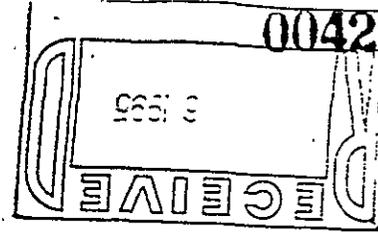


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# SCOPING REPORT: NUCLEAR RISKS IN TRIBAL COMMUNITIES

A Report by the Confederated Tribes of the Umatilla Indian Reservation  
Outlining Concerns About Risk-Based Approaches to  
Environmental Management Decision-Making

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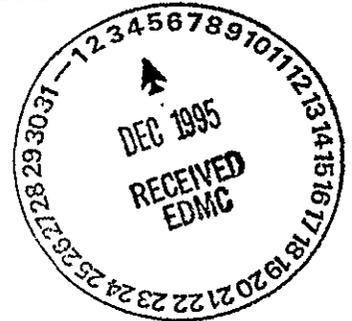
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Confederated Tribes of the Umatilla Indian Reservation  
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Hanford Program

Prepared For:

U.S. Department of Energy  
Office of Environmental Management  
Office of Integrated Risk Management  
Office of Strategic Planning and Analysis  
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Committees on Appropriations  
Senate Committee on Energy and Natural Resources



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Confederated Tribes of the Umatilla Indian Reservation  
Department of Natural Resources  
Hanford Program

## I. INTRODUCTION

Both the United States Congress and the U.S. Department of Energy (DOE) are actively considering the standardized use of risk-based remedial decision-making to address "clean-up"<sup>1</sup> of DOE nuclear production sites across the country. Congress has directed DOE to provide a full risk picture at DOE sites across the nation in order to facilitate cost-risk comparisons and prioritization of remedial actions (Appendix A).

Thus far, no comprehensive or sitewide evaluation of risks and costs has been performed at Hanford or any other DOE site. Risks<sup>2</sup> at DOE sites are associated with environmental, health, safety, and cultural threats resulting from historical operations and unsound disposal practices at DOE sites during the past half century. Those few risk analyses<sup>3</sup> that do exist are narrowly framed, based on very little substantive data, depend on numerous assumptions, result in high degrees of uncertainty, and tend to skew decisions toward actions that may not be thoroughly thought out or truly protective. Fulfilling this Congressional mandate will necessarily require focused information collection so that site risks, costs, benefits, and compliance agreement requirements can be evaluated in a comprehensive and not piecemeal fashion. A full risk picture must include addressing the impacts of time, of doing nothing now--or ever--and of "risking" the future health consequences, accumulating impacts, and the ever increasing public health care costs that will necessarily result if the real risks present are not proactively reduced.

Technical staff of the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) are highly concerned that any approach based largely on conventional risk assessment and cost-risk methods may not adequately address those important cultural and social values and other considerations that are an integral part of any comprehensive risk management program. The risks posed by massive historical releases of hazardous chemicals and radioactive materials to the air, water, and soil column will directly impact not only human health and the environment--a particular concern in subsistence-dependent tribal families--but also tribal cultural values, traditional tribal lifestyles, and tribal cultures themselves for many generations to come--risks that often are not accounted for in existing methodologies.

The purpose of this report is to advocate reform of current risk assessment practice in order to make risk assessment a more effective tool for public policy and environmental management decision making. In order to illustrate the need for reforms, this report focuses on direct,

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indirect, and cumulative impacts to CTUIR tribal communities from environmental management decision making at Hanford.

This report provides a more focused perspective on how to establish both technically and politically defensible environmental management policy in an era of fiscal constraints. It also provides suggestions for developing sound values-based risk policy and technical guidance. These reforms will ultimately result in more clearly defined mission plans, more focused strategic planning goals, and more timely, health-effective, and cost-effective remedial actions. Such a broader perspective will be much more capable of providing the sufficiently broad, representative, and credible information base necessary to facilitate and support the difficult decisions that must be made in order to establish priorities and cost-effectively "clean-up" DOE sites across the nation.

### II. TRIBAL CONCERNS WITH CONVENTIONAL RISK ASSESSMENT PRACTICE

Risk assessment is often praised for its ability to quantitatively characterize, and thus support ranking or prioritization of actions necessary to eliminate, control, or 'manage' risk.<sup>4</sup> But it is plagued nonetheless by a number of inherent limitations in its ability to reflect cultural or other social values, such as those of American Indian tribes, that are not easily quantified, numerically simulated, or modeled. Conventional risk assessment methods, having been adapted from other techniques for other purposes, inherently possess major shortcomings that now preclude their widespread application as effective or defensible public policy/environmental management tools. Reforms must be instituted so that assessment techniques address the full scope of risk, which necessarily includes qualitative attributes, cultural factors, personal biases, and subjective judgements. No true or comprehensive characterization of risk can ignore such considerations.

The concerns of American Indian communities and individual tribal members, including members of the CTUIR, who practice traditional lifestyles, readily highlight a number of the well recognized and underappreciated deficiencies and limitations of conventional risk assessment methodology. The inclusion of cultural values in a comprehensive evaluation process will have important implications for the use of such a tool in risk management and remedial action decision-making. Only through a values-based analysis within an American Indian-based holistic environmental management framework can the unique nature of tribal culture, needs, rights, and interests be adequately or appropriately represented.

Issues of vital concern to tribes that are not addressed by current risk assessment practice include: 1) unique and multiple use of treaty-reserved rights and resources for subsistence, ceremonial, cultural, or religious practices, 2) multiple exposure pathways that result from cultural resource use that are neither considered nor commonly included in typical "suburban" exposure scenarios, 3) that tribal communities often constitute critical segments of populations whose lifestyles result in disproportionately greater than average exposure potential, either sociologically or geographically, 4) the failure to address the role of time and to adequately

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assess risks to future generations, 5) issues of environmental justice and the right to a safe and healthful environment (the need for formally incorporating affected community input), and 6) more intangible considerations such as aesthetic, physical, economic, community, and future well-being, equity, peace of mind, and sustainability.

### A. Unique Resource Use and Exposure Pathways: An Interdependent Food Web

Tribal culture and individual tribal people consider themselves as integral components of an interconnected and interdependent environment. This perspective stands in stark contrast to the predominant view in non-Indian society where humans are commonly viewed as separate from and superior to the environment in which they live. Tribal members depend upon numerous sources of food and other resources that are not commonly used by the dominant society, and that are thus ignored in traditional risk assessments (Appendix B). For example, tribal people are traditionally subsistence fishers, hunters, gatherers, and traders, and inherently value and utilize all parts of resources, many of which the dominant society simply discards. Consequently, through practicing traditional activities, tribal members may be readily exposed to multiple sources of contaminants along multiple exposure pathways not shared by the typical suburban residents that form the basis of conventional risk analyses and exposure scenarios. Cultural practices themselves also may result in increased exposure potential because the practices employed in food gathering and other cultural practices are themselves integral components of the process, and cannot be separated from it. Certain cultural, ceremonial, and spiritual practices, such as sweat lodges, are unique to tribal people, but present multiple exposure pathways not addressed by conventional risk analyses. Multiple resource use and multiple exposure pathways further compound the bioaccumulation potential of concentrating contaminants among food web trophic levels. For example, typical measures of contaminant concentrations in water do not adequately represent or protect human consumption or use of resources as riparian zone plants growing where contaminated shoreline seeps and springs discharge, salmon redds that overlie riverbottom contaminant discharge zones, or the organisms that in turn feed upon these food sources.

### B. Critical Segments of Populations

Multiple resource use, multiple exposure pathways, and unique traditional lifestyles and cultural practices common in tribal communities mean such communities constitute critical segments of populations—indicator populations, if you will—that may be subject to much higher risk than most elements of non-Indian society. If the exposure and risk potential of a population as a whole can be simplistically modeled as a typical bell-shaped curve, then tribal communities would consistently fall at the high end of the spectrum—one that is underrepresented (or worse) in conventional risk analyses. This effect is still further compounded because the generally small size and limited geographic extent of most tribal populations fail to provide a "statistically significant" sample. Hence, conventional risk analyses ignore such conditions because they

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cannot be confidently or defensibly modeled, even though impacts may be well demonstrated. Furthermore, the limited areal extent of many waste sites, including significant, but localized discharges or exposure potential at Hanford, make it difficult to employ conventional epidemiologic methodology, which typically requires large populations and areas of coverage.

### C. Multi-Generational Impacts and the Impacts of Time

One of the most serious deficiencies of conventional risk methods is that they fully ignore the impacts of time and of accumulating impacts to future generations. Hence, true risks as measured through time are vastly underestimated. Conventional methods address only current conditions. Even where attempts to account for future impacts are made, they must assume that the risk slate is wiped clean with each new generation. In point of fact, impacts accumulate through time, seemingly distinct actions or effects are environmentally interconnected, and the indirect impacts associated, for example, with non-cancerous effects are ignored. Equally severe or life-threatening impacts such as birth defects, reduced birth rates, reduced immunologic or metabolic function, and increased adverse health conditions whose origin may be difficult, if not impossible, to prove are just a few of the indirect impacts to current or future generations that simply cannot be addressed by current methodologies. Such impacts may be particularly important because of the very long-lived, mobile, and environmentally persistent nature of many Hanford contaminants, especially radionuclides, heavy metals, and organic compounds.

Conventional risk methods that ignore the element of time reflect the short-sighted values of the dominant non-Indian society and its obsessive focus on only the here and now. Such a view is largely unknown in tribal culture, where present generations feel a profound commitment to provide for elders and future generations--all of whom may be subject to greater adverse impacts. This is clearly reflected in the protective and sustainable environmental management philosophy that many tribes have long employed by asking the question, "What will be the impacts of our actions today seven generations hence?" For example, non-Indian society has developed techniques to establish remedial standards and standards of residual risk that measurably discount the value of future generations at increasing rates through time. Aside from the questionable moral and ethical considerations involved, this selfish, short-sighted approach is the ultimate slap in the face, as it provides no accountability or commitment to steward current lands and resources for the future. All such efforts only facilitate and encourage maximum environmental destruction now to maximize immediate returns, while at the same time severely prejudicing future options by passing on a worsening legacy of environmental pollution to our children and grandchildren.

### D. Environmental Injustice

There are few better illustrations of environmental *injustice* than those provided by the nuclear industry from its very birth. From the dropping of the first atomic bomb on war-weary East

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Asians, to the concentration of uranium mining activities in tribal lands in the American Southwest, to the preferential location of defense and commercial nuclear reactors and proposed waste storage "solutions" on tribal lands, the focus is consistently on remote areas and communities with little political power or influence—especially those of American Indian tribes. For example, three major defense production, storage, and training facilities are located within the ceded lands of the CTUIR. These include not only DOE's Hanford site, but also the Umatilla Army Depot, where 12% of the nation's arsenal of chemical weapons and agents are stored, and the Boardman Bombing Range, a training range for military pilots from Puget Sound bases. Hence, both tribal members and the Umatilla Reservation itself have long been burdened with a disproportionate share of risk and potential exposure to some of the most dangerous agents or conditions known to humans. These include Hanford's radioactive materials and the radiation they emit, a suite of heavy metals and other toxic or hazardous chemicals, the Umatilla Army Depot's nerve and mustard agents, rockets, and explosives (some of which are intermixed and reactive), and unknown quantities of unexploded ordnance at the Boardman Bombing Range.

Such sites constitute "hot spots," be they geographic (near-source) or sociologic (owing to subsistence dependence on contaminated resources). Issues of environmental justice have received increasing attention in the Executive Branch, as President Clinton has issued an Executive Order<sup>5</sup> directing each cabinet-level department—including DOE—to develop an implementation strategy for addressing such issues. This plan must define how departments will facilitate direct involvement of affected local communities in both recognizing and resolving the disproportionate impacts of federal government actions on critical segments of populations such as American Indian tribes. The development and application of improved risk assessment methodologies in environmental management decision making must be an essential feature of these reforms, and should be specifically addressed.

### III. RISK ASSESSMENT CHALLENGES PRESENTED BY HANFORD

#### A. Overview of DOE Complex and Mission

The mission of the U.S. Department of Energy has shifted greatly in recent years. DOE facilities across the nation supported the massive arms build-up that proceeded steadily from the end of World War II through the 1980s. Growing public concerns over widespread safety questions, environmental problems, and regulatory compliance, however, forced shutdown of major portions of the complex across the nation during the 1980s, a process accelerated by the almost overnight end to the Cold War. But the legacy of the Cold War remains.

By the early 1990s, DOE's mission had shifted equally abruptly. DOE is now attempting to "clean-up" its legacy of widespread waste management problems and uncontrolled environmental pollution, that is, to restore the environment. The Department of Energy clearly recognizes the significant technical, institutional, and political challenges that it faces in cleaning up its legacy-- and hints at a solution.

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"Solving the waste-management and contamination problems of this legacy will take decades and enormous resources. . . And even then the task will not be fully completed for those sites and facilities [such as Hanford] that will need continued guarding and monitoring.

"The task of Environmental Management is to begin to close the circle on the splitting of the atom for weapons production through sustained efforts to understand the whole problem as well as its parts.

"The nation faces daunting institutional and technical challenges in dealing with the environmental legacy of the Cold War. We have large amounts of radioactive materials that will be hazardous for thousands of years; we lack effective technologies and solutions for resolving many of these environmental and safety problems; we do not fully understand the potential health effects of prolonged exposure to materials that are both radioactive and chemically toxic; and we must clear major institutional hurdles in the transition from nuclear weapons production to environmental cleanup.

"These challenges cannot be solved by science alone. In the midst of the complexities and uncertainties, one thing is clear: the challenges before us will require a similar—if not greater—level of commitment, intelligence, and ingenuity than was required by the Manhattan Project."<sup>6</sup>

As if such a mission alone were not challenging enough, DOE also is one of the larger federal agency managers of publicly owned lands and natural resources. DOE currently manages at least 137 defense and non-defense sites in 33 states and one U.S. territory that together cover some 3300 square miles and pose some 10,000 individual remedial challenges.<sup>7</sup>

This report focuses on issues at DOE's Hanford site in Washington State. Hanford lies within a portion of the CTUIR's ceded lands, within which the CTUIR maintain treaty-reserved rights and interests (Appendices B and C). Hanford poses some of the most difficult, complex, and pervasive "clean-up" problems of any DOE site in the nation (Appendix D).

### B. The Risks at Hanford Are Real

DOE, as well as many other independent reviewers, clearly recognize that the DOE nuclear weapons complex poses a wide variety of risks and "clean-up" challenges.<sup>8</sup> These risks are characterized in terms of the source and severity of the risk, exposure pathways, and potential receptors. Among sites in the DOE complex, Hanford's problems are profound, complex, and often interrelated, and represent real risks to the surrounding communities, region, and nation that are unparalleled anywhere else within the DOE complex. Although the risks appear to be local, the potential impact from a catastrophic incident may have profound impacts to the

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region's international economy and agricultural base. Events such as the Chernobyl meltdown or the Tomsk tank explosion demonstrate that while distance dilutes awareness, knowledge, and concern about risks outside a commonly perceived area of influence, catastrophic events at one locale can have much more widespread, even global implications.

Historical releases from Hanford are traceable downstream along the Columbia River, spreading over hundreds of square miles of the Pacific Ocean, as far north as Canada and as far south as northern California, and downwind into eastern Washington, Oregon, and Idaho.<sup>9</sup> Such demonstrated historical impacts only hint at the full spatial and temporal scope of future risk. Outlining "real risks" to tribes, the public, site workers, and the environment necessarily combines toxicologic effects, risk perception, risk evaluation, qualitative values, and community or cultural impacts.

At Hanford, risks are present from a variety of conditions and operating practices--past, present, and future--and to a variety of receptors, including individuals dependent upon contaminated natural resources for subsistence or other cultural purposes, the human and ecological communities in which they live, and to future generations of humans and other organisms. The risks posed by these conditions and impacts are outlined in more detail in Appendix G under the following topics.

- Risks from Hanford Nuclear Production Facilities
- Risks from Hanford Tanks
- Risks from Hanford Spent Fuel
- Risks from Past Hanford Disposal Practices
- Risks to Communities and Cultures
- Risks through Time

Risks associated with the first four categories above have been widely recognized and discussed (even if little has actually been done about them), but the last two categories have been widely ignored and their true impacts greatly underappreciated.

### C. Hanford Federal Facilities Compliance Agreement (Tri-Party Agreement)

In 1989, DOE, along with its regulators, the U.S. Environmental Protection Agency (EPA) and the Washington State Department of Ecology, signed a federal facility compliance agreement known as the Tri-Party Agreement (TPA). DOE had been operating its nuclear production facilities across the country, including Hanford, in defiance of federal and state environmental laws for years. The purpose of the TPA was to outline and schedule those tasks that would either permit or constitute "clean-up" of the Hanford site, and to bring operations into compliance with existing federal and state laws.

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The TPA represents a unique product of both regulatory requirements and accommodation of public interests in the Pacific Northwest. By its very nature, the TPA incorporates qualitative values and may be considered as a regionally unique, democratic alternative to conventional risk assessment for establishing remedial priorities. Because it is also the product of a political process, as well as being based on technical demands and institutional requirements, it has received extensive public review and input and thus embodies at least some important social and cultural principles (e.g., protect the Columbia River).

In addition to its benefits, the TPA has its limitations. First and foremost, the TPA defines long-term commitments to Hanford clean-up that transcend typical short-term political vision, attention spans, and election cycles. This also means that a long-term political and financial commitment is required to accomplish the goals of the TPA and to comply with federal and state environmental laws. While they are not blameless, the TPA and regulators too often are singled out for stalling "clean-up," but tribal experience indicates that it is primarily DOE who most consistently fails to serve its "constituents." This failure is most clearly shown by not providing strict management control and responsibility, contractor accountability, an overall purpose and direction that DOE managers also believe in, and *any* good faith, proactive, on-the-ground commitment to "clean-up." It is a widely held belief, strongly supported by extensive historical government records, that Hanford truly is the most polluted place in the country. Hence, a prime purpose of the TPA is to maintain focus on the ultimate goal of environmentally sound waste management, remediation, and restoration of the Hanford site.

Federal (and state) environmental laws—whose principles are embodied directly in compliance agreements such as the TPA—often offer the only protection available against flagrant onslaughts of environmental contamination and the risks they pose to individuals, children, families, communities, lands and resources, and the freedom and right of choice that all such communities collectively depend upon. The bulk of these laws<sup>10</sup> were first passed because of unconscionable abuses such as Love Canal, and are a direct result of the dismal failure of trusting polluters interested only in short-term profits (benefits) to "self-regulate" or protect public resources.

Moreover, while private industry was the target of much of the original legislation, the shutdown of the nuclear weapons complex and other defense facilities made it especially clear that the federal government was in fact one of the most flagrant offenders. Because public agencies such as DOE continued to flaunt regulatory compliance, particularly under RCRA, and maintain its "right" to "self-regulate," the Federal Facilities Compliance Act was passed in 1992 in order to reinforce that federal government facilities were subject to the same laws as everyone else.

But the TPA does not address a number of critically important issues to communities. For example, these include off-site transportation of radioactive or hazardous chemicals, numerous facilities not directly under DOE control, and especially, the true costs of environmental contamination as manifested by adverse human and environmental health impacts and associated public costs, either near-term or long-term. Such impacts are currently and at best, poorly

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understood; more comprehensive and focused efforts must be directed at understanding the interrelation of such chemically-induced causes and health-related effects.<sup>11</sup>

Increased reliance on tools such as risk assessment or risk evaluation only diverts attention from the measurable health-related impacts to uniquely affected communities such as American Indian tribes, whose culture, traditions, and lifestyles put them at much greater risk than the population as a whole (Appendix B). These short-sighted approaches fail to account for the true long-term health impacts and the increased health care costs that directly result, because they fundamentally ignore short-term, long-term, acute, and chronic effects, the long latency period of many carcinogens or other health-impacting agents, the environmental persistence and bioaccumulation of long-lived contaminants and their breakdown products, or the long-term cumulative effects on future generations.

The TPA was not framed with the intent of characterizing, assessing, or prioritizing how much risk would actually be reduced, because little relevant risk information was available at the time the TPA was negotiated. Nevertheless, and although imperfect, the TPA currently constitutes the only generally agreed upon, negotiated combination of priorities and schedules of DOE, regulators, tribal governments, and Pacific Northwest residents, and it is continually evolving to meet new realities.

Fifty years of secrecy and a "self-regulated" license to pollute cannot easily be undone by only six years on the frontier with some semblance of democratic oversight and open tribal/public involvement. The commitment to close the circle must not succumb to short-sighted budgetary considerations, or to a failure of the federal government to take full responsibility for its historical actions by simply legislating "clean-up." Widespread contamination is present and will remain unless *action* is taken. Creating national sacrifice zones, by throwing up a fence and then just walking away from those communities who are directly affected by such unchecked impacts and actions, but have no say in those decisions, is totally unacceptable. Local affected communities who were given no choice in siting or managing such operations historically must not now be forced to disproportionately shoulder the current and future "clean-up" burdens—or their resulting health impacts—alone.

### D. The Struggle of Political, Technical, Cultural, and Institutional Perspectives

For fifty years, DOE had only to meet its own institutional requirements. Because its operations were long hidden behind the secretive cloak of national security, policy and management issues were never open to public scrutiny. Consequently, such issues were debated only internally, and (paradoxically) enjoyed widespread and unquestioning political support in Congress and within the government structure as a whole. Moreover, seemingly insurmountable technical limitations were routinely overcome by a level of drive, ingenuity, and scientific creativity virtually unparalleled in U.S. (if not world) history. This ingenuity, however, was focused solely on the

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goal of producing weapons of war--not on cleaning up the equally fatal waste products of that production on American populations such weapons were ostensibly intended to protect.

With the shutdown of the weapons production complex and a new mission, DOE has struggled profoundly (and with only limited success) to change its own deeply entrenched Cold War "culture." DOE has made some piecemeal attempts to respond to the concerns of other cultures and communities that were long affected by its weapons production activities, but that previously had no say in their operation or resolution. New political realities rightly demand open democratic participation in, and accountability for, costly issues of national concern that have long been ignored by both technical managers and politicians. In addition, a new set of technical exigencies and current limitations now will require an equally diligent drive and dedication to overcome. DOE's continued dependence on a narrow, outmoded management philosophy and closed decision making processes, however, have made it difficult at best for DOE to openly embrace its new mission and achieve substantive progress beyond simply maintaining the status quo.

The unique legacy threatening Hanford (and other DOE sites) took fifty years to accumulate. It will not be resolved overnight, despite political and public impatience. Sustained action will be required to meet goals agreed to in good faith in compliance agreements, and this in turn will require a long-term commitment of both dollars and political will. Some problems will be more readily and quickly resolved than others. Some will require long-term actions and technologies that do not now exist--directly challenging traditional political, institutional, and technological limitations. The federal government has committed in both words and actions that these challenges will be met.

The risks that current and future conditions at DOE sites across the nation now pose are very real. As such, these risks cannot be eliminated or ignored simply because they are difficult, costly, or cannot be solved today or even tomorrow. *Widespread contamination cannot be willed away. Neither can "clean-up" be declared legislatively "complete" simply by altering regulations or so-called "clean-up" standards in order to satisfy political impatience or the short attention spans of the public or Congress. Similarly, "clean-up" cannot necessarily be considered complete simply because of pressure from current conflicting budgetary considerations or past budgetary mismanagement. Without an adequate risk baseline, it will remain impossible to determine what, if any, actual "clean-up" progress is being made.*

Existing wastes and contamination and the daily impacts they now have in human and ecological communities cannot be altered by legislative action, only by remedial actions. Turning Hanford or any other DOE site into a "national sacrifice zone" is not an acceptable legacy to leave to future generations. The paradox is that while such a short-sighted approach may be justified as "cost-effective" now, it fundamentally ignores the long-term consequences, risks, and true life-cycle costs to both affected communities and the U.S. government. *Congress and the public all benefited from the national security provided by the nuclear arsenal that created this legacy of polluted land and resources. Federal government commitments to "clean-up" must be kept and*

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*proactively fulfilled. Affected communities already have had to bear a disproportionate share of the impacts of "self-regulated" federal actions for 50 years; they should not also now be expected to bear a disproportionate amount of the "clean-up" burden as well.*

The Tri-Party Agreement at Hanford and other federal facility compliance agreements constitute the ultimate foundation of prioritization for risk management, risk-reduction strategies, and remedial actions. The TPA is a unique contract blending regulatory requirements, priorities, and the desires of residents of the Pacific Northwest. This agreement has benefited significantly from extensive public review and input and by its very nature prioritizes risk control and embodies public perspectives and regulatory compliance. *Thus the TPA comprises a much more democratic alternative than any strictly risk-based identification of remedial priorities, which both DOE and regulators directly entered into in good faith. Popular acceptance in the Pacific Northwest has resulted only with the firm understanding that the TPA constitutes a legally enforceable federal government commitment and schedule that would direct timely, substantive, and protective Hanford site "clean-up."*

Within a compliance agreement framework, risk evaluations can be an effective remedial decision-making tool, *but only if* a sufficiently comprehensive spectrum of information related to affected communities is considered directly by the process itself. The narrowness of traditional risk assessment alone cannot satisfy these requirements, and often serves simply as a seemingly objective, but in fact highly malleable technique to decide only how *little* is to be done. Unfortunately, this is especially true when--as in the case of DOE--the polluter also is responsible for directing "clean-up." The focus tends to be on defining how *much* pollution or how *little* "clean-up" is acceptable, rather than on a more holistic approach of more broadly defining what is truly desirable and achievable. Conventional risk assessment defines and characterizes risks only very narrowly, for example, based on only single chemicals, exposure pathways, or a single risk factor such as cancer. Moreover, increasing criticism focused on characterizing remedial actions as overly protective (how can this even be possible??) is misdirected. *These narrow concerns ignore the critical importance of the unspoken values, biases, and judgement process embedded within a non-Indian myth that fundamentally violates and dismisses 13,000 years of protective and sustainable environmental management by American Indian tribes.*

Risks to cultures and to cultural values are just as real as risks to human health and the environment. This is especially true for American Indian communities, whose very culture, lifestyles, and tribal identity depend on a clean, healthy environment whose integrity has not been violated (Appendix B). In the Hanford region, sovereign tribes ceded title to vast tracts of their traditional homelands, but specifically retained rights in their treaties to lands, resources, and traditional activities. Hence, all decisions affecting Hanford site "clean-up" must respect tribal sovereignty and treaty-reserved rights, must enhance government-to-government communications, and must facilitate direct and early tribal involvement in decisions that may impact tribes, as mandated under the DOE Indian Policy.<sup>12</sup> Moreover, as one of the nation's larger land and natural resource managers, DOE has trustee responsibilities to protect and

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preserve its lands, natural, and cultural resources not only under the treaties, but also under numerous federal and state laws. Although some progress is beginning to be made in characterizing what might be termed the "ecocultural landscape,"<sup>13</sup> DOE has yet to effectively integrate American Indian cultures, cultural values, and its cultural resource protection and management responsibilities into its site "clean-up" decision-making processes.<sup>14</sup>

Widely recognized deficiencies of conventional risk assessment for comprehensive environmental decision-making have led to numerous independent attempts to create more comprehensive and holistic approaches to risk-based decision-making. The most successful and enduring of these approaches depend on a more integrated environmental management framework that intimately includes values and other qualitative considerations. Numerous, but by no means exhaustive, examples are highlighted within this report.<sup>15</sup> The approaches identified below are readily applicable--and in some cases, have been applied--to DOE sites across the nation, including Hanford.

*There is no need to "reinvent the wheel." These examples all show that more comprehensive risk evaluation frameworks already have been developed, effectively utilized in wide ranging applications across the nation, and can be further adapted to site-specific DOE needs. There is, however, a critical need to have the conviction, courage, and forethought to move forward with incorporating a more holistic management philosophy within all levels of DOE, and to move beyond the historical piecemeal approach to risks, compliance, health, and environmental management in general.*

## IV. TOWARD A MORE JUST AND COMPREHENSIVE RISK EVALUATION PARADIGM

A. Risk Perception is the Cornerstone of Risk Assessment, Risk Evaluation, and Risk Management1) There's More to Risk Than Just Numbers

Despite what we are frequently told, *science is never truly objective*. Science is in fact a highly value-laden product of the culture and society within which it occurs and which it serves. Because we all are members of this society and encounter science daily, we are often unaware or take for granted the imprint of our inherent cultural and personal biases. Furthermore, the nature of the judgement process we apply to filter through all the available information is highly complex and individual, and requires that we select and highlight some information and then ignore or discard the rest. The same is true for all societies or cultures: it is a universal human way to cope with information overload. For example, cultural values and biases dictate the kinds of questions asked in scientific inquiries--and more importantly, the questions not asked.

The term "risk" itself is a value word, like "safe" and "clean." It just *sounds* more numerical, technical, and therefore objective. Risk typically is defined in terms of methods, not goals,

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which only adds further confusion and contributes to its frequent misuse or misapplication. Further, many assumptions, uncertainties, and limitations are inherent in the risk assessment process, largely reflecting a lack of data or knowledge about risk, and have been well delineated (Appendix H). The chief failure of conventional risk assessment--and especially its application--is that it addresses only a part of the much bigger risk picture.

*Many of the identified deficiencies with conventional quantitative risk assessment reflect the fact that risk is not only a function of readily quantifiable (if highly limited) measures of toxicity, dose, exposure duration and pathways, and induced health effects. Risk also inseparably depends upon more elusive, and difficult to measure qualitative factors, such as social and cultural values, along with personal and cultural biases and the relatively subjective or intuitive judgement process used by humans to select and weigh the spectrum of available information and attitudes. Ironically, in many important respects, more is known and quantifiable about "perceived" risk than about toxicological hazards, environmental pathways, and health impacts.<sup>14</sup>*

Although often difficult to specify, such considerations are no less important than conventional measures to affected communities, to technically defensible risk management strategies, and to politically supportable decisions for remedial action. To the confoundment of many so-called experts, who are more comfortable with cold, hard statistics about mortality or accident rates, these often highly subjective considerations--often belittled as the "outrage" component--exert a disproportionate influence on decisions. Because such elusive factors are difficult to measure or model, they have been traditionally excluded from conventional risk assessment methodology, dismissed as only opinions or preferences, or if they are included, it's only as "guiding values" during a later risk management phase. *Yet the political reality is that environmental managers must comprehensively address the full scope of risk in order for decisions to have any true viability, lasting power, or popular support.*

The full scope of risk also is profoundly influenced by personal experiences (which may be misleading), how information is presented (mortality versus survival rates), degree of familiarity, biased media coverage, strength of convictions (that remain steadfast regardless of evidence to the contrary), and a host of other highly variable individual factors. Moreover, when nuclear issues in particular are considered, factors such as uncontrollability, dread, catastrophic potential (on a global scale), fatal consequences, immediacy, high risk to future generations, and involuntariness take on a heightened influence.<sup>17</sup> For example, people are generally willing to accept risks from voluntary activities (such as skiing) that are roughly 1000 times greater than from involuntary hazards (such as food preservatives).<sup>18</sup>

Clearly, risk means different things to different people.<sup>19</sup> For example, a high degree of "perceived" risk typically is required to cause a change in behavior, such as avoidance, stricter discharge limits, or in the case of remedial decisions, "clean-up." It is time to move beyond the arbitrary and fallacious technical distinctions between "hazard" and "outrage," which are too commonly misinterpreted separately as "real" and "perceived" risks (i.e., not "real" to experts, those who matter, even if "real" to affected communities, who don't matter). In point of fact,

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factors commonly associated with "outrage" are more often than not found to be related to quality of life and cultural values that truly are at real risk.

### 2) It Always Returns to Values

Hence, conventional quantitative risk assessments alone tell only a limited part of the story. Numbers can provide a representative version of the truth--if the right data are collected--but a comprehensive characterization of risk and its role in risk management and remedial decision-making always returns to values and quality of life issues. The real question is whose values will govern the process. Will it be those of remote, uninvolved "experts," a distant, self-obsessed, and sometimes uninformed federal government, or those of the communities that are affected by such actions every day?

There is much more at risk than human health and the environment, although these are clear measures of health and risk. Important qualitative and cultural values--and cultures themselves--are at risk from DOE facilities and past, current, and future activities across the nation. This equally important cultural risk can only be determined by including both values and the affected communities directly in a rigorous and systematic evaluation process. Such concerns are at the very heart of the environmental justice reforms that all federal cabinet-level departments are implementing. These values cannot simply be applied as *post hoc* "scaling factors" to the "real" (read: legitimate) hazard data during a subsequent risk management phase, nor should they be used solely to modify the tail end of a decision process after the "experts" have already framed the discussion and established "their" boundaries as to the scope of the study or range of options.

Without a more rigorous, credible, and comprehensive process, decisions based on risk alone may result at best in unprotective or short-sighted remedial actions. At worst, they result in political decisions that are based solely on budgetary constraints and rely on a biased, fragmentary information base. To facilitate the widespread acceptance necessary for success and to comprise a credible approach to risk management and remedial action decision making, traditional risk evaluation must become a more responsive, open, and humane process.

## B. Moving Beyond Conventional Risk Assessment

### 1) Overview

The widespread deficiencies and limitations of conventional risk assessment, both as a technical evaluation methodology and as a policy or political decision-making tool, are well recognized by many diverse interests (see Appendix H). Risk assessment is often praised for its ability to quantitatively characterize, and thus support ranking or prioritization of actions necessary to eliminate, control, or 'manage' risk.<sup>20</sup> But conventional risk methods are plagued nonetheless by a number of inherent limitations in their ability to reflect cultural or other social values--such as

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those of American Indian tribes—that are not easily quantified, numerically simulated, or modeled. Regardless, a full evaluation of risk remains a highly subjective matter, which necessarily includes qualitative attributes, cultural factors, and subjective judgements. No true or comprehensive characterization of risk can ignore such fundamental and integral considerations, which can only be identified and incorporated through comprehensive involvement of affected communities and their values throughout the process.

Because so many different sets of values (whose to choose?) are commonly involved, some of which may conflict, many processes and decisions simply leave it to the "experts" or settle for a solution that appears least objectionable to the most people at the surface, even if it is short-sighted or unprotective. Too often, "consensus" simply means compromising any real substance out of a process or decision.

"When common ground is limited, we reach for acceptability, not desirability. In environmental management, when stakeholders have different value systems (cultures) we tend toward analytic thinking. Therefore, trying to get holistic thinking from people with different value systems is difficult. Analytic thinking supports science, individualism, and discovery. Holistic thinking supports management, consensus, and optimization. For [successful] environmental management, clearly we want to blend both holistic and analytic thinking in a situation where our differences force us toward analytic thinking.

"We don't have to define desirability precisely. A rough estimate will do. . . . [A] rough estimate of desirability is not only easier, it's better. . . . [W]hen we define exact boundaries, people will tend to focus on the boundary and meet lower requirements.

"The answer is to optimally blend holistic and analytic thinking and to trade off individualism and technology against unified values and management. Holistic thinking is in itself oriented toward this blend. The environment deserves a profound understanding of the harmonious blend of science and management."<sup>21</sup>

Risk evaluations, as integral components of a political process, should not be allowed to singularly substitute for the need to weigh a broad spectrum of relevant information and make tough decisions or political choices. Nor should tough choices simply default to the so-called "panel of experts" approach that only facilitates further disconnect from affected communities, justifies a "solicit input" and "respond to comments" approach, and isolates democratic decision-making from those activities that affect people's lives and their communities every day.

### 2) Building Consensus

These widely recognized limitations have led to numerous attempts to improve the quality, comprehensiveness, and responsiveness of risk evaluation efforts. One of these efforts was

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conducted in direct response to Assistant Secretary Grumbly's request before the National Research Council in November 1993, which resulted in a report called *Building Consensus Through Risk Assessment and Management of the DOE's Environmental Remediation Program* (1994). The *Building Consensus* report in particular attempts to outline a new risk evaluation framework. It begins by highlighting two elements essential to building a credible risk evaluation process: "it is vital to the quality of the [risk evaluation] process that independent external review and public [and tribal] participation occur throughout"<sup>22</sup> and the "importance of including considerations other than quantitative ones in risk assessment and risk management."<sup>23</sup>

The inclusion of meaningful and effective public/tribal participation in *all* phases of a credible risk evaluation program is the clearest way to build credibility, which *Building Consensus* spells out in some detail.

"Stakeholder"<sup>24</sup> participation should begin with scoping and continue throughout the assessment process. It should be included in key decisions and integrated into the work plan. . . . It should begin early in the conceptual phases of a program and continue through[out] each phase. It should be interactive and iterative, and stakeholders should perform consultative roles in which they help define basic concepts and approaches, rather than exclusively the more traditional 'review and comment' role. Broad stakeholder participation can improve the quality of assessments by increasing the comprehensiveness of data; ensuring that all site-relevant pathways, end points, and land uses are taken into account and are based on an accurate understanding of habits, values, and preferences of affected people; and contributing to the discussion of appropriate and acceptable uses for risk assessment in the process of risk management. *Stakeholder participation in assessing risks at DOE facilities must be an integral component of any process that is expected to result in credible, broadly accepted assessments.*<sup>25</sup> [emphasis added]

Moreover, Assistant Secretary Grumbly is particularly sensitive to the essential need for *credibility* in order to gain public, tribal, and regulator acceptance. Such credibility results directly from a responsive, responsible, and competent organization fully satisfying a comprehensive set of objectives. *Building Consensus* outlines six essential attributes that any risk evaluation "institution" must possess:

- "It needs to be perceived as being neutral and credible.
- "It needs the ability to conduct scientifically valid and responsible risk assessments.
- "Its assessments must be subjected to independent external review by technical experts [not just agents selected by the organization responsible, paradoxically, for both pollution and clean-up].
- "It needs the ability to plan, organize, manage, and facilitate public [and tribal] participation in [affected] communities.
- "It needs to have [financial and scientific] management capability.

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- "It needs the ability to communicate complicated scientific information on potential risks and uncertainties effectively."<sup>26</sup>

"*Building Consensus*" then identifies four principal objectives for risk assessments:

- Providing "credibility,"
- The need to "operate expeditiously,"
- The need to "consider the *full range of risks of concern* to stakeholders in the light of social, religious, historical, political, land-use, and cultural values and needs," and
- Being "efficient and cost effective and produc[ing] results that contribute to identification of remedies and priorities."<sup>27</sup>

### C. Toward Holistic/Integrated Environmental Management

A number of recently completed efforts directly confront recognized problems and limitations with conventional risk assessment methodology. Each attempts to establish criteria and process(es) that provide a sufficiently comprehensive information base to support credible, technically defensible, and politically acceptable risk management and remedial decisions.

A recurrent theme among all of these efforts has been the need to directly address those important qualitative issues, social/cultural values, and elements of time traditionally ignored in conventional risk assessment and piecemeal (crisis) environmental management. The focus of these efforts has been to develop a more comprehensive and rigorous framework that specifically includes qualitative considerations and social/cultural values as an integral component of the risk evaluation and decision making process. This focus is based on universal recognition that many factors in addition to quantitative data are relevant to priority setting and risk management, and that these must be included in the evaluation process in order to provide both credibility and comprehensiveness to the nature, magnitude, and urgency of risks identified. Moreover, there is consistent and universal recognition among these efforts of the critical need for integrated tribal/public participation throughout the decision making process for it to gain the credibility and popular support necessary for success.

These innovative risk evaluation efforts all have directly and successfully challenged the well recognized limitations of conventional risk assessment methodology. They have attempted to construct comprehensive and workable solutions that will improve both the usefulness and defensibility of risk evaluation as an analytical support technique and as a decision-making tool. These state-of-the-art studies consciously recognize and fully incorporate the full scope of risk into their process, and show how it can be done efficiently, cost-effectively, and credibly.

In many respects, these approaches can meet Assistant Secretary Grumbly's mandate by building in credibility and effective tribal/public participation throughout the process. The selected examples highlight numerous, workable, and cost effective alternatives. The critical obstacle yet

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to be overcome is the still deeply entrenched institutional resistance within DOE and its contractors that has effectively prevented even the consideration of new or more comprehensive approaches, let alone their implementation. The principal challenge now is to adapt and adopt these techniques into DOE's decision-making framework, both at the site-specific and complex-wide levels, and to foster DOE's recognition that such efforts will pay off both politically and financially with more widespread popular support and more timely, cost-effective results.

Nine different forums that explore comprehensive risk evaluation and holistic environmental management are highlighted in Appendix I; they are by no means exhaustive. These include the Blacksburg Forum, the Vermont Comparative Risk Project, the Wisconsin Tribes Comparative Risk Project, and the California Comparative Risk Project, and five Hanford-specific forums, Values-Based Risk Evaluation, the Hanford Future Site Uses Working Group, the Hanford Tank Waste Task Force, the Hanford Environmental Dose Reconstruction Project, and the Native American Working Group.

Each of these efforts has developed an innovative approach to characterizing risk and/or developing environmental priorities that are built upon meaningful and comprehensive tribal/public participation throughout the process and firm incorporation of social, cultural, and aesthetic values directly within their evaluation methodology. Each, however, has depended upon a combination of science, an upfront awareness of the critical role of perspective and uncertainty, and the combined judgement (recognizing its subjectivity) of scientists, citizens, and affected community members. The consistent and systematic application of evaluation criteria to both quantitative and qualitative considerations also permit ranking, where desired. Moreover, all forums independently agree that true risk cannot be accurately and comprehensively characterized--and hence broadly accepted risk evaluations result--without an overarching holistic perspective and breadth of data that fundamentally recognizes and incorporates values and qualitative measures of risk into integrated environmental management strategies.

### D. Risks, Costs, and Benefits are Interrelated

Reducing risks requires action on (or in) the ground. The magnitude, breadth, severity, and urgency of the multiple threats that Hanford poses will necessarily result in involuntary human suffering, accumulating environmental damage, and growing associated public health costs, either immediately or over the long-term. Avoiding the adverse impacts, whether direct or indirect, that result directly from such threats can only occur by effectively removing or reducing the risks.

Real risk reduction cannot be accomplished legislatively by gutting current environmental laws, by removing the rights of citizens and communities to enforce such laws on their own if government will not, or by establishing remedial standards or residual risk levels that are not truly protective, but merely the result of intense political pressure and "compromise." True risk reduction must be focused where the greatest risks are really located, which is *not* in the halls of

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Congress or DOE (even though some might disagree). Not only affected communities, but society as a whole will truly benefit, over both the short- and long-term, from substantive actions that demonstrably protect human health, the environment, and cultural values. Many people simply don't trust government and government officials these days--and rightfully so--because of government's persistent failures to live up to commitments. Congress and especially DOE also would benefit enormously and immeasurably from society's restored faith and trust in a government that does not often seem to protect the interests of society as a whole.

The current annual Hanford EM budget (FY 95) is on the order of \$1.4 billion. Current planning in both DOE and Congress indicates that such order-of-magnitude levels are unlikely to continue, regardless of actual field conditions. Allocation of the current Hanford budget is split between various programs including Waste Management, Nuclear Materials and Facility Stabilization, Environmental Restoration, Landlord, and others (Appendix J). For example, funding for Environmental Restoration nationwide totals about 25% of DOE's EM budget, but at Hanford this program accounts for only 13% of expenditures. Moreover, while it is expected that the overall EM budget will decline in real dollars over the next few years, major new "clean-up" responsibilities, such as the Savannah River Site, SC, and the Mound Plant, OH, will be added, leaving even fewer dollars available for existing commitments.

As most people would perceive it, very little of this budget is directed at actual "clean-up" (i.e., the proactive components of remediation and restoration, decontamination and decommissioning); the bulk of funds are spent on "waste management," or simply maintaining the status quo. For example, at Hanford, fully two-thirds of the dollars now spent go simply to monitor and maintain existing conditions (or confirm that they are growing worse) at tank farms, in contaminated facilities, and to store hazardous wastes, and nothing more. Another 20% goes directly for "overhead;" additional major indirect costs that further inflate this figure are hidden throughout each program's budget. *If progress in achieving "clean-up" is ever to occur, a fundamental change in thinking, goals, and decision-making frameworks is desperately required.*

### 1) The Need for a Proactive On-the-Ground Commitment

"Clean-up" of DOE sites has come under increasing scrutiny by tribes, the public, and Congress because considerable expenditures of public funds over the past five years have resulted in little apparent accomplishment of outlined goals. Outside of DOE, there is widespread support for proactive remedial and restoration *actions*: remove or stabilize existing wastes and contamination, stop discharges into the Columbia River, pump-and-treat contaminated groundwater, stabilize tank wastes and spent fuel, remove or reuse outmoded facilities, etc. To most of Hanford's "stakeholders" and to most individuals of whatever community, these types of *actions* are what most people think of as "clean-up."

*It's not that enough money is not available, it's more a lack of proactive commitment and focus to actually conduct meaningful "clean-up" in the field and not just maintain the status quo.*

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*Prioritization alone is not enough. The basic problem has been a refusal to act. Endless discussions at DOE center on ancillary issues, having all the answers before beginning, waiting for better/cheaper technology, residual risk and clean-up standards, duplicative monitoring, and a focus on the letter but not spirit of regulatory requirements. These distractions have in common that they are all forms of delay or doing nothing. Together they have led to a remarkable lack of action in the field to actually reduce or eliminate those very real risks that are affecting both human and ecological communities every day.*

Risk evaluation or prioritization cannot become yet another excuse for rationalizing still further delays or doing nothing, for continuing to stall meaningful actions while contamination spreads, for failing to develop values-based remedial designs, or for refusing to accept responsibility for tough decisions that lead to action. It is especially critical that, in an era of budgetary constraints, limited resources must target meaningful actions and focused data collection that directly reduce current and future risks to humans and other communities, not just continued monitoring. The longer we wait, the more complex, difficult, costly, and widespread problems will become. Fences (or other institutional controls) alone cannot mitigate these threats, either now or in the future.

## 2) Impacts of Proposed Budget Reductions for Cost-Effective Risk Reduction

Proposed EM budget reductions over the next several years have been self-imposed at the DOE-Headquarters level in an attempt to avoid perhaps a less selective Congressional budget axe. Currently proposed major cutbacks for FY 1996 and 1997 mean that available funds will be inadequate to meet scheduled TPA milestones, which constitute legally binding commitments on the federal government. The focus of proposed cuts would appear to bring virtually all meaningful field remediation efforts, such as groundwater pump-and-treat programs, to a grinding halt. To make matters worse in the eyes of tribes, the public, regulators, and stakeholders, the Environmental Restoration Program appears to be the disproportionate focal point of cuts year after year. Moreover, expensive new production activities that are now being proposed cannot take precedence, and must not be permitted at the expense of "cleaning up" the legacy of past weapons production activities. DOE appears to be deliberately setting itself up to fail in the eyes of tribes, the public, and Congress when it proposes the largest cutbacks in just those areas that demonstrate the most visible on-the-ground action and have the greatest popular support to accomplish what most people would consider "clean-up."

DOE appears to be heading down the same road to failure because, in its panic to address both real and feared budget cutbacks, it has retreated into its former (?) secretive habits and failed to seek the support and involvement of its "constituents." By not involving its constituents, their values, and interests in the hard decisions to be made, DOE is bound to repeat its past mistakes and fail once again. For example, groundwater pump-and-treatment programs have received widespread support from a diverse group of interests because they are proven to be highly effective and meaningfully contribute to removing, reducing, or controlling further contaminant

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migration--both at Hanford and elsewhere. Few other "clean-up" programs share such a high degree of popular support and demonstrated field success. Specifically, one groundwater pump-and-treat project addressing carbon tetrachloride contamination in the Hanford 200 Areas has been enormously successful.<sup>24</sup> But DOE and especially its contractors have been disturbingly quiet about this unabashed success story--perhaps because they then might be expected to implement such programs more widely.

Contractors must not be allowed to control and further stall meaningful progress out of simple self-interest and greed. It is not unusual for contractors to stall or oppose implementing an agreed upon approach in order to simply perpetuate and institutionalize the incoming federal dollars. The increasing proliferation of contractors (and contractor employees) at the Hanford site has greatly compounded already exacerbated communications problems and work efficiency. Moreover, having too many contractors also has facilitated an "empire-building" mentality consisting largely of petty turf battles. Many program managers appear to have lost all sight of the overall purpose and direction of "clean-up" in their narrowly focused zeal to control programs, staff, workscope, and ever more dollars. Unfortunately, contractors often contribute more to Hanford's problems than to its desperately needed solutions.

Those who only question what is done without simultaneously asking how it is done miss the point. Over a year ago, the Hanford Federal Facility Compliance Agreement was amended to include a Cost and Management Efficiency Initiative geared to result in a savings of \$1 billion at Hanford alone over the next five years. Yet DOE and its contractors appear to have done little to actually implement this desirable program, to actually eliminate top-heavy management, excessive overhead and indirect costs, bureaucratic inefficiency, excessive and redundant oversight, focus employee activities, and to actually get the dollars focused into on-the-ground actions--such as Hanford groundwater pump-and-treat projects. To our knowledge, few if any measures of success have been developed for this effort, and no attempts to solicit values, involve outside interests, and to develop an overarching philosophy for improvement have yet been made.

Similarly promising efforts such as the Schedule Optimization Study (1992) and the Project Performance Improvement Plan (1994)--studies specifically commissioned by DOE--also have faded into oblivion, once the initial fanfare and excitement has dissipated. These forums directly address true obstacles to "clean-up" progress, but their recommendations are consistently ignored by DOE managers who are much more a part of the problem than the solution. Rather than let themselves be blamed, attention is diverted from the crux of the problem. For example, many now call for scrapping the TPA, because "it" can be blamed as the source of delays and excessive costs. This diversionary tactic is their first choice, *even though DOE has made few good faith efforts up to this point to live up to the agreements it signed*, which were negotiated in good faith. Another DOE strategy has been to reduce, postpone, or eliminate workscope and staff in the field, but not in the managers' offices. What does this portend for DOE's already tarnished credibility and trustworthiness in the eyes of tribes, the public, or Congress?

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3) Action in the Field, Not the Halls of Congress, Is Required

Enough is known now about the most urgent and severe Hanford risks and conditions to begin meaningful action in the field. More data or information is always desirable and in fact must be collected in order to better understand and comprehensively characterize the full scope of Hanford risks sitewide and support their prioritization for resolution. But there are many things that can be done immediately to move ahead with "clean-up" in the field.<sup>29</sup> Use the lessons learned along the way to adjust and make necessary improvements; valuable data and new insights will result. *The key point now is to start.* Make major management and decision-making framework changes, involve affected communities in all aspects of decisions and programs, refocus programs to accomplish timely, good faith results in the field, etc.

"Changing the rules" by legislating "clean-up" approaches or remedial standards without sustained, effective, and comprehensive "clean-up" of the nation's Cold War legacy in the field will only lead to further, magnified, and more widespread problems in the future. While creating "national sacrifice zones" apparently can be rationalized by some as cost-effective in the short-term, this short-sighted approach will necessarily result in proportionally much greater public health, environmental, and societal costs over the full period of *many thousands of years* that such risks will persist, grow, and spread. This legacy, imposed upon tribal and other communities without their knowledge or consent, appears to be rooted in a profound belief that science can be legislated, that both legal and moral considerations can be dismissed if they're inconvenient, and that federal government commitments can remain unfulfilled.

## V. CONCLUDING OBSERVATIONS

Cost-risk-benefit analyses will increasingly be used to support budget allocation, prioritization, and remedial standards. Because of the unforgiving potential consequences of poor or politically expedient decisions, it is more important than ever to improve and better integrate risk assessment, risk management, and decision analysis tools to fit the data needs, public desires, and federal government responsibilities. Within any particular decision context, it is imperative to maintain a consistency of philosophy and a clear understanding of the information needs (breadth, precision, and uncertainty) at different decision levels. Furthermore, this participatory democratic process should be driven by values-based goals, and supported by the most appropriate and defensible tools chosen specifically to accomplish the identified goals.

- Equal access to a shared decision process is often lacking. Full tribal/public participation should influence all stages of the process, from scoping, to values identification, to information requirements, to the final decision.
- The process must *begin* with statements of values, principles, and decision criteria, rather than simply with narrow technical problem statements. Values are system requirements, not just opinions or preferences that can be "addressed" later.

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### A. The Lessons of Piecemeal Environmental Management

The current lack of an integrated environmental management policy based on comprehensive and clearly stated principles and objectives, either at Hanford specifically or throughout the DOE complex in general, has resulted in a long and frustrating history of poor decisions, lost time, and inestimable sums of wasted public dollars. Constant internal reorganizations and perpetually high staff turnover at DOE effectively prevent learning from either past mistakes or successes. For example, the following recent failures from Hanford illustrate the dire need for an overarching vision and consistency of purpose, a more sound integration of technical, institutional, and cultural perspectives, a more sound and open intergovernmental decision process, and a solid base of information to begin with.

- N-Springs barrier (failed to address cultural sensitivity and overlooked technical feasibility issues in rush to act),
- Waste entombment in grout (did not satisfy health and retrievability requirements and failed to involve and meet public/tribal acceptance),
- EMSL siting and resiting (ignored cultural resource protection concerns voiced by both tribes and DOE's own contractor),
- Proposal to quarry rip-rap or barrier material from sacred sites such as Gable Mountain (failure to consider affected tribal community/spiritual values and long-term, cumulative environmental impacts to on- or offsite quarry sites),
- Aesthetic degradation of Gable Mountain from proposed nearby SMES siting (failure to consider affected tribal community/spiritual values),
- Location of ERDF within prime sage-steppe habitat (decision made without tribal/public/natural resource trustee input, considering long-term environmental impacts, or habitat mitigation requirements),
- Deficiencies of simple surface barriers for long-term environmental and value protection (failure to provide long-term protectiveness, indirect and cumulative impacts of mining vast amounts of hard rock and cover soils from external sites),
- Proposal to renege on 300 Process Trenches ROD (original agreement to remove wastes now deemed "too hazardous" to workers), and
- Claim to have "cleaned up" 45% of the Hanford site (a highly deceptive public relations campaign because only an infinitesimal fraction of 1% of contamination—none radioactive—was involved, and restoration of disturbed areas is highly limited).

### B. The Strength of Integrated/Holistic Environmental Management

On the other hand, defensible and widely acceptable decisions are much harder to enumerate. Where they exist, each has in common components of the broader integrated environmental management philosophy described herein, which depend upon a more effective and substantive tribal/public involvement in values identification and multiple phases of decision making, and a

more solid, if still incomplete, information base. The examples below owe their success to an overarching vision that reflects widely accepted values and a consistency of purpose--elements that are blatantly missing from any of the above failures.

- Recently completed Environmental Restoration Program Refocusing amendments to Hanford Tri-Party Agreement (which DOE balked at signing for months),
- Some Facility Transition planning, and
- The identified "Path Forward" for spent fuel in the K-basins.

In fact, the development of clearly defined principles, goals, and decision criteria and a single sitewide engineering design basis which directly incorporates values, expectations, interests, and rights will be essential to provide the holistic framework necessary for both technically defensible and politically acceptable decisions. This process must include the fundamental establishment of a comprehensive and effective intergovernmental process built together with tribal sovereigns, and not just in response to them.

### C. Returning to Congress' Mandate

The success of DOE's environmental management program overall and the permanence of decisions that result ultimately will require a much stronger information base than now exists. Effective prioritization of activities can only occur with sufficient information, which will also provide a baseline against which risk reduction progress can be measured in terms of both health-effectiveness and cost-effectiveness, and for which cost-risk-health goals can be developed. Credibility, however, will depend upon developing clear and focused data objectives and will require an open process that facilitates the equal participation of affected communities and a comprehensive inclusion and evaluation of all major issues of concern. Current data quality ranges from zero to subjective to (occasionally) relative and (rarely) qualitative or quantitative. *Because of a long history of successful and sustainable environmental management, tribes would appear to be one of the few sources of sound technical and policy guidance on what information is needed for various decision contexts and how to collect it cost-effectively.*

- What is the relation between compliance agreement requirements and actual environment, health, and safety effectiveness?
- Under what circumstances is a life-cycle/cost-risk approach needed, when will a budget-based approach suffice, and when must cultural values predominate?

In returning to these original questions that Congress sought answers to, it is imperative to note that credible cost-risk-benefit analyses cannot take place until a more comprehensive and defensible risk picture begins to develop. This will require the integration of both a sufficient information base and the values of affected communities. This critical point appears to be recognized by both Departmental and Congressional leaders, *but now must result in actions being implemented to provide the necessary scope of information together with the necessary*

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*process that facilitates involvement of affected communities. Only then can the questions Congress has asked be adequately, comprehensively, credibly, and defensibly addressed.*

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Notes

1. The term "*clean-up*" constitutes one of the most overused and abused terms associated with DOE's new environmental restoration mission at many of its sites. Although this term is often used as shorthand for a variety of activities, its overuse has led to a loss in any real meaning and in fact its use frequently obscures the true nature of actions taking place. In this report, the term "*clean-up*" is used only in a general sense to convey an overall image. Specific actions are referred to by the appropriate term, such as environmentally sound waste management, environmental remediation, or environmental restoration. Although more cumbersome, these terms more accurately and correctly describe the specific nature of actions being undertaken.

2. For the purposes of this report, '*risk*' may be defined as the likelihood of adverse consequences from an action or condition. Quantitative risk assessments tend to substitute the term 'probability' for 'likelihood,' with the implication of greater mathematical rigor and precision.

3. Risk analyses may encompass a wide variety of techniques and approaches. Approaches may produce either quantitative (numerical, probabilistic) results, or result in qualitative rankings such as high, medium, or low levels of risk. Types of analyses commonly in use include, but are not limited to: quantitative risk assessment, comparative risk assessment, qualitative risk assessment, values-based evaluation, alternatives assessment, worst-case scenarios, fault-tree analyses, and other techniques.

4. At first glance, risk assessment appears to offer a number of distinct advantages. In remedial decision-making, for example, a number of potential benefits have been recognized.

- Risk assessment helps in ranking the relative importance of individual contributions to overall risk.
- Risk assessment helps to identify risks that are easily reduced or eliminated.
- Risk assessment can provide an objective (?) basis for decisions on controlling or managing risks.
- Risk assessment can provide important quantitative information as input to decisions for allocating resources to remediate sites.
- Risk assessment makes it possible to rank remedial alternatives in terms of risk to workers, the environment, and the public.
- Perhaps most important, risk assessment can provide a process for consensus and a forum for the participation of stakeholders in the development of the risk assessment process and the identification of important social, cultural, and tribal values in the selection of factors to be assessed and remediation alternatives to be analyzed. This process will hopefully lead to greater acceptance of the eventual result of that remediation as well as provide insights as to how to reduce public health impact during and after remediation. [emphasis added]

from *Building Consensus*, p. 13-14.

5. President Clinton issued Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," on February 11, 1994. "The purpose of this Order is to underscore certain provisions of existing laws that can help ensure that all communities and persons across the nation live in a safe and healthful environment." The cover letter to the Order further states that "[e]ach Federal agency shall analyze the environmental effects, including human health, economic and social effects, of Federal actions, including effects on minority communities and low-income communities, when such analysis is required

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by the National Environmental Policy Act of 1969 (NEPA). . . . Among the requirements in this Order is the identification of differential patterns of consumption of natural resources, and considerations of environmental and human health risks as well as social and economic impacts.

6. *Closing the Circle on the Splitting of the Atom, The Environmental Legacy of Nuclear Weapons Production in the United States and What the Department of Energy is Doing About It*: U.S. Department of Energy, Office of Environmental Management, January 1995, p. 9.

7. *Closing the Circle, and Environmental Management 1995*: U.S. Department of Energy, Office of Environmental Management, February 1995.

8. *Closing the Circle*.

9. See supplemental documentation in Appendix F.

10. E.g., the Comprehensive Environmental Response, Compensation and Liability Act, "CERCLA or 'Superfund'," 42 U.S.C. § 9601 et seq., the Emergency Planning and Community Right-to-Know Act "EPCRA," 42 U.S.C. § 11001 et seq., and the Resource Conservation and Recovery Act, 42 U.S.C. 6901§ et seq.

11. Forcing ATSDR to more meaningfully fulfill its CERCLA mandate would be a step in the right direction. Few of its current efforts have anything to do with understanding or assessing impacts to communities and their health, either presently or in the future.

12. See Appendix C.

13. The term '*ecocultural landscape*' refers to a combination of "landscape ecology" plus the term "cultural landscape," as used by the U.S. Forest Service. It is intended to convey a more all-inclusive ecosystem concept in which humans and their values are an integral part of the whole system and not separate from it.

14. The crisis created by DOE contractors unearthing American Indian cultural artifacts during site grading operations for the Environmental and Molecular Sciences Laboratory (EMSL) in April 1994 is a case in point. Following release of the initial Environmental Assessment for siting EMSL in 1992, the CTUIR submitted comments emphasizing the high potential for cultural artifacts being present along this river margin bluff site. Similar reservations also were expressed by cultural resources staff of DOE's own contractor, the Pacific Northwest Laboratory (PNL). These concerns were ignored. Instead, the favored river view site was chosen in spite of voiced concerns and the availability of two less risky siting options. After artifacts were discovered on the second day of site activities, the process came to a screeching halt while restoration activities began. After several months delay, the building was resited to one of the original alternative locations. This fiasco unnecessarily cost the U.S. taxpayers between \$3 and 8 million, solely because DOE failed to listen to legitimate and widely expressed concerns.

15. See Section IV, Subsection C, *Toward Integrated/Holistic Environmental Management*, and Appendix I.

16. Slovic, Paul, 1987, *Perception of risk*: *Science*, v. 236, p. 281-283.

17. See Slovic, Paul, 1987, *Perception of Risk*: *Science*, v. 236, Figure 1, p. 282.

18. Slovic, Paul, 1987, *Perception of risk*: *Science*, v. 236, p. 282.

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19. These ideas, which are further expanded upon within this note, are largely adapted from Slovic, Paul, 1987, Perception of risk: *Science*, v. 236, p. 280-285.

This is particularly the case with rapidly evolving chemical and nuclear technology issues and the impacts these technologies increasingly have on modern society and the environment—technologies that are unfamiliar and incomprehensible to most people. Harmful consequences may be rare or delayed, hence difficult to quantify or statistically analyze. Such consequences, however, often may be catastrophic, long-lasting, involuntary, not easily reduced, have fatal consequences, appear uncontrollable, pose a high or increasing risk to future generations, and receive much public attention (see Figure following Appendix G). Events like the 1986 Chernobyl meltdown in the former Soviet Union, the 1985 Bhopal chemical release accident in India, or the 1979 accident at the Three-Mile Island nuclear plant in the northeastern United States fit this category.

Such events have been interpreted as "signals" by some researchers that "effort and expense beyond that indicated by a [conventional] cost-benefit analysis might be warranted to reduce the possibility of 'high-signal accidents.'" *Events involving nuclear weapons (war), nuclear weapons fallout, nuclear reactor accidents, and radioactive waste all are specifically identified as "particularly likely to have the potential to produce large ripples. As a result, risk analyses involving these hazards need to be made sensitive to these possible higher order impacts."*

"In short, 'riskiness' means more to people than 'expected number of fatalities.' Attempts to characterize, compare, and regulate risks must be sensitive to this broader conception of risk. . . . [T]here is wisdom as well as error in public attitudes and perceptions. Lay people sometimes lack certain information about hazards. However, their basic conceptualization of risk is much richer than that of experts and reflects legitimate concerns that are typically omitted from expert risk assessments. As a result, risk communication and risk management efforts are destined to fail unless they are structured as a two-way process. Each side, expert and public, has something valid to contribute. Each side must respect the insights and intelligence of the other." [emphasis added]

20. Refer to Endnote 4, above.

21. *Report of the Blacksburg Forum: The First Step Toward the Holistic Approach to Environmental Management*: Management Systems Laboratory, Virginia Polytechnic Institute and State University, Blacksburg, VA, 1991, p. 19-20.

22. *Building Consensus Through Risk Assessment and Management of the Department of Energy's Environmental Remediation Program*: National Research Council, Committee to Review Risk Management in the DOE's Environmental Remediation Program: National Academy Press, Washington, D.C., 1994, p. 21.

23. *Building Consensus*, p. 23.

24. The term 'stakeholder' is commonly used to encompass all 'interested and affected parties' that may be impacted by a particular action or proposed action. A catch-all term, it often indiscriminantly lumps together state and local governments, public interest groups, business and labor interests, environmental groups, and others, in addition to sovereign tribal nations. But not all 'stakeholders' are created equal. Tribal nations comprise a unique legal entity whose rights, interests, and responsibilities are both distinct from and superior to those of state and local governmental interests and any public interest groups. Tribal sovereignty is formally recognized and protected in treaties signed with the United States government, in which tribes specifically reserved rights to utilize lands and resources and to perform traditional activities as they have for thousands of years. Moreover, the treaties also imposed a trust responsibility upon the U.S. government to protect and preserve those lands and resources upon which tribes depend for subsistence or other cultural activities. Furthermore, Columbia Plateau tribes are unusual

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among many tribal nations in that their treaties specifically provide off-reservation treaty rights and guarantee access to resources throughout the lands ceded to the United States in the treaties and throughout all other usual and accustomed locations. The sovereignty of tribal nations also requires the U.S. government to establish formal government-to-government relations and to proactively consult with tribes concerning any proposed federal action or program that may affect the interests of tribes, as mandated in the DOE Indian Policy. Tribes are also designated as Natural Resource Trustees under CERCLA, and thus must be formally consulted in the planning, management, and execution of any "clean-up" programs developed under CERCLA that may impact their sovereignty, treaty-reserved rights, lands, natural and cultural resources, or other interests. *No other entities commonly considered 'stakeholders' share these unique and distinct rights and privileges.* This point is a consistent source of confusion among many state and federal agencies and elements of the public, especially outside the Pacific Northwest where such conditions are rare. Hence, tribes should always be separately identified and their unique rights and interests formally acknowledged.

25. *Building Consensus*, p. 36-37.

26. *Building Consensus*, p. 37-38.

27. *Building Consensus*, p. 24, 26.

28. It is especially interesting to note that any quantitative risk assessment conducted to define the current risk posed by carbon tetrachloride contamination in the 200 Areas would show that the current risk is far below regulatory thresholds that normally would trigger a response action. Thus, such a result would more typically be used to support non-action at the site because there are not now viable exposure pathways to humans or the accessible environment, in the absence of considering this groundwater as a drinking water source. This narrow view, of course, totally ignores any future threat posed when existing contamination migrates and begins to discharge into the Columbia River at concentrations far above permissible standards, as shown in modeling results. Furthermore, this unique scenario clearly emphasizes how risk assessments may or may not be used for political reasons or in response to public concerns. In this case, social values and qualitative concerns about the potential future impacts of this known carcinogen and its inevitable discharge into the Columbia River vastly outweigh the strictly quantitative assessment which in and of itself would show that only a 'negligible' risk is now present.

29. Refer to Section III, Sub-section B, and Appendix G.

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APPENDIX A

DOE's RISK REPORT TO CONGRESS

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APPENDIX A

## DOE's RISK REPORT TO CONGRESS

Several different Committees of both houses of the United States Congress and various offices within the U.S. Department of Energy are examining standardized use of risk-based remedial decision-making to prioritize, and presumably allocate budgets for, "clean-up" of DOE nuclear production sites across the nation.

A. Congressional Mandate

Congress passed Public Law 103-126, the National Defense Authorization Act, on October 28, 1993, in which ". . . the Department [of Energy] is directed to review [federal facility] compliance agreements and to submit by June 30, 1995 a report to the Committees on Appropriations evaluating risks to the public health and safety posed by conditions at weapons complex facilities that are addressed by compliance agreement requirements."<sup>1</sup>

Based on a recommendation of the Conference Committee report on the FY94 Energy and Water Development Appropriation, "the objective for this report was for the Department to provide information and evaluation to support the eventual development of a mechanism for establishing priorities among competing cleanup requirements in light of limited Federal discretionary budgets." The conference report emphasized that "these efforts should be done without performing exhaustive, formal risk assessments of the thousands of cleanup activities addressed in compliance agreements." Rather, the review should constitute a qualitative "estimate of the risk addressed by the requirements based on the *best scientific evidence available*." [emphasis added]

B. Department of Energy (DOE) Responses1) Background

In November 1993,<sup>2</sup> Assistant Secretary Grumbly announced DOE's intent to develop "a *credible risk evaluation program which will support the Department's EM mission*" within two years. "Good risk management, which cannot happen without good risk assessment, is critical to program success," Grumbly observed.

He identified "*credible risk evaluation*" as key to DOE success in:

- Protection of public health, safety, and the environment,
- Becoming technological world leaders in environmental restoration, and
- Establishing DOE as outstanding stewards of public resources.

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Mr. Grumbly fully recognized the inherent difficulties and limitations associated with conventional risk assessment when he asked, "*Should 'risk' be defined only by a set of numbers, or are there qualitative values that need to be factored in?*" He stated that the following closely related issues must be addressed:

- 1) "We obviously need some meaningful quantitative data, but we need to remember who our customers are--the public--and not get lost in debates over numbers that keep us from seeing the forest for the trees.
- 2) "We need to balance the concerns of the public health community, which is concerned with the results of and threats from past events and their consequences, and the risk assessment community, which tends to focus more on current and future problems.
- 3) "We need to remember that there are more than just technical problems to consider in risk assessment. *We have to address hard institutional and political problems too.* [emphasis added]
- 4) "Who does risk assessment matters."

Mr. Grumbly concluded, "We must have assessments that are acceptable to the scientific and public health communities and the affected public--that's the only thing we will accept, nothing less."

### 2) Current Tools DOE is Using to Prepare Its Report to Congress

In the past, DOE has employed a number of different tools to prioritize its funding allocations, only some of which have focused directly on risk.<sup>3</sup> Few, if any, of these methods have withstood the test of time, largely because they do not truly and comprehensively address legitimate concerns about funding being directed specifically at problem resolution in the field, the full scope of risks presented by DOE facilities, or tribal/public issues, values, and the direct involvement of affected communities.

Currently, DOE is adopting several different, and in some cases, independent mechanisms to utilize in preparing a report to Congress (tentatively titled "Risks and the Risk Debate: Searching for Common Ground"). This report will outline DOE's approach to identifying, characterizing, and prioritizing risks and developing risk-based decision mechanisms for addressing tribal, public, and environmental health and safety concerns posed by DOE sites across the nation.

At least three independent (?) efforts are now ongoing in support of the preparation of DOE's report to Congress. Two of these are occurring within the Department of Energy: the Consortium for Environmental Risk Evaluation (CERE) report and the Baseline Environmental Management Report (BEMR). DOE also is conducting another internal review known as the EM Qualitative Risk Initiative, or Risk Data Sheet (RDS) activity; the nature, scope, and results

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of this late effort are not known to CTUIR staff. An external report is being coordinated by Steve Blush, former DOE staffer, at the request of the Senate Energy and Natural Resources Committee. The Blush report also is examining risks and costs associated with "clean-up" of DOE sites, with particular focus on Hanford. The degree of coordination between these efforts is unclear.

Unfortunately, none of these reports for were available to CTUIR staff prior completion of our report,<sup>4</sup> with the exception of a draft of the CERE evaluation. An initial evaluation of the proposed methods, however, indicates that none of these efforts is likely to provide the desired information base of sufficient scope, breadth, and comprehensiveness to support an adequate description of the full nature of hazards and risks associated with the nuclear weapons complex. Hence, this report has been prepared to assist DOE is assembling a more comprehensive and truly representative version of the risk puzzle: the more pieces of the puzzle that are available, the better chance we all will have of understanding and seeing the whole picture.

The inferred narrowness of existing approaches and their limited ability to provide a full risk picture are strongly supported by our cursory review of the draft report provided to CTUIR staff by the CERE program. The CERE program purports to assess how well weapons complex risks and "clean-up" costs are understood by conducting a qualitative evaluation of existing quantitative risk assessments at six selected DOE sites now governed by compliance agreements. A distinctly separate part of CERE's program is "cataloging concerns of minority, disadvantaged groups, and disproportionately affected communities" as a means of providing DOE with a "laundry list" of public concerns for consideration in its report to Congress.<sup>5</sup>

Only a draft of the CERE report was publicly available at the time this report is being prepared (March 1995). Unfortunately, the CERE draft made available to CTUIR staff contained no new ideas or evaluation processes, and tended simply to reflect the narrowly focused "panel of experts" approach (yawn) that is, in fact, so much a part of the problem. Furthermore, the CERE approach deliberately fails to consider significant risk elements such as offsite transportation of radioactive, mixed, and hazardous chemical wastes, tribal cultural issues, tribally unique resource use and exposure pathways, a sufficiently broad spectrum of land-use options, multiple and cumulative impacts, and the effects of time, among others. CERE defines an overly broad scope, but then depends on a narrow and selective information base, fails to incorporate values and meaningful tribal/public involvement, and draws broad, sweeping conclusions from highly limited data sets. Thus no credible either sitewide or complex-wide risk evaluations and comprehensive cost-benefit analyses are possible. Additional discussion of CERE program limitations is provided in Appendix D.

DOE also is conducting an internal review of its current Fiscal Year budget commitments in order to assess current resources directed specifically at identifying and characterizing risks, remedial costs, compliance agreement requirements, and benefits. A simple review of current budget commitments, however, will comprise neither a sufficient nor representative measure of true risks through time, acute and chronic health impacts, life-cycle costs, short- and long-term

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benefits, and compliance agreement requirements. Budgets and the priorities they fund are the bedraggled by-product of multiple political compromises. They still require the application of judgement and values. The question is *whose* values will govern the decision making process.

This report intends to broaden the "clean-up" debate to include a *full scope of pertinent risks and costs*, many of which are now effectively ignored by the more narrowly defined approaches DOE is employing, or has employed in the past. *The chief failure of the current DOE decision-making framework is that it is dominated by the institutional values of DOE managers and policy makers alone. It does not reflect the breadth and comprehensive perspective required to build either credible technical evaluations or achievable risk management and remedial decisions that share widespread popular support.* Our report focuses attention on major critical issues now not being considered or that are even being undermined in the dynamic risk debate. By including such issues, DOE can create a more inclusive and responsive framework that will satisfy valid Congressional concerns that budgeted funds must be directed at efficiently and effectively solving real problems and permit DOE to both embrace and proactively accomplish its new mission. Most importantly, only through adopting such a reform will DOE be able to meaningfully protect affected communities from the real risks they face, both now and in the future.

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 Notes
 

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1. The following material is excerpted from "Fact Sheet: June 1995 Report to Congress," Draft, July 13, 1994, obtained from CERE, February 14, 1995.
2. "Working Toward Meaningful Risk Evaluation," speech by Thomas Grumbly at National Research Council Workshop to Review Risk Management in the Department of Energy's Environmental Management Program, National Academy of Science, Washington, D.C., November 3, 1993.
3. Examples of some of these include the RASS (Resource Allocation Support System), the Project Management System (DOE Order 4700.1), and the current PPG (Project Planning Priority Grid). It is critical to note that each of these systems, along with others, depend solely on the values, biases, and judgement process of DOE managers, and not DOE "constituents." Moreover, some approaches, such as RASS, fail to integrate budget priorities across DOE programs, overcome deeply entrenched institutional barriers, and are based only on narrowly framed or selective evaluation and weighting criteria and a judgement process based solely on institutional requirements. Hence, these highly limited approaches typically focus on analytical/numerical approaches that fail to address concerns and values of affected communities.
4. A copy of the Blush report, *Train Wreck along the River of Money, An Evaluation of the Hanford Cleanup*, by Steven M. Blush and Thomas H. Heitman, was received by CTUIR staff only a couple of days prior to completion of this report. Hence, sufficient time was not available for an adequate review.
5. This CERE program overview based on *Tulane/Xavier CERE Program Qualitative Risk Evaluation Fact Sheet*, December 6, 1994.

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APPENDIX B

SAMPLES OF CTUIR CONCERNS ABOUT  
LIMITATIONS OF CONVENTIONAL RISK ASSESSMENT METHODOLOGY

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APPENDIX B

## A LIMITED SAMPLE OF CONCERNS OF THE CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION COMMUNITY ON USING AN APPROPRIATELY DEFINED RISK ASSESSMENT MODEL

by Stuart Gerald Harris, Natural Resource Specialist, CTUIR Hanford Program;  
Enrolled Member, CTUIR

## INTRODUCTION

The Umatilla Indian Reservation located near Pendleton, Oregon is occupied by descendants of three Columbia Plateau Tribes, the Cayuse, the Walla Walla, and the Umatilla (Tribes). The Tribal Government is referred to as the Confederated Tribes of the Umatilla Indian Reservation (CTUIR). As a full service government, the CTUIR Board of Trustees (BOT), makes the decisions on providing detailed information regarding culturally sensitive information.

Under these Tribes' Treaty of 1855 [12 Stat. 945], the Tribes ceded lands to the United States. The lands comprising the eastern portion of the U. S. Department of Energy's (DOE) Hanford Site is among the lands ceded by the Tribes. Under the treaty the Tribes retained rights to perform many activities on those lands, including but not limited to fishing, hunting, gathering roots, berries, and pasturing livestock.

Long standing U.S. Supreme Court precedent holds that the federal government (including its executive agencies) has a trust responsibility to Indian Tribes. This means that the U.S. has a fiduciary responsibility to protect the rights of Indian tribes, including tribes' property and treaty rights. Additionally, a succession of U.S. Presidents beginning with President Nixon, have affirmed a federal policy of upholding tribal sovereignty and dealing with tribal governments on a "government to government" basis. Furthermore, there are federal laws to protect tribes' cultural, religious, and archeological sites, access to, and exclusive use, of those sites, and of traditions, activities, and practices associated with those sites as well as Hanford as a whole. Finally, environmental laws also confer rights upon the tribes. For example, the CTUIR is a Trustee for Natural Resources under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

## CTUIR - AN INTERDEPENDENT CULTURE AND ENVIRONMENT

The CTUIR is a sovereign government, that has legal interest in the natural resources upon which the CTUIR's Treaty rights are based, including lands of the Hanford Site. Effective exercise of these treaty rights depends on the health of the natural resources. The CTUIR does not want the people exercising their treaty rights to be placed at risk.

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A risk from nuclear or hazardous waste that potentially affects one person of the CTUIR community may have lasting impacts throughout all of the community. In other words, a wave of risk can ripple outwards affecting all of the individuals in our culture, just like a wave generated and propagated in a tapestry. The unique CTUIR culture can be irrevocably changed or extinguished if enough of the environment and the natural resources on which the CTUIR treaty rights are based are irreparably harmed. Without the natural resources, the cultural values of critical significance to the traditional CTUIR American Indian, and her/his community would be lost. If a culture dies, the only remnant is the material culture. In the event of the unthinkable happening, a continuously sustainable natural resource based material culture, such as the CTUIR would rapidly disperse into the natural environment leaving no trace of the living CTUIR culture.

The people of the CTUIR are a unique culture, that has long been complexly intertwined with the environment through their cultural, familial ties, (e.g., marriage, gender, extended families), and relationships with other tribes. The CTUIR people have enjoyed since time immemorial, many types of native foods and artistically constructed items of material culture (e.g., cookware, clothing, etc.). Individual members are an inextricable part of the environment. These members, their community and the environment are essentially one in the same.

The CTUIR culture, which has co-evolved with nature and through thousands of years of ecological education, has provided its' people with their unique and valid version of holistic environmental management. The traditional CTUIR American Indian is aware from cultural teachings that the appropriate behavior leads to continuous sustainable success in gathering food and material. Traditional education regarding food or raw material gathering practices are passed on from one generation to the next, and is done to ensure food for the next season or generation. The knowledge of the many gathering seasons and areas the traditional CTUIR American Indians get to utilize during the year has been handed down from generation to generation. Some CTUIR families teach cultural knowledge in complete secrecy on the maternal or paternal side of the family/tribal unit in order to protect tribal cultural/spiritual knowledge from exploitation from the non-American Indian societies and governments. Within the traditional lifestyle or culture, it simply is not enough to know that there are supposed to be salmon runs at certain times of the year. To sustain the tribes during the remaining interim periods when salmon are not returning to spawn and other foods are available, there has to be knowledge about other interrelated food chain cycles, gathering techniques, preparation, and cultural/spiritual relationships about what is needed for sustenance. This interdependency of the collective knowledge about the seasonal foods not only affects traditional individuals, but affects the whole tribe as a culture. One person can not be expected to know all things. In practical terms, if a tribe depended on one critical individual, the loss of that one "all knowing" person would effectively end or severely disrupt subsistence existence for the rest of the cultural unit. The same is true of oral tribal history, songs, heritable religious practices and numerous other cultural practices. Continuity may depend on specialized knowledge in each generation.

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The natural world in the Northern temperate zone operates on a seasonal clock. Traditional American Indians of the CTUIR are influenced by this clock, and expectantly look forward to the next cyclic event. These events include not only birth and death but change in general. Throughout the year, when the CTUIR traditional American Indian participates in activities, (e.g. hunting and gathering for foods, medicines, ceremonial, and/or subsistence), the associated activities are as important as the end product. In the Judeo-Christian tradition, an analogy would be "kosher" dietary practices. In the exercise of these activities, the traditional CTUIR American Indian may cover hundreds of square miles, thousands of feet of relative elevation, and cross numerous types of physiographic provinces. All of the country crossed in the search for food has special meaning to the traditional American Indian and each area demands special effort and behavior. This traditional activity is a key to the hunting of, and gathering of, traditional American Indian foods and culturally significant materials.

All the foods and implements gathered and manufactured by the traditional American Indian are interconnected in at least one, but more often in many ways. For example, trade made up for what could not be physically gathered by one person in one time period. Salmon caught on the Columbia River are often traded for roots, other produce, or material culture. This trade creates a web of interaction and interdependence cutting across families, bands, and tribes. These objects of life are as important to the traditional American Indian as the materials that comprise them.

The people of the CTUIR community follow cultural teachings or lessons brought down through history from the elders. The goal of these teachings is to foster community cohesion and interdependence. Emphasis is placed upon cooperation and helping others in the community, cultivating close community interactions. This is an ancient oral tradition of cultural norms. The material or fabric of this tradition is unique, and is woven into a single tapestry that extends from the past into the future.

### RISK ASSESSMENT PATHWAYS

The methodologies used in classical risk assessments are being critically considered by the CTUIR. The classical risk assessment has many deficiencies, including a limited breadth of coverage and lack of integration. Through a pseudo-scientific methodology, the classic risk assessment: 1) ignores time, 2) extrapolates from the lab into the field, 3) contains biotoxicological effects that are not fully understood, 4) ignores multiple pathways and complex contaminants, 5) contains enormous uncertainties, 6) ignores long term impacts, effects to health, environment, workers and society, 7) prejudices future options, 8) loses the big picture by ignoring cumulative effects related to assessing only one chemical/one path/one site assessment at a time, 9) ignores eco-cultural sustainability, and 10) is based on a suburban

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lifestyle. The holistic environmental management strategies outlined in the *Blacksburg forum*<sup>1</sup> or *Toward the 21st Century: Planning for the Protection of California's Environment*<sup>2</sup> highlight these major problems.

In order to encompass the wide range of factors directly tied to the traditional American Indians of the CTUIR, a risk assessment has to be scaled appropriately. In effect, a re-structuring of the risk assessment process must occur in order to address the overwhelming problems including but not limited to, lack of breadth of coverage, lack of integration and deficiencies related to not addressing the CTUIR traditional American Indians' quality of life, the interrelated eco-culture and their unique exposure parameters and pathways. Other deficiencies include the failure to address the role of time to adequately assess risks to future generations of CTUIR members. The process of American Indian Tribes supplying cultural conversion metrics for risk assessments is, at best, subject to the legislative processes of the various sovereign Tribal governments. Unfortunately for the risk assessor there are few traditional American Indians willing and able to supply the appropriate pathway information, and to say they can speak for any one but themselves. A risk assessor in search of identifying American Indian data gaps has to identify the affected tribe(s) and approach the subject of lifestyles tentatively identified with a potential risk through the proper protocol of the individual tribal government. Until that information is obtained, the results of the classic risk assessment in no way suggest the potential pathways or exposure routes that fall within the breadth, depth, and richness of the CTUIR's culture. Unfortunately, the processes, the approach and even the necessity to account for traditional American Indian lifestyles have gone unnoticed in classical risk assessments that typically focus on suburban lifestyles.

The potential exposure pathways specifically oriented towards the traditional American Indian lifestyles need further identification to ensure protection of the CTUIR and the resources on which CTUIR culture is based. This must be done to provide risk assessors with the most accurate information possible. The principal concerns that affect the CTUIR traditional American Indian relate to a lack of identification of the critical pathways. In addition some risk assessments identify these pathways, "consider" them, and then ignore them, or label them as "insignificant." These multiple potential pathways to exposure are not included in typical suburban exposure pathway model, which has a seriously deficient relationship to the lifestyle of the traditional CTUIR American Indian. Each path stems from unique and multiple uses of the resources for food, ceremonial, cultural, or religious practices. Just as important to the people of the CTUIR are the more intangible considerations such as: aesthetics; physical, economic, community, future well-being, and equity; peace of mind; and sustainability.

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<sup>1</sup> *Report of the Blacksburg Forum: The first Step Toward the Holistic Approach to Environmental Management: Management Systems Laboratory, Virginia Polytechnic Institute and State University, Blacksburg, VA, 1991.*

<sup>2</sup> *Toward the 21st Century: Planning for the Protection of California's Environment, California Comparative Risk Project, Final Report, May 1994.*

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A risk assessment covering only mechanistic exposure routes linking a single toxicological component to simple one celled organisms, to mega fauna, then to humans, without accounting for the time involved, does little to express the complexity of the interrelationships between the traditional American Indian, their lifestyles, their relationship with the earth and the natural resources. Anyone attempting to derive and plot on a chart the life cycles of all the native plants, animals, as well as the methods of storage, preparation, and all the unique interrelationships that stem from the area of concern, in order to deduce the complete functional pathways for exposure, will find that the process is probably beyond our capabilities and is expensive. Charting whole ecosystems is certainly not in the realm of this paper, moreover, the thought of placing a value on each and every organism for the purposes of producing a number, does not convey what is a traditional American Indian entity. Even if a number could be produced, this does not take into account the traditional American Indian values, let alone uptake rates, absorption rates, mutation rates, bioaccumulation rates, and other food chain data needed to make a decision on what is important and what may affect the CTUIR traditional American Indian.

There are some common food plants such as the common cattail, the tule, the willow, and the nettle, that serve dual or more purposes. These could be considered by risk assessors, if nothing less than to point out the enormous data gaps involved. The traditional tribal communities often constitute critical segments of populations whose cultural lifestyles result in disproportionately greater than average exposure potential. Gathering, cleaning, eating, and using these plants may potentially expose many traditional American Indians multiple times, and may subject critical CTUIR population groups to unneeded exposure. The life of the cultural items made from potentially contaminated plants may last years; exposure may occur daily or more, over multiple generations.

Traditional American Indians of the CTUIR have to bear a disproportionate amount of risk in relation to the longevity of radionuclide contaminated groundwater. Take, for example, the common cattail: in the spring the shoots are eaten, the roots are consumed, and the fibrous stalks and leaves are split, woven or twisted. Later in the year the pollen is used in breads, and the stalks are used. The woven products may include food storage bags, food storage baskets, cook hole layers, cooking baskets, mats for the floor, mats for the sweat lodge, or mats for the funerary. Each of these activities necessitates a behavior pattern that encompasses: traveling to the plants, selection, gathering, sorting, cleaning, stripping, peeling, splitting, chewing, and forming of the plant materials. This is just for one type of plant among the hundreds of plants and animals that are used by traditional CTUIR American Indians.

#### CRITICAL SUB-POPULATIONS OF THE CTUIR

Even during the quest for some food, a typical CTUIR member may potentially be exposed through a variety of pathways. The riverbank walk towards the spring where the plant of interest grows may contain discreet particles of radioactive material, such as Co<sup>60</sup>. This affects

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certain subgroups within the CTUIR population more than expected, such as the women and the children. The classic risk assessment focuses on a healthy suburban male of average mass. In comparison the women and children as a result of their smaller mass and shorter stature will receive a higher dose<sup>3</sup>. The mud surrounding some Hanford springs may potentially contain Cr [+6], Sr<sup>90</sup>, or H<sup>3</sup>.

During the assessment of the quality of the plants (i.e., which ones to select for gathering), a process that demands time standing in spring water, or in spring water saturated mud, could result in absorption of H<sup>3</sup> through the skin<sup>4</sup>. The women and children, due to their physical characteristics and their culture, may receive greater exposure. Children in particular may be at much higher risk of radionuclide contamination of the environment than adults. Children have a much shorter stature and less body mass than adults, meaning that they have less natural shielding and are closer to source materials.

The gathering process involves not only continued immersion in the spring water, but immersing the hands and compacting mud under and around the fingernails as well. Sorting the plants afterwards, either at the site or elsewhere involves more handling and washing. The bulbs or root of the food plant may have special cleaning needs. Roots may not be uniformly smooth as carrots or potatoes but undulated, having places where the earth can not be washed out, and if eaten, creates an ingestion pathway for potential exposure. The skin of the root may need to be peeled. Peeling roots is a difficult and time consuming chore involving not only the hands but in many cases a knife and the teeth. Splitting the leaves involves a lot of handling and the experience comes with cuts and abrasions, and more soil accumulation under the nails. If the food is to be eaten and not stored, another potential pathway for contamination is revealed through traditional cooking methods. Local rocks are gathered and heated with local wood. A hole is dug. The heated rocks are dumped in the hole. The rocks are covered with the cattail leaves. The cleaned, peeled, roots are placed on the leaves, and covered with more leaves. This is covered with soil, and a fire is built over the covered cook pit. The result is tasty, but in certain places this type of unique cultural activity could increase exposure. Thus, traditional CTUIR American Indians can be exposed to radionuclides through digging, breathing smoke, breathing dust, breathing steam, eating dust and soil, storing vegetables underground, and eating steamed vegetables.

This risk scenario is but one of many that can be played out for one food, at one site, during one time of the year. The complexities involved with hunting and gathering foods are extremely time consuming and involve at a very primary level many traditional American Indians and the environment. Other significant factors include higher intake rates per body mass for children than adults, the fact that primary gathers are likely to be women of childbearing age, variations

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<sup>3</sup>U.S. Environmental Protection Agency. 1993. *External Exposure To Radionuclides In Air, Water, And Soil. Federal Guidance Report No. 12. September 1993. EPA 402-R-93-081*

<sup>4</sup>Ohtake, H., Silver S. 1994. *Bacterial Detoxification of Toxic Chromate. Biological Degradation and Remediation of Toxic Chemicals. Ed. G. R. Chaudhry. Portland, Oregon: Dioscorides Press 403-415*

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in metabolic parameters, and increased risk to CTUIR elders with age-dependent decreased physiological resistance or underlying health problems. Because the CTUIR is unique, risk assessors must realize and accept that the threat to the whole living CTUIR culture begins with two reasons for increased risk: increased exposure and increased sensitivity

"The Columbia River continues to be very important to the traditional American Indians that live around it. The river provides a link to the past and a path [for] the future of their children. Understanding the ecosystem and how the traditional American Indian is associated with it is critical for these people and their survival. The health of the river is dependent on the health of the groundwater; the peoples' health is dependent on the river and all that comes from it." (Harris, 1994)

The need for understanding the pathways that directly involve the traditional American Indian cannot be understated. The ties to the environment are much more fixed than is currently understood. These ties will play a very important role in determining how risk assessment methodology is produced and how effective risk management will be. The issues of environmental racism, environmental justice, and the right to a healthy environment, highlight a need to formally incorporate affected tribal input.

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References:

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