During this period, the military's penchant for secrecy and the perceived imperative of external threat overrode virtually any environmental concern in the name of "national security." As early as 1978, then-President Jimmy Carter signed an executive order explicitly requiring the U.S. military to obey the nation's environmental laws. But, with no governmental oversight, the order went virtually unheeded.

Toward the end of the Cold War, the standard operating procedures of the U.S. military deviated dramatically from those of the nation's private corporations and yet, the entrenched Cold War mindset allowed the problems to continue unabated. In fact, during the administration of Ronald Reagan in the 1980s, the administration unequivocally gave the U.S. military free rein on environmental matters by effectively tying the hands of the Environmental Protection Agency through an executive order emphasizing what it called the "unitary theory of the executive" that limited the Environmental Protection Agency's enforcement power by arguing that that one agency of the executive branch must not sue another.

Public awareness and perception of the military's environmental problems began to shift in the waning years of the Cold War. As U.S. Senator John Glenn put it in 1989, arguing for cleanup funds for the nation's nuclear production facilities: "The costs of cleaning up these sites will be extraordinarily high, but the costs of doing nothing will be higher. After all, what good does it do to protect ourselves from the Soviets...if we poison ourselves in the process?"⁶⁶ Only the passage by Congress of the Federal Facilities Compliance Act of 1992—landmark legislation that finally required the Pentagon to obey the nation's environmental laws—caused the military to begin to change its entrenched cavalier attitude toward environmental contamination.⁶⁷

It is a central irony of the U.S. military's environmental quagmire that, throughout, the situation was perpetrated in the name of the Cold War. The Pentagon's actions were informed by a sense that defense against the Warsaw Pact took precedence over other concerns. Overshadowed by the Cold War's commanding external peril, the U.S. military's legacy of environmental contamination was simply ignored for decades. Today, the United States, in a fateful twist, the external enemy of the Cold War years has evaporated. But the Cold War's environmental legacy—the long-ignored threat at home—will remain for many years to come.

Notes

¹ According to the U.S. Nuclear Weapons Cost Study Project at the Brookings Institution, the Manhattan Project itself cost some \$20 billion. See

<http://www.brookings.edu/projects/archive/nucweapons/50.aspx>.

² Stephen I. Schwartz, ed., *Atomic Audit: The Costs and Consequences of U.S. Nuclear Weapons since 1940* (Washington, D.C.: Brookings Institution Press, 1998).

³ U.S. Department of Energy, *FY 2009 Congressional Budget Request: Environmental Management, Defense Nuclear Waste Disposal and Nuclear Waste Disposal*, February 2008. See also "DOE Bomb-Factory Cleanup Costs May Push \$266 Billion, Study Says," *Engineering News-Record*, November 24, 2008, p. 57.

⁴ Blaine Harden, *The Washington Post*, "Nuclear Cleanup Site Has Cities Cleaning Up Financially," November 1, 2006, p.A3.

⁵ Seth Shulman, "Operation Restore Earth," *E Magazine*, March/April 1993, p.37.

⁶ *Ibid.* For a full accounting, see U.S. Department of Defense, *Defense Environmental Programs Annual Report to Congress*, Fiscal year 2008.

⁷ See EPA "Superfund" National Priorities List. Available at: www.epa.gov/superfund/sites/npl/npl.htm.

⁸ Seth Shulman, *The Threat at Home: Confronting the Toxic Legacy of the U.S. Military*, Boston: Beacon, Press, 1992, pp. 77-8.

⁹ *Ibid.*, pp.40-41.

¹⁰ The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as Superfund, was enacted by Congress on December 11, 1980; 42USC9601.

¹¹ As quoted in Shulman, *The Threat at Home*, p.13.

¹² "From Crisis to Commitment: Environmental Cleanup and Compliant at Federal Facilities," *Report of National Governor's Association/National Association of Attorneys General Task Force on Federal Facilities*, January 1990.

¹³ *Ibid.*

¹⁴ National Governor's Association Report, op. cit., January 1990.

¹⁵ U.S. Department of Defense, *Defense Environmental Programs Annual Report to Congress*, Fiscal year 2008

¹⁶ *Ibid.*

¹⁷ See for example, the in-depth case study of the U.S. Army Cornhusker Army Ammunition Plant, in Shulman, *The Threat at Home*, pp. 74-82.

¹⁸ Examples of the Pentagon's efforts to avoid regulation abound but are beyond the scope of this paper. See, for instance, Lyndsey Layton, "Pentagon Fights EPA On Pollution Cleanup," *Washington Post*, June 30, 2008, p.A1; Michael Janofsky, "Pentagon Asks Lawmakers to Loosen Environmental Laws," *New York Times*, May 11, 2005, p.16; Jennifer 8. Lee, "Military Seeks Exemptions On Harming Environment," *New York Times*, p.27.

¹⁹ For more on Hanford history see, for example, Richland, Washington Silver Anniversary Steering Committee, *Alive! Yesterday and Today: A history of Richland and the Hanford Project*; see also Paul Loeb, *Nuclear Culture*, New York: Coward, McCann & Geohegan, Inc, 1982.

²⁰ *Ibid.*

²¹ While Rocky Flats has now completed a multi-billion-dollar cleanup effort, a whistleblower in the cleanup process has raised serious concerns, charging that the remediation contractor at the site cut corners that leave radioactive contamination leaching in the ground. The case has worked its way to the U.S. Supreme Court. See, for instance, Brian Hansen, "Rocky Flats cleanup done, but lawsuits over work continue to roil in courts," *Inside Energy with Federal Lands*, December 18, 2006, p. 9.

²² For an in-depth accounting, see U.S. Congress, Office of Technology Assessment, *Complex Cleanup: The Environmental Legacy of Nuclear Weapons Production*, February 1991, (Washington, DC: U.S. Government Printing Office, 1991).

²³ *Ibid.*, p. 16.

²⁴ U.S. General Accounting Office, *Nuclear Waste: DOE's Handling of Hanford Reservation Iodine Information*, May 1988, (Washington, DC: U.S. Government Printing Office, 1988), p. 8.

²⁵ Debra K. Rubin, "Huge Cleanup at Bomb-Making Megasite Is The New Atomic Fallout," *Engineering News-Record*, November 24, 2008, p.74.

²⁶ *Ibid.*

²⁷ Radioactive Waste Campaign, *Deadly Defense: Military Radioactive Landfills*, (New York: Radioactive Waste Campaign, 1988), p. 99.

²⁸ *Ibid.*

²⁹ Ibid.

³⁰ The documents initially released are known as the Hanford 40-Year Environmental Data and consist of approximately 19,000 pages of previously unavailable material. The release was a result of Freedom of Information Act requests and legal action taken by two groups, the Hanford Education Action League (HEAL) of Spokane, Washington and the Environmental Policy Institute (EPI) of Washington, DC; see also Michele Stenehjem, "Pathways of Radioactive Contamination: Examining the History of the Hanford Nuclear Reservation," *Environmental Review*, Fall/Winter 1989, pp. 95-112. The study undertaken is Pacific Northwest Laboratory, Draft Summary Report: Phase I of the Hanford Environmental Dose Reconstruction (HEDR) Project, July 1990, p. 4.4.

³¹ GPU Nuclear Corporation Communications Division, *Backgrounder*, "Three Mile Island Unit 2: Radiation and Health Effects: A Report on the TMI-2 Accident and Related Health Studies," 1979.

³² Dose Reconstruction project, op. cit.

³³ Ibid.

³⁴ 10 CFR 20.1201. "Occupational dose limits for adults." United States Nuclear Regulatory Commission. 1991-05-21. Available at: www.nrc.gov/reading-rm/doc-collections/cfr/part020/part020-1201.html.

³⁵ Ibid.

³⁶ Dose reconstruction Project report, op. cit. See also, Fred Hutchinson Cancer Research Center, *Hanford Thyroid Disease Study Final Report*, January 23, 2007, Centers for Disease Control Contract Number 200-89-0716.

³⁷ H. Jack Geiger, "Generations of Poisons and Lies," *New York Times*, August 5, 1990, Op-edit, p. E19.

³⁸ Seth Shulman, "Daunting Costs for Clean-up at Hanford," *Nature*, 25 May 1989, Vol. 339, p. 241. A subsequent Department of Energy Press Release, "U.S. Corps of Engineers to Participate in Hanford Cleanup," July 27, 1990 states that cleanup of Hanford could cost between \$1 billion and \$2 billion per year for the next thirty years; Michele Stenehjem, a historian who has studied environmental problems at Hanford extensively estimates costs closer to the \$60 billion figure in "Indecent Exposure," *Natural History*, September 1990, p. 22.

³⁹ Ibid.

⁴⁰ Radioactive Waste Campaign, *Deadly Defense*, op. cit. pp. 99.

⁴¹ Shulman, "Daunting Costs for Clean-up at Hanford," *Nature*, op. cit., p. 241. A subsequent Department of Energy Press Release, "U.S. Corps of Engineers to Participate in Hanford Cleanup," July 27, 1990 states that cleanup of Hanford could cost between \$1 billion and \$2 billion per year for the next thirty years; Michele Stenehjem, a historian who has studied environmental problems at Hanford extensively estimates costs closer to the \$60 billion figure in "Indecent Exposure," *Natural History*, September 1990, p. 22. See also Teresa A. Tyborowski, "Putting a Price Tag on the Environmental Consequences of the Cold War," *Federal Facilities Environmental Journal*, Autumn 1996, pp.35-45.

⁴² Blaine Harden, *The Washington Post*, "Nuclear Cleanup Site Has Cities Cleaning Up Financially," November 1, 2006, p.A3.

⁴³ Ibid.

⁴⁴ Ibid.

⁴⁵ See "Hanford's Leaking Tanks," editorial, *Washington Post*, December 4, 1991, p. A24.

⁴⁶ Letter from former Senator Dan Coats (R-IN) to then-Secretary of Defense Richard Cheney, November 29, 1989.

⁴⁷ Indiana Department of Environmental Management, *Report to the Governor: U.S. Army, Jefferson Proving Ground Evaluation*, Madison Indiana, April 20, 1989, p. iv-v. See also *Hearings before the Environmental Restoration Panel of the Committee on Armed Services*, Overview of DOD Environmental Activities, March 15, April 5, 11, 25, 26, May 2, and 17, 1989, (Washington, DC: U.S. Government Printing Office, 1990), p. 425.

⁴⁸ For a history of JPG, see Sue Baker, *For Defense of Our Country: Echoes of Jefferson Proving Ground*, (Indianapolis, Indiana: Guild Literary Services, 1990).

⁴⁹ Report to the Governor, see above, p. vi.

⁵⁰ The Commission on Base Closure and Realignment, Secretary of Defense, *Report to Congress*, December 1988.

⁵¹ As quoted in Shulman, *The Threat at Home*, p.6.

⁵² Report to the governor, pp. iii, vi.

⁵³ As cited in Shulman, *The Threat at Home*, p.6.

⁵⁴ On site interviews as recounted in Shulman *The Threat at Home*, p.7.

⁵⁵ Information on visitation permits to the site is available online through the U.S. Fish and Wildlife Service at: www.fws.gov/midwest/BigOaks/public_use.htm.

⁵⁶ See *Los Angeles Times*, San Diego County edition, February 4, 1985, p. 1. See also the comments of Representative Vic Fazio, U.S. House of Representatives, Hearings on H.R. 1872 before the House Subcommittee on Armed Services, *Defense Department Authorizations and Oversight* (Washington, DC: U.S. Government Printing Office, 1985), p. 986.

⁵⁷ Rich McKay, "Orange County school district sues engineers for approving school site on former bombing range," *Orlando Sentinel*, July 15, 2009.

⁵⁸ Defense Logistics Agency, *Defense Fuel Supply Center Fact Book*, Fiscal Year 2008.

⁵⁹ As estimated in *The Defense Monitor*, Center for Defense Information newsletter, vol. 18, no. 6 1989, p. 6.

⁶⁰ U.S. Department of the Air Force, *Fiscal Year (FY) 2009 Budget Estimates*, February 2008, vol. 2.

⁶¹ As cited in Shulman, *The Threat at Home*, p. 25.

⁶² *Ibid.*

⁶³ U.S. Department of Defense, *Defense Environmental Programs Annual Report to Congress*, Fiscal Year 2008, Appendix H: "Active Installations Environmental Restoration Progress."

⁶⁴ *Ibid.*

⁶⁵ Shulman, *The Threat at Home*, pp. 77-8.

⁶⁶ John Glenn, Op-edit, *New York Times*, January 24, 1989 p.A21.

⁶⁷ For an account see Shulman, "Operation Restore Earth," *E Magazine*, op.cit. p. 38.