Indecent Exposure

For forty years scientists knew that radionuclides from reactors along the Columbia River accumulated in body tissue. They decided to keep it to themselves

by Michele Stenehjem

The Hanford Engineer Works was a secret project, created in early 1943 to produce plutonium for the first American atomic weapons. The enterprise brought spectacular results. In only twenty-nine months, the Hanford project had manufactured and delivered the plutonium for the bomb that was dropped on Nagasaki, Japan, ending World War II. Just one month earlier, Hanford had produced the plutonium for the world's first atomic explosion, the Trinity bomb test at Alamogordo, New Mexico. These feats were the result of extraordinary technological achievements and the largest scale-up in the history of the engineering craft. They also changed national defense strategy and altered global politics during the ensuing decades. For forty years after the war, the endeavor was praised by presidents, statesmen, historians, journalists, scientists, and, it seemed, everyone involved or interested in atomic energy.

In 1986, however, with the release of some 19,000 pages of environmental monitoring reports, engineering reports, office memorandums, and letters concerning Hanford's early history, the world learned that there had been a darker side to the vast undertaking. These documents, many previously classified, and the 40,000 pages subsequently released, disclose that in the course of producing plutonium for World War II and the cold war that followed, the Hanford Works released radioactive wastes totaling millions of curies. The facility released billions of gallons of liquids and billions of cubic meters of gases containing contaminants, including plutonium and other radionuclides, into the Columbia River and into the soil and air of the flat, wide Columbia Basin. Some of the releases were caused by leakage or faulty technology; others were the result of deliberate policies set by scientists convinced of the acceptability of these emissions. In the years of peak discharges, 1944 to 1966, these scientists and policy makers never informed the residents of the region of the emissions or warned them of any potential or real dangers, even when the releases far exceeded the "tolerance levels" or "allowable limits" defined as safe at the time. Instead, on many occasions they told the public that Hanford's operations were controlled and harmless.

Beginning about 1950, the states of Washington and Oregon, along with the U. S. Public Health Service (PHS), began to take an interest in Hanford's operations, particularly with regard to Columbia River contamination. Concerned with the safety and purity of the river and the value of the fishing industry—the salmon catch in particular—the states and the PHS conducted extensive "radio-ecological" surveys of the waterways and sought access to the classified data of Hanford's aquatic biologists. Nonetheless, the states and the PHS were continually frustrated by Hanford's secrecy and hegemony.

The Columbia is the largest river flowing into the Pacific Ocean from the North American coast. It is approximately 1,200 miles long and drains about 260,000 square miles of land. The section of the river known as the Hanford Reach begins approximately 350 miles upstream from the Columbia's mouth, at the foot of Priest Rapids (near the first production reactor at Hanford), and runs downstream fifty-two miles to the northern edge of Richland, Washington.

Salmon and steelhead trout—two species that go to sea but spend the first and the last portions of their lives in fresh water—spawn in the reach, thriving in the cold waters along with whitefish, bass, trout, carp, and suckers. Some of the region's largest populations of game birds—ducks, Canada geese, quails, pheasants, and chukars—nest there as well.

Between 1944 and 1955, eight "single-pass" reactors were built along the Columbia River's banks in the Hanford Reach. The single-pass system—so named because river water pumped into the reactor cores to prevent them from overheating was pumped back into the river—is illegal today, for it discharges unsafe concentra-

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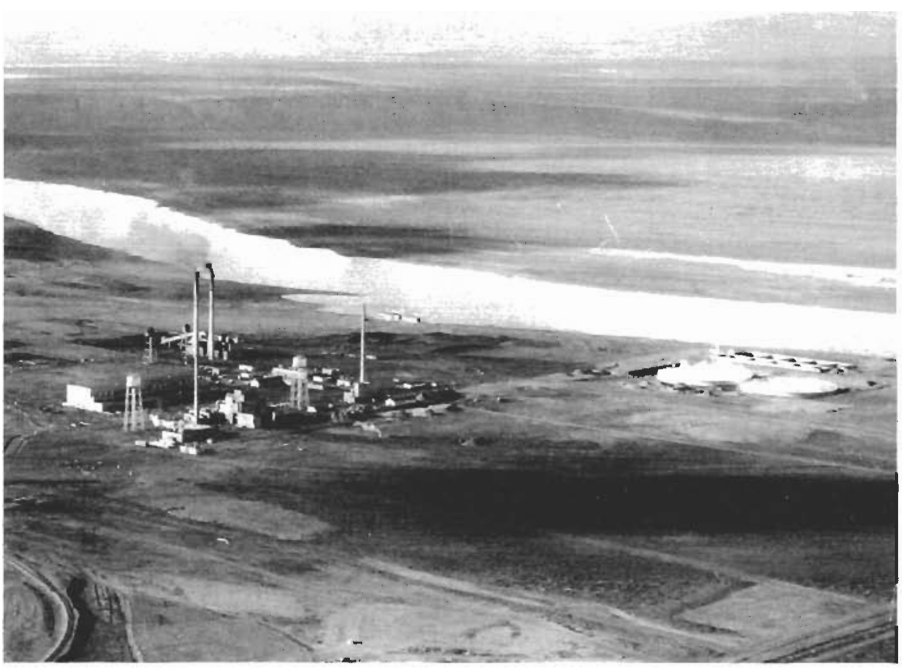

Photograph taken in 1944 of one of the eight nuclear reactor sites built along the Columbia River at Hanford, Washington. Retention basins along the river released radioactive waste downstream.

and officials of these states and the PHS met with AEC representatives at Hanford. In March 1964, all parties agreed to conduct a review of waste disposal practices at Hanford. During the review, Foster, GE scientist R. G. Geier, and others described recent company efforts to find ways to reduce radioactive contamination of the river. At that time they admitted that cooling time in the reactors' 107 basins was so short, and the throughput so high, that retention was "of little practical value in providing for radioactive decay."

Aside from the direct release of radioactive materials into the river, the Columbia also received pollution from groundwater. Over a period of forty years, beginning in 1945, eight and a half billion gallons of liquid wastes from Hanford's chemical processing facilities had been pumped into open-bottom pits called cribs. This liquid, contaminated with low- and mid-level radioactive waste, percolated down to the groundwater. These liquids seeped through underground springs and into the river. One Hanford study found that local tumbleweeds drew contamination from this contaminated soil up into the stems of the plants. Researchers feared that a windblown accumulation of tumbleweed might catch fire and release radioactivity into the air.

In 1964, after President Johnson announced that the AEC and the Department of Defense needed less plutonium and enriched uranium, plans were announced that began the gradual shutdown of the eight single-pass reactors at Hanford. All these reactors were finally closed by 1971.

Did Hanford's reactors shut down just because the nation needed less plutonium and enriched uranium? Maybe not—because production rose a few years afterward at the Savannah River atomic site in South Carolina. Perhaps, instead, the politics of pollution—the growing insistence by Washington, Oregon, and the PHS that the high contamination levels in the Columbia River be reduced—inspired this national decision to close Hanford's single-pass reactors. Such a resolution moved new pollution to host states that were less outspoken and less insistent on having a meaningful oversight role.

By 1967, P-32 concentrations in Hanford-area plankton stood at 5,000 to 118,000 times that of the river water, a slight decline from the high values of 1959 to 1964. Studies completed in 1973 by Battelle Pacific Northwest Laboratories demonstrated a significant fall in radioactivity levels in river water and aquatic organisms. The isotopes, however, were "still available from the sediments, from N-reactor (recirculation cooling system) seepage effluents, and from residual radioactivity in the different organisms in the food web."

In 1975, Hanford scientists found that twenty-seven years of single-pass reactor operation had left a legacy of long-lived radioactivity present in Columbia River sediments.

In May 1989, the Hanford Federal Facility Agreement and Consent Order (known as the Tri-Party Agreement) was

Preliminary Findings, July 1990

How much of the radiation released into the air and water around Hanford ended up in the bodies of those who lived and worked near the plant? In July the Technical Steering Panel of the government-sponsored Hanford Environmental Dose Reconstruction Project released the results of its first studies. The panel looked at the years 1944 through 1947, a period that saw the release of some 440,000 curies of radioactive iodine (I-131) into the air. (Curies measure radioactive decay over time. One curie is 37 billion atoms decaying per second.) The 440,000 curies released at Hanford in the three-year period was some 29,000 times the amount emitted in the one-day nuclear accident at Three Mile Island, Pennsylvania, in 1979. Some 6 million curies were released at Chernobyl. Using the recently released data on plant emissions, the panel believes that of the 270,000 people living in the ten counties around the Hanford site from 1944 to 1947 who were exposed to releases of radioactive iodine, most received low doses, some 1.7 rad, but 5 percent, or about 13,500 people, received a total dose of more than 33 rad from drinking milk containing I-131. This is some 1,300 times the annual amount of airborne radiation the Department of Energy considers safe for civilians living near nuclear weapons plants.

Infants and children who drank milk from cows that ate pasture grass in areas downwind from Hanford (*see* page 10) accumulated the highest doses. Some 1,200 children received up to 650 rad and a smaller group perhaps as much as 2,900.

Although the iodine 131 concerned the panel the most, residents downstream of the plant also received annual doses of up to 1.7 rad of radioactive phosphorus 32 (about the amount received in a gastrointestinal X-ray series) from drinking Columbia River water or eating the fish caught in the river during the peak years of plant operation.

signed. The signatories—the U.S. Department of Energy (DOE), the U. S. Environmental Protection Agency (EPA), and Washington State—agreed to complete cleanup of the Hanford site by the year 2018. Washington State, through its Nuclear Waste Advisory Council, assumed a major oversight role in the remedial work. All signatories were required to solicit public comment through open, quarterly meetings. In August 1989, Secretary of Energy James Watkins released the DOE's Environmental Restoration and Waste Management Five-Year Plan. This document officially announced the department's "commitment to a 30-year goal to clean up and restore the environment at its nuclear sites, to revitalize its own internal culture, and to break with dysfunctional aspects of its past activities and corporate posture." Specifically, the DOE pledged itself to "comply with laws and regulations aimed at protecting human health and the environment, . . . contain known contamination at inactive sites and vigorously assess the uncertain nature and extent of contamination at other sites, . . . fulfill the requirements of compliance agreements already in place . . . [and] implement programs to minimize current waste generation and future waste disposal requirements." On August 29, Secretary Watkins visited Hanford and called the site the "flagship" of DOE waste cleanup and environmental restoration programs. In July 1990, Watkins called for at least $6 billion to be spent on waste management and environmental restoration over the next five years at Hanford. The final cost may be some $60 billion.

On July 12, 1990, the Technical Steering Panel of the Hanford Environmental Dose Reconstruction Project, a $15-million federal study of Hanford's past emissions, announced its Phase I conclusions. The news was very bad. Emissions of radioiodine (I-131) from the Hanford chemical reprocessing plants from 1945 through 1947, and releases of radionuclides from the reactors into the Columbia River from 1964 through 1966 (the Phase I areas of examination), had been huge. The Centers for Disease Control will soon begin tests to determine health effects. The burden of radioactive waste that is part of the heritage of Hanford will remain a challenge to the communities around it for many years to come.

Michele Stenehjem received her doctorate in history from the State University of New York at Albany. She now lives in Richland, Washington, and has recently completed a book on the history of waste disposal at weapons plants.