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Final - March 22, 2005

Senior Trustees
Natural Resource Trustee Council

(Provide enhanced communication with senior members of the Hanford Natural Resource Trustees regarding their responsibilities at Hanford)

Ref: 0074630

David Allen, Regional Director, U.S. Fish and Wildlife Service
Mary Baker, Environmental Scientist, National Oceanic and Atmospheric Administration
Gabe Bohnee, Nez Perce Tribe
Michael Grainey, Director, Oregon Department of Energy
Stuart Harris, Umatillas
Andrea Spencer or Carroll Palmer, Yakama Indian Nation
Russel Jim, Yakama Indian Nation
Ken Niles, State of Oregon
Craig O'Connor, Special Counsel, National Oceanic and Atmospheric Administration
Jeff Tayer, Regional Director, Washington Fish and Wildlife Service
Robert Taylor, Tribal Treasurer, Nez Perce Tribe
Polly Zehm, Deputy Director, Washington State Department of Ecology

| **Date of tour March 24, 2005** | | **RL Participants** |
|---|---|---|
| 8:00AM | Keith Klein, Leif Erickson, Dana Ward, and Steve Wisness will meet the visitors in the Federal Building Lobby Badging | Klein<br>Erickson<br>Ward<br>Wisness |
| 8:45AM | Pass by 300 Area | Same |
| 8:55AM | Pass by FFTF, Horn Rapids Dam | Same |
| 9:15AM | Rattlesnake Mt. Entrance | Same |
| 9:20AM | 200 West, Tanks | Same |
| 9:50AM | 200 East, Vit operation and ERDF | Same |
| 10:30AM | Travel to WTP via ETF (opt) | Same |
| 10:40AM | Gable Mt. View | Same |

| | | |
|---|---|---|
| 11:15AM | 100 K Area | Same<br>James Zeisloft |
| 12:30PM | Federal Building- Dismiss Bus | |
| 12:30PM | Lunch - Federal Building Room 142<br>Box lunches will be provided at a cost of $8.00 each.<br>Make checks payable to: Fluor Hanford, Inc.<br><br>Note: As exact timing cannot be determined it should be noted that all the meeting participants will be together and will have the same timing issues. | All meeting participants |
| 1:00PM | Room 214, CIC (by private transportation)<br>Senior Trustee Meeting | All meeting participants |
| 3:30PM | Adjourn | |

Senior Trustees

| | |
|---|---|
| Ken Niles | ken.niles@state.or.us |
| Stuart Harris | stuartharris@ctuir.com |
| Jeff Tayer | TayerJJT@dfw.wa.gov |
| Craig O'Connor | Craig.r.o'connor@noaa.gov |
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| Michael Grainey | Michael.W.Grainey@state.or.us |
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| Robert Taylor | RobertT@nezperce.org |
| ~~Dan@nezperce.org~~ | |

Gabeb@nezperce.org

Senior Mtg Site Tour pkg
(March 24, 05)

# U.S. Department of Energy
# Hanford Site

Registration for a Hanford Site Tour on _____

Welcome to the Hanford Site!

We appreciate your interest in the Hanford Site and are looking forward to your visit. As can be expected, there are a few details that must be taken care of prior to your visit.

For the tour we recommend comfortable clothing, suitable for an industrial environment (cotton, or wool preferred) with sleeves. The required footwear for the construction site is: Over-the-ankle Leather Closed Toe Substantial sole--the type with thick "waffle weave"--like hiking boots. Flat, leather soles are not permitted.

The following articles are not allowed on the tour: Dangerous weapons, ammunition, explosives, incendiary devices, or similar devices that could cause property damage or personal injury; controlled substances, drug paraphernalia, alcoholic beverages (including "near" and "non-alcoholic" beer and/or wine. In addition to the items listed above, the following security controlled items are prohibited within exclusion, limited, and protected areas: Privately owned radio transmitters and cellular telephones, computers and associated media, recording equipment (audio, video, and data), cameras and personal protective sprays. All persons, vehicles, and hand-carried items are subject to search by Hanford Patrol. Any prescription drugs required with you at all times and metal medical implants must be made known at the time of registration.

All visitors must be at least 16 years old.

If you have recently had a nuclear medicine test or you have metal implants in your body you must bring a statement to that affect signed by your doctor and dated.

Visitors will be asked to show photo identification at the time they are badged. The only acceptable photo identifications are your driver's license, military identification, or passport.

We must have the following information on each visitor by close of business five days prior to the visit. If you are not a citizen of the United States of America your registration form must be received six weeks prior to the visit. Send the information to carolyn_f_ballard@rl.gov or fax it to Carolyn Ballard at (509) 376-5383.

**PLEASE PRINT OR TYPE:**

**Full name** exactly as it appears on your photo identification:

_____

Social Security/Passport Number: _____ Citizenship: _____
Date of Birth: _____ Place of Birth: _____
Company Name: _____
Home or business address: _____
_____
Your Title: _____
Telephone Number: _____ E-Mail address: _____

Please identify the level of Radiological Training you have had: Level One ___ Level Two ___ None _____

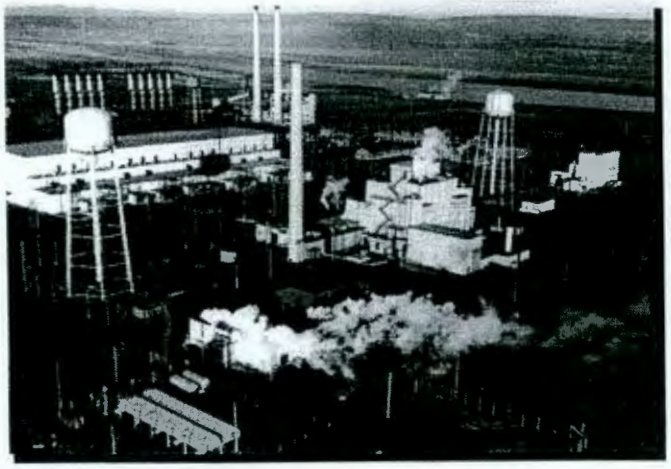
If you register to go on the tour and cannot attend please notify your host as soon as possible. If you have questions or comments please feel free to contact your group's tour coordinator or Carolyn Ballard at (509) 371-1276, FAX (509) 376-5383 or E-mail at carolyn_f_ballard@rl.gov.

I certify the above information is accurate to the best of my knowledge. Signature required by visitor or host.

Name: _____ Date: _____

# Hanford History

- The Manhattan Project, named after the site at Columbia University where much of the early research was done, was the United States government's research project that produced the first atomic bomb. The project lasted four years (1942- 1946).
- In 1943, a laboratory to construct the bomb was established at Los Alamos, New Mexico and nuclear material production was carried out at Oak Ridge, Tennessee and Hanford, Washington. Hanford was the largest of the sites.
- The Hanford Site underwent three large expansions in the early Cold War years. The three expansions occurred between 1947 and 1955, and brought the federal government's capital expenditure at Hanford to $1 billion.
- The Hanford Site produced approximately 54 metric tons of plutonium for defense purposes. This amount is about half of the total defense plutonium produced by the United States.
- During the most intense years of the early Cold War, from 1947 to the Cuban Missile Crisis in 1962, Hanford's plutonium production rate followed a steep upward curve, growing substantially each year.
- Hanford Site employment throughout the production years hovered at about 10,000 workers.
- Battelle began conducting environmental monitoring and reporting work, as well as scientific research and development at Hanford in 1965, when it was selected to operate the Pacific Northwest Laboratory for the Atomic Energy Commission, a predecessor agency of the U.S. Department of Energy.
- In 1996, the entire Hanford Site was designated as a National Historic District, under the National Historic Preservation Act.



Construction on Hanford's historic B Reactor began in October 1943. Enrico Fermi and a team of engineers started the reactor only 11 months later on the evening of September 26, 1944. The B Reactor operated until February 1968, except for a two-year period beginning in March 1946.

## Background

For more than 40 years, plutonium for the nation's nuclear defense program was produced at the U.S. Department of Energy's Hanford Site in southeastern Washington state. As a result, areas within the site's boundaries are contaminated by chemical or radioactive waste making the Hanford Site the largest environmental restoration effort in the nation.

## Why was Hanford Selected?

The Hanford location was selected in January 1943 because it was remote, near railroads, it had abundant water for reactor cooling, plentiful electricity from hydroelectric dams, and on-site aggregate for making concrete.

## Hanford Grew with the Cold War

In the spring of 1943, approximately 1,500 residents were evacuated from the communities of Hanford, White Bluffs, Richland, and the surrounding area, a total of 1,664 square kilometers (640 square miles). The federal government bought the property from the residents, established a living camp for construction workers and a large complex of fabrication shops in White Bluffs, and built permanent housing and other facilities for operations employees in Richland.

Construction workers gathered from across America, living in the temporary camp. The population swelled to 51,000 in a few short months. The crucial race to develop nuclear weapons during World War II would change the quiet, desert lands of Hanford into the scene of an engineering whirlwind.

The Hanford Site was to become home to the first full-scale plutonium production plants in the world. Hanford's mission was to produce plutonium for a new weapon that would bring a swift end to World War II.

The world's first three plutonium production reactors quickly took shape along the banks of the Columbia River, 56 kilometers (35 miles) north of Richland. Few people involved in that mammoth construction project knew what it was all about.

## *Hanford History*

Just 28 months after construction started, Hanford-produced plutonium provided the material for the world's first nuclear detonation.

The first test in Alamogordo, New Mexico, was quickly followed by two nuclear weapons dropped on Japan, ending World War II.

The Hiroshima bomb contained highly concentrated Uranium-235 manufactured in Oak Ridge, Tennessee. The Nagasaki bomb was powered by concentrated plutonium manufactured at Hanford.

The Government's demand for plutonium continued after World War II. By 1964, nine plutonium production reactors were operating at Hanford.

In addition to reactors, the spacious desert complex also housed facilities for the entire nuclear cycle, including fuel fabrication, chemical processing, waste management and research.

The world-changing events associated with the Hanford Site have local, state, national and international significance that cannot be dismissed or denied. The Hanford Site mission both shaped and was shaped by world events in the last half of the 20th century. The buildings and structures remaining on the Hanford Site are the cumulative legacy and physical manifestation of that mission.

## When Did Hanford Diversification Begin?

Peak plutonium production began to slow down in 1965 and Hanford began to diversify. Eight of the nine plutonium production reactors were closed between 1964 and 1971. Only N Reactor, with the dual purpose of plutonium and electricity production, remained in operation.

During 1965-66, the contract to operate the site was split from one prime contractor into seven separate contractors responsible for different Hanford functions. Beginning in the 1960s, the Hanford Site devoted increasing amounts of research time, talent and facilities to exploring the peaceful uses of nuclear power.

The federal government located its largest test programs in mixed oxide fuels at Hanford in the 1960s. The test fuels research program was managed by the federal Atomic Energy Commission's (AEC's) Pacific Northwest Laboratory, which was operated for the AEC by Battelle Memorial Institute.

By 1975, energy research and improved methods of waste management had become major themes at Hanford. The Fast Flux Test Facility, built to test new coolant systems and material for advanced reactors, was built during the 1970s and became fully operational in 1982.

## What's Happening at Hanford Today?

The primary focus today is the safe storage, treatment and disposal of Hanford's legacy wastes and environmental restoration.

In 1989, the U.S. Department of Energy (DOE), Washington State Department of Ecology and the U. S. Environmental Protection Agency signed the historic Hanford Federal Facility Agreement and Consent Order, known as the Tri-Party Agreement. The agreement, regarded as a living document and subject to ongoing revisions, outlines a plan to bring the site into environmental regulatory compliance while cleaning up Hanford legacy wastes.

No defense production occurs at Hanford today. DOE is reducing the risk the Hanford Site poses. Cleanup of the site will be complete by 2035, if not sooner. Economic diversification of the eight-county region surrounding the Hanford Site is also a key focus for DOE and its contractors.

In addition to cleanup activities, the Volpentest HAMMER Training and Education Center, also known as HAMMER, offers a variety of specialized classes to customers worldwide.

DOE's Pacific Northwest National Laboratory delivers science-based solutions to the challenges of expanding energy, ensuring national security, and advancing science, while maintaining environmental quality.

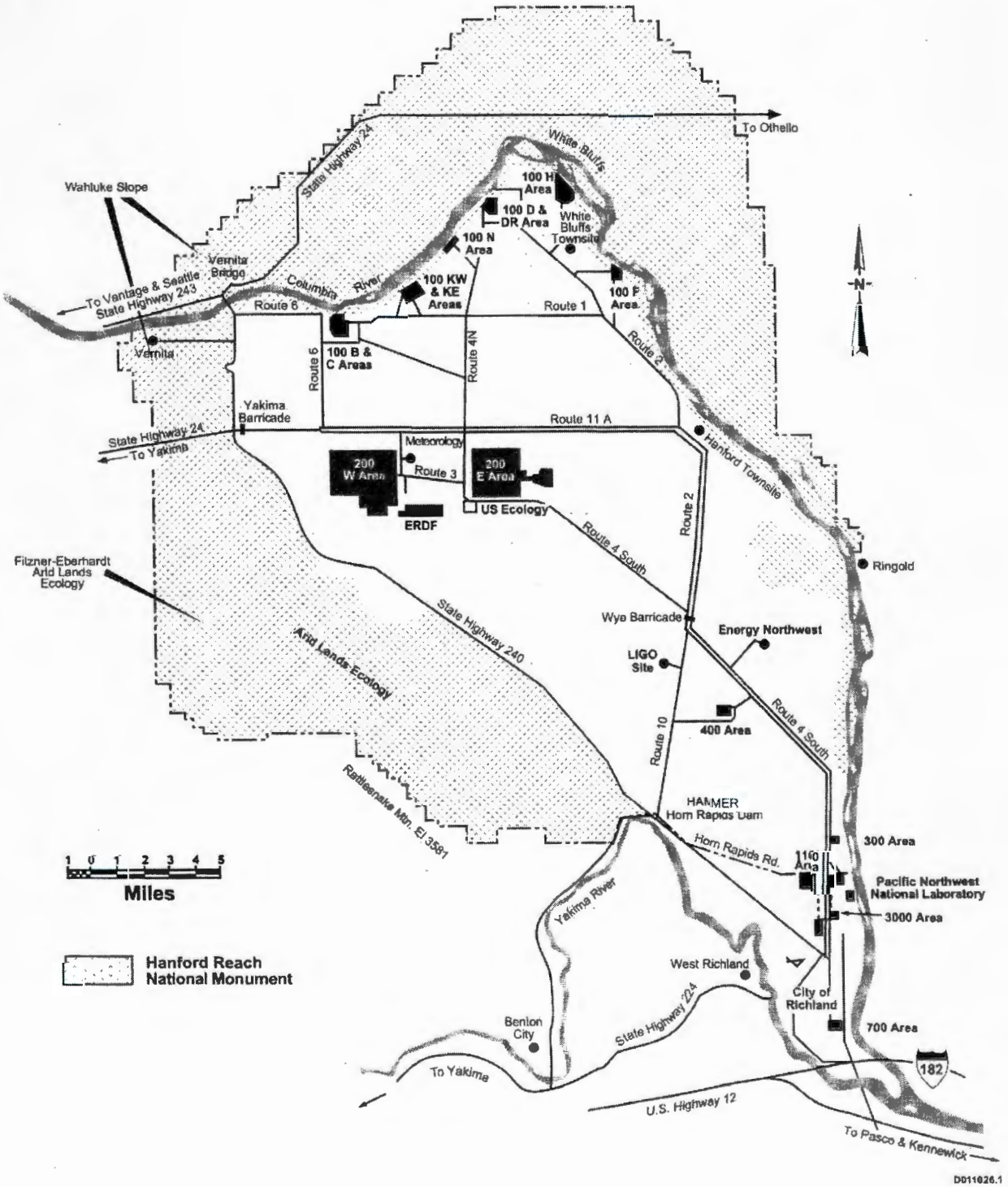
**For more information**

**Write:** U.S. Department of Energy
P.O. Box 550, A7-75
Richland, WA 99352

**Or Call:** (509) 376-7501

**Or contact us** on our INTERNET home page at *http://www.hanford.gov*

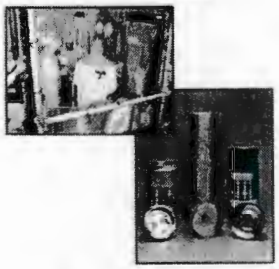
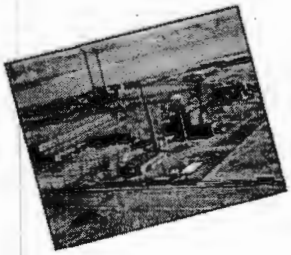
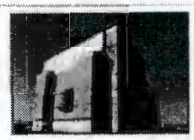
# Hanford Site



# Location of Hanford Site

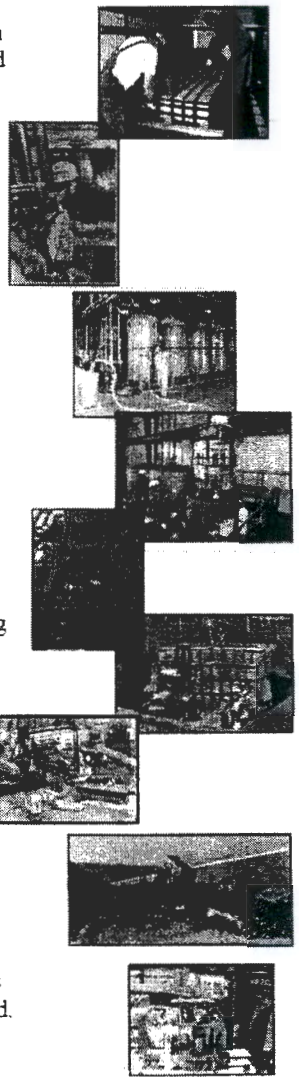
U.S. Department of Energy
P.O. Box 550
Richland, WA 99352
(509) 376-7501
http//www.hanford.gov

# Risk Reduction at Hanford's Richland Operations Office Projects

| December 2000 | July 2004 |
|---|---|
| 2,100 metric tons (2,300 tons) of corroding spent nuclear fuel in leak-prone basins a few hundred yards from the Columbia River | About 96% (~2,000 metric tons) of spent nuclear fuel packaged into high-integrity pressure vessels and moved to dry, safe, underground storage in the middle of the Hanford Site. |
| 18 metric tons of plutonium-bearing materials are in various unstable forms (liquids, metals, alloys, oxides, residues, etc.) after Hanford's mission switches from plutonium production to environmental cleanup in the late 1980s. | Entire inventory of plutonium-bearing materials in safe, stable forms and packaged in specialized containers for shipment off the Hanford Site. Materials with high concentrations of plutonium, (including plutonium metals themselves), all treated, stabilized, and packaged in 50-year, high integrity, stainless steel containers. The materials categorized as transuranic waste are being shipped to the Waste Isolation Pilot Plant in New Mexico.  |
|  Nine defunct plutonium production reactors line the Columbia River shoreline; one, C Reactor, has been safely sealed for up to 75 years. Seven more reactors are scheduled to be cocooned as well (B Reactor set aside). | DR Reactor "cocooned" -- its ancillary buildings torn down, the surrounding waste sites cleaned up, and the reactor core is safely sealed for up to 75 years.  |
| | F Reactor is "cocooned," with torn down ancillary buildings and the surrounding waste sites cleaned up. 17 corroding fuel rods found in the fuel storage basin were processed and transferred to dry, interim storage in the middle of the Hanford Site. The remaining reactor core is safely sealed for up to 75 years. |
| | D Reactor cocooning about 99% complete. New roof under construction. Reactor will be sealed in the fall. |
| | H Reactor cocooning about 81% complete. Eight fuel rods discovered and safely transferred to dry, interim storage in the middle of the Hanford Site. |
| 207 of 758 waste sites, but no burial grounds, along the Columbia River corridor cleaned up -- 551 remaining. About 2.2 million tons of contaminated soil moved away from the river and disposed in the middle of the Hanford Site. | An additional 98 waste sites along the Columbia River corridor cleaned up. About 4.9 million tons (49%) of contaminated soil removed and disposed of in the Environmental Restoration Disposal Facility in the middle of the Hanford Site. Two burial grounds remediated, turning up 786 drums of uranium chips, now removed, treated, and disposed. |

# Risk Reduction at Hanford's Richland Operations Office Projects

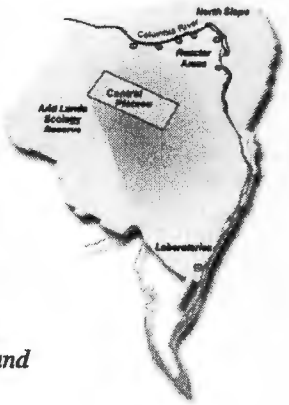
| | |
|---|---|
| Nearly 2,000 metric tons of uranium billets present in the 300 Area near the city of Richland. | More than 1,000 uranium billets have been removed from the 300 Area and shipped off-site; disposal path identified for remaining inventory. |
| Approximately 10 million curies of source term material sits in buildings in the 300 Area near the City of Richland and next to the Columbia River. | Completed cleanup of a "hot cell" once known as the "hottest cell west of the Mississippi River." Fewer than one million curies of source term material remains. |
| Five contaminated groundwater plumes undergoing treatment with interim technologies. | Treatment complete for two of the five plumes (H and U Plant Areas); final treatment technology installed for third. Nine billion liters of groundwater treated. |
| No transuranic waste shipped off the Hanford Site. | More than 3,300 drums of transuranic waste shipped off the Hanford Site to the Waste Isolation Pilot Plant in New Mexico. |
| No transuranic waste retrieved. | About 5,400 drums of transuranic waste retrieved from trenches in the middle of the Hanford Site, further feeding the "pipeline" of shipments leaving the Site for New Mexico. |
| Three Plutonium Concentration Facilities awaiting demolition. | One of three Plutonium Concentration Facilities gone following DOE's first "free air" demolition project. |
| 14,000 drums of waste from the H Reactor Area stored at the Central Waste Complex in the middle of the Hanford Site. | 8,100 of 14,000 drums treated and disposed in Hanford's Environmental Restoration Disposal Facility. |
| Fast Flux Test Facility in standby mode. | Fast Flux Test Facility being deactivated; fuel assemblies washed and stabilized and secondary sodium loop drained. |
| Total recordable injuries at Hanford = 1.9 per 200,000 man-hours. | Total recordable injuries at Hanford by end of 2003 = 1.3 per 200,000 man-hours; statistics continue to trend downward. |
| Lifecycle costs estimated at $35 billion and cleanup to be completed by 2070. | Lifecycle costs estimated at $21 billion and cleanup to be completed by 2035 or sooner. |



# Who's Who at Hanford

Restore the River Corridor • Transition the Central Plateau • Prepare for the Future

*The Hanford Site, a 1,518-square kilometer (586-square mile) tract of land, was established during World War II to produce plutonium for America's nuclear weapons arsenal. The site reached peak production in the 1960s when nine reactors were in operation at the Hanford Site. DOE halted weapons material production in the late 1980s and is now engaged in the world's largest environmental cleanup effort to deal with the legacy of radioactive and hazardous wastes that resulted from the plutonium production era.*



*The Hanford Site has two separate DOE offices. The DOE Office of River Protection (ORP) manages the program to remove the waste from the tanks, vitrify the waste (turn it into stable glass logs) for long-term storage or disposal, and close Hanford's tank farms. The DOE Richland Operations Office (RL) oversees science and technology programs at the Pacific Northwest National Laboratory and the bulk of cleanup, including plutonium stabilization, cleanup of contaminated soil and buildings, stabilization and storage of spent nuclear fuel, and waste treatment and disposal. This fact sheet identifies the contractors for Hanford's major programs.*

## Battelle Memorial Institute

Battelle Memorial Institute (Battelle) of Columbus, Ohio operates DOE's Pacific Northwest National Laboratory (PNNL), whose core mission is to deliver environmental science and technology in the service of the nation. The Laboratory is also a major player in the area of national security and draws on its environmental strengths to meet selected energy, national security and human health needs. PNNL, one of DOE's nine national laboratories, was created in 1965 when the government's research laboratory was separated from Hanford Site operations. At that time, Battelle invested in a private research facility south of the Hanford Site that was combined with existing government facilities in a consolidated laboratory. Today, Battelle scientists conduct more than 2,000 research projects annually for DOE programs, other government agencies, and industry clients. DOE's newest user facility, the William R. Wiley Environmental and Molecular Science Laboratory, is located within the PNNL complex.

## Bechtel Hanford, Inc.

Bechtel Hanford, Inc. (BHI) is RL's prime contractor for environmental restoration at the Hanford Site. BHI's major project management tasks include cleaning up waste sites, decontaminating and decommissioning former production reactors and surplus facilities and disposing of contaminated waste.

## Bechtel National, Inc.

Bechtel National, Inc. (BNI) is ORP's contractor for designing, building, and starting up a waste treatment facility that will transform liquid radioactive waste into a stable glass form. The waste is currently stored in 177 underground tanks. The waste will be treated and converted to a glass waste form in a process known as vitrification. Once immobilized, the high-level radioactive waste will be shipped to a federal geological repository for permanent disposal. The low-level radioactive waste will be disposed of at the Hanford Site.

## CH2M HILL Hanford Group

CH2M HILL Hanford Group (CHG) is ORP's prime contractor for storing and retrieving for treatment approximately 53 million gallons of high-level radioactive and hazardous waste stored in 177 underground waste storage tanks. CHG's role also includes characterizing and delivering the waste to BNI for vitrification.

CHG will be responsible for treated waste storage until permanent disposal facilities are available.

## Fluor Hanford, Inc.

Fluor Hanford, Inc. (FHI) is RL's prime contractor for the remainder of Hanford cleanup. FHI is managing and integrating a full range of work including moving spent nuclear fuel, deactivating and decommissioning the Plutonium Finishing Plant, managing waste, protecting groundwater, and remediating waste sites in the central plateau. FHI also provides site-wide services, including security, emergency preparedness, fire protection, materials procurement, and essential infrastructure services including utilities, facility maintenance, real estate and site planning, emergency response, property management, fleet and transportation operations, and crane and rigging.

FHI leads a team of subcontractors and affiliate companies providing special expertise to specific projects and activities. They are:

- Framatone, ANP: Major focus is supporting the removal and placement of spent nuclear fuel in dry interim storage of reactor fuel.
- Duratek Federal Services of Hanford, Inc. (DFSH): Provides management technical professional support for waste management, analytical services, environmental management, corrective action management, and waste services.
- Numatec Hanford Corporation (NHC): Provides engineering and project management services and technical expertise.
- Day & Zimmermann Protection Technology Hanford (PTH): Provides management, operation and integration of safeguards and security services.

### AdvanceMed Hanford

AdvanceMed Hanford (AMH) provides occupational medical services to DOE and site contractors. AdvanceMed is responsible for medical monitoring and qualification examinations, medical surveillance, diagnosis and treatment of injury or illness, monitored care, legacy health issues, employee counseling and health promotion, occupational health process improvement, records management, emergency and disaster preparedness, health care cost management, field/facility visits, case management, records and data extraction, other occupational medical services, reporting, and supporting transition.

### U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service (USFWS) administers approximately 66,825 hectors (165,000 acres) of the Hanford Site as a component of the 93-million acre National Wildlife Refuge System.

A Presidential Proclamation established the Hanford Reach National Monument in June 2000. USFWS and DOE are joint stewards of the monument. USFWS administers three major management units:

- Fitzner-Eberhardt Arid Lands Ecology Reserve (ALE)
- Saddle Mountain Unit
- Wahluke Unit.

### Land Leased to Others

DOE leases Hanford Site land to government and commercial agencies.

- The State of Washington leased land is subleased to US Ecology, a private company that operates a low-level waste disposal business.
- Energy Northwest owns and operates the Northwest's only operating commercial nuclear power plant, the Columbia Generating Station, which produces electricity for the Bonneville Power Administration.
- Johnson Controls, Inc. provides energy savings enhancement for the Hanford Site.
- The Laser Interferometer Gravitational Wave Observatory (LIGO) is located on land leased to the National Science Foundation and operated by the California Institute of Technology.

**For more information**

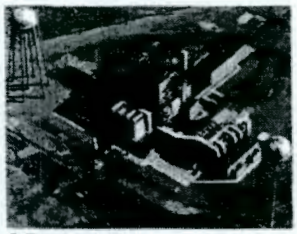
**Write:** U.S. Department of Energy
P.O. Box 550, A7-75
Richland, WA 99352

**Or Call:** (509) 376-7501

**Or contact us** on our INTERNET home page at *http://www.hanford.gov*

# The Columbia River Corridor

Restore the River Corridor • Transition the Central Plateau • Prepare for the Future



C Reactor before cocooning.

C Reactor after cocooning.

DR Reactor before cocooning.

DR Reactor after cocooning.

## Background

Hanford's Columbia River Corridor stretches out over about 210 square miles. It is home to nine former plutonium production reactors, including the B Reactor, the world's first full-scale nuclear production reactor, which produced the plutonium for the bomb that ended World War II. The River Corridor also houses fuel fabrication, research and support facilities.

As a result of reactor operations for plutonium production between 1943 and 1989, there exist today hundreds of waste sites, burial grounds, and excess facilities in need of cleanup, excavation and/or demolition.

## Scope and Projects

### Reactor Cocooning

The last of Hanford's nine reactors was shut down in 1989. Today plans call for eight of the nine to be put into interim safe storage, or "cocooned" (the historic B Reactor may be preserved as a museum). Cocooning involves demolishing all but the shield walls surrounding the reactor core -- more than 85% of the reactor complex -- and putting a 75-year roof on the remaining structure. Cocooning basically eliminates the need for surveillance and maintenance, and will provide a safe condition in which to allow the reactors' radioactivity to be reduced through natural decay -- without exposing workers. Today, cocooning of two Hanford reactors is complete -- C Reactor was finished in 1998 and DR in 2002 -- and work on three others is well underway. D and F Reactors will be complete in 2003, H Reactor in 2004, K East and K West Reactors in 2011, and N Reactor in 2012.

### Waste Site Cleanup

The River Corridor contains about 630 waste sites and burial grounds, the majority of which surround the nine reactor areas along the river. Each of the reactor sites contains

The Hanford Reach of the Columbia River.

landfills, liquid waste disposal ponds, areas contaminated by operational leaks and accidents, and waste sites where contaminated and uncontaminated wastes were buried. Buried materials include chemically and radioactively contaminated materials such as asbestos, lead, chromium, carbon tetrachloride, strontium, uranium, cesium, and tritium.

Once dug up or removed from demolition sites, the contaminated soil and/or debris is moved away from the Columbia River and into the Environmental Restoration Disposal Facility (ERDF), a lined disposal site near the center of the Hanford Site. Since this work began in 1996, workers have cleaned up over 4 million tons of contaminated material -- a volume substantially more than would fit into the Empire State Building. About 3,000 tons of contaminated soil and materials each day go into the ERDF, which is expected to eventually hold about 10 million tons of this low-level waste from cleanup. Once filled, the ERDF will be capped with an engineered barrier to prevent the release of waste and infiltration of rain.

### Spent Fuel Removal

Hanford's "spent" nuclear fuel is fuel that had been irradiated in a reactor as part of the plutonium production process. Hanford was left with about 2,300 tons of spent nuclear fuel in the K East and K West Reactor Basins

(about 80% of the U.S. Department of Energy's [DOE] nationwide inventory) when reprocessing operations were halted in the late 1980s.

In December 2000, Hanford workers began moving the fuel out of the K West Basin and into dry, long-term safe storage far from the Columbia River. Two years later, more than 1,000 tons of fuel have been moved -- representing all of the K West Basin inventory and about 26 million curies of radioactivity. Fuel removal in the much more contaminated K East Basin has also begun, using a fuel transfer system to move the fuel into the K West Basin for washing and loading, prior to sending it to the drying facility and storage at the Canister Storage Building, near the center of the Hanford Site. All spent fuel will be out of the basins and away from the Columbia River by 2004. Eventually, all of Hanford's spent nuclear fuel will be disposed of in a national repository expected to be at Yucca Mountain, Nevada.

## 300 Area Cleanup

For nearly 60 years, the 300 Area, located just 1.5 miles north of the City of Richland and along the west bank of the Columbia River, was the center of Hanford's radiological research and fuel fabrication. This resulted in highly contaminated facilities and waste sites, and a large inventory of radioactive materials. Key 300 Area cleanup progress includes:

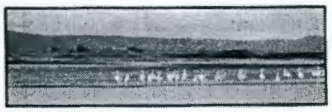
- About 12 million curies of radioactivity have been removed from the 324 Building, which was used for chemical and metallurgical research on radioactive materials and processes for 30 years. Inside this building is B Cell, a concrete shielded room where chemical processes using radioactive material took place. Due to the high radiation levels in the cell, workers had to conduct cleanout operations using remotely handled manipulators looking through four-foot thick shield windows or viewing through in-cell cameras. Today, radioactive debris containing about 3 million curies of radioactivity has been safely removed from the B Cell. This, combined with other shipments of radioactive materials, has reduced the overall 324 Building inventory to less than 200,000 curies.
- Nearly two metric tons of commercial spent nuclear fuel had been held for laboratory experiments. On October 2, 2002, the last of these fuel assemblies was safely transported out of the facility in lead-shielded, 18-foot casks, and placed in safe interim storage on Hanford's Central Plateau. They will stay in interim storage until they can be permanently disposed of in a national repository.
- About 900 metric tons of leftover uranium from N Reactor fuel fabrication have been safely shipped off the Hanford Site, and another 140 metric tons of uranium "scrap" and other materials have been disposed of onsite. Uranium dioxide crystals have also been removed from the 300 Area and sent to the Oak Ridge (Tennessee) National Laboratory.
- About 1,500 55-gallon drums of waste were discovered in the 618-4 Burial Ground during an excavation operation in 1998. Workers have now dug up and removed the barrels -- some of which contain depleted uranium shavings in oil or uranium oxide powder.

## Accelerated Cleanup

With the exception of two burial grounds requiring the deployment of new technologies (618-10/618-11), and the ongoing remediation of groundwater, DOE intends to complete cleanup of the Columbia River Corridor by 2012. Although there will be some continuing degree of engineering and institutional controls on the use of groundwater, most of the corridor either is or will be eligible to be included in the Hanford Reach National Monument and the 300 Area will be available for industrial use. Completing cleanup of the Columbia River Corridor will shrink the footprint of active cleanup operations by 210 square miles, and focus DOE resources and energy on accelerating risk reduction in the Central Plateau.

B Cell before and after.

The 300 Area, just north of the City of Richland, is used primarily for research.



The K East and K West Reactors with white pelicans in the foreground.

**For more information**

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# Spent Nuclear Fuel Project

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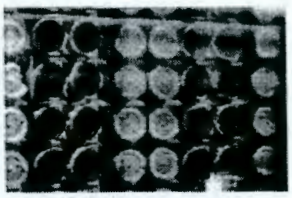
The spent fuel in the K East Basin is "uncapped," which contributed to the vast amount of sludge in the basin.



K West Basin's capped spent nuclear fuel canisters sit among empty ones. Ninety percent of the K West Basin fuel has been removed.

## Background

Hanford's "spent" nuclear fuel is fuel that has been irradiated in a reactor as part of the plutonium production process. Hanford was left with about 2,300 tons of spent nuclear fuel in the K East and K West Reactor water-filled basins (about 80% of the U.S. Department of Energy's [DOE] nationwide inventory) when reprocessing operations were halted in the late 1980s.

The K East and K West Reactor complexes sit along the Columbia River.

The million-gallon water-filled basins were not designed for long-term storage, and the K East Basin has leaked contaminated water into the ground. Initially inside the basins were about 105,000 irradiated, solid uranium metal fuel assemblies, of which about 6,000 were severely corroded and another 3,000 were damaged. The K West Basin fuel was packaged and sealed in canisters, keeping that basin less contaminated than the K East Basin where the fuel was in open canisters exposed to the water. Some of the fuel, particularly in the K East Basin, has corroded, resulting in a significant amount of radioactive "sludge" that must also be dealt with. Located less than 1,000 feet from the Columbia River, the spent nuclear fuel, sludge, debris, and water in the K Basins represents about 55 million curies of radioactivity and is one of Hanford's most urgent threats to human health and the environment.

## Progress

In December 2000, Hanford workers began the process of moving the fuel out of the K West Basin and into dry, long-term safe storage far from the Columbia River. This process consists of:

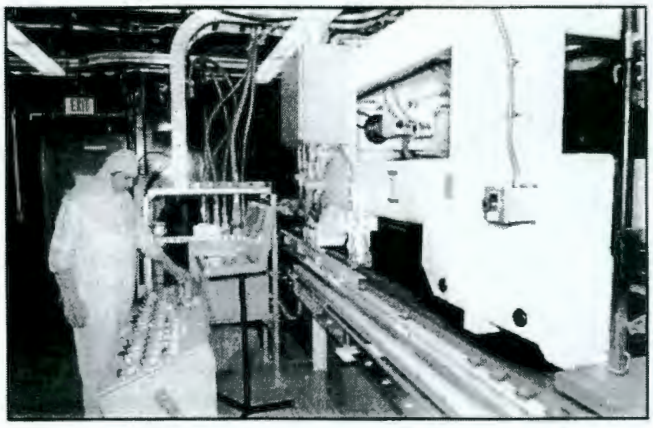
- Using underwater equipment to handle, sort, inspect and wash the fuel canisters and elements and then load them into baskets holding about 50 elements each. The baskets are then loaded into sealed multi-canister overpacks (MCO) for transport out of the basin.
- Transporting the MCOs to the nearby Cold Vacuum Drying Facility, where they are attached to a drying apparatus. The MCO is heated to approximately 45 degrees centigrade by circulating water through the space between the MCO and its shipping cask to facilitate the drying process. All of the water is then drained from the MCO and the fuel is dried using a vacuum system. Inert helium gas is used to backfill the container. The entire process at the Cold Vacuum Drying Facility takes about 50 hours.
- Moving the MCO of dried fuel about nine miles to the Canister Storage Building, located in the central part of the Hanford Site, where it is placed vertically in steel tubes extending 40 feet below a 5-foot thick concrete floor. Eventually, all the spent nuclear fuel will be shipped off the Hanford Site and disposed of in a national geologic repository, currently planned for Yucca Mountain, Nevada.

By January, 2003, Hanford workers had moved more than 1,000 tons of fuel from the K Basins into the Canister Storage Building.

This amount represents the entire K West inventory and 26 million curies of radioactivity. Another critical step occurred

in November 2002, when workers moved the first fuel from the much more contaminated K East Basin to the K West Basin. To reduce worker radiation exposure and expedite the K East Basin process, workers are using a fuel transfer system to move the fuel into the K West Basin for washing and loading, prior to sending it to the drying facility and storage.

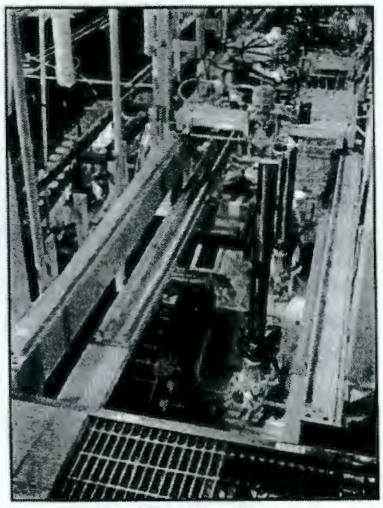
Workers will also consolidate and ship sludge from the basins to Hanford's T Plant for interim storage. The sludge from the basin floor and pits will be characterized as remote-handled waste and stored in T Plant's empty process cells. The sludge from the canisters and fuel washing will be temporarily stored underwater in the T Plant pool. Eventually, the K Basins' sludge will be packaged and shipped to the Waste Isolation Pilot Plant in New Mexico for permanent disposal.



The fuel transfer system allows workers to move fuel from the K East Basin to the K West Basin for cleaning, loading, and shipment to the Central Plateau.

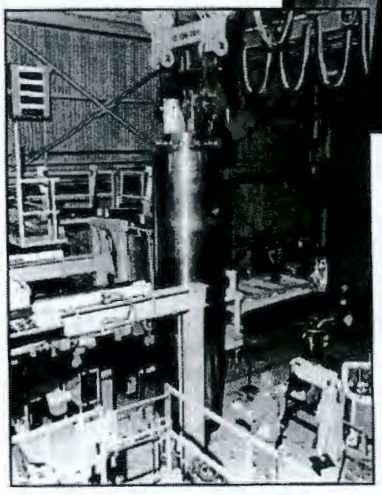
## Accelerated Cleanup

The Tri-Party Agreement calls for all the fuel, sludge, water, and debris to be out of the K Basins by July 2007, removing about 95% of the radioactivity from Hanford's 100 Area near the Columbia River. DOE and contractor Fluor Hanford have set a target completion date of September 2006 -- 10 months early.



Robotic arms sort and wash the fuel elements prior to loading them into multi-canister overpacks.

The Canister Storage Building, shown here during construction, safely stores multi-canister overpacks of spent nuclear fuel in underground tubes until the fuel is moved offsite to a national repository for permanent disposal.



Workers prepare a multi-canister overpack of spent nuclear fuel for shipment to the Cold Vacuum Drying Facility.

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# Soil Remediation

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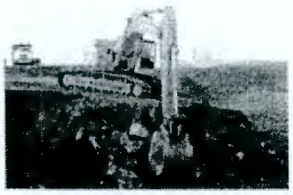


Contaminated dirt in a reactor area along the Columbia River.

Workers dig in a reactor area.

## Background

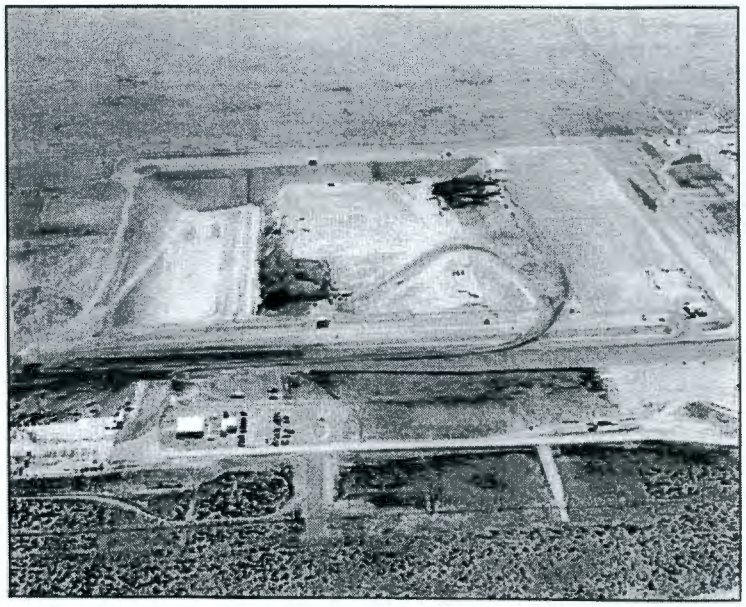
Soil remediation includes quantifying contaminants, excavating, treating (where appropriate), disposing of contaminated soil, regrading, and revegetating. It is a huge task at the Hanford Site. In fact, site engineers estimate that the specially designed disposal trench -- the Environmental Restoration Disposal Facility (ERDF) -- will contain ten million tons of contaminated soil and other debris by the time cleanup operations are complete. Located in the middle of the Site, ERDF was built specifically for low-level and mixed waste disposal.

At Hanford, soil contamination occurred from a variety of sources. Along the Columbia River, the primary sources were the reactor operations in the 100 Area (along the river) and fuel fabrication activities in the 300 Area (just north of the city of Richland).

Nine plutonium production reactors were built along the river between 1943 and 1962. In order to cool the reactors during operation, river water was passed through the reactor and then detained in large concrete retention basins for about 90 minutes to allow the near-boiling water to cool and allow some of the contaminants to decay before releasing the water back to the river. Over time, the retention basins and pipelines began to leak, releasing contamination into the surrounding soil.

When a fuel failure in the reactor occurred, operators diverted the contaminated water from the retention basins into cribs, rather than sending this back to the river, causing significant soil contamination and over time much of this contamination migrated into the ground water.

Fuel fabrication activities in the 300 Area contaminated many soil sites with chemical and radiological materials. The soils around and underneath many buildings and laboratories were contaminated by leaks from chemical processing pipes and tanks. Disposal of solid waste into sites called burial grounds also accounts for a considerable amount of contamination. The burial grounds typically contain contaminated process equipment and drums, which may contain uranium chips or other types of debris.



Environmental Restoration Disposal Facility

## Soil Remediation

### Progress

ERDF opened in July 1996. Since that date, and in accordance with the regulatory process governing waste disposal, about five million tons of contaminated soil and other debris from the 100 and 300 Areas have been disposed there. Remediation activities are ongoing at several of the reactor sites. Cleanup of the 210 square mile River Corridor -- including soil remediation -- is targeted for completion by 2012 except for two waste sites known as 618-10 and 618-11 burial grounds.

An exposed pipeline at the B/C reactor sites.

Workers remove K Area retention basins and surrounding dirt.

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# The Central Plateau

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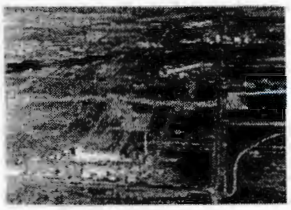
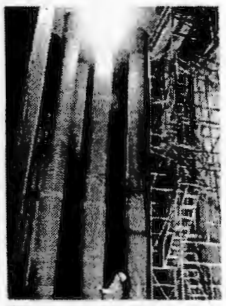
200 East Area



200 West Area



Steel tubes in the Canister Storage Building where spent nuclear fuel is safely stored awaiting shipment to the national geologic repository.

B Plant

## Background

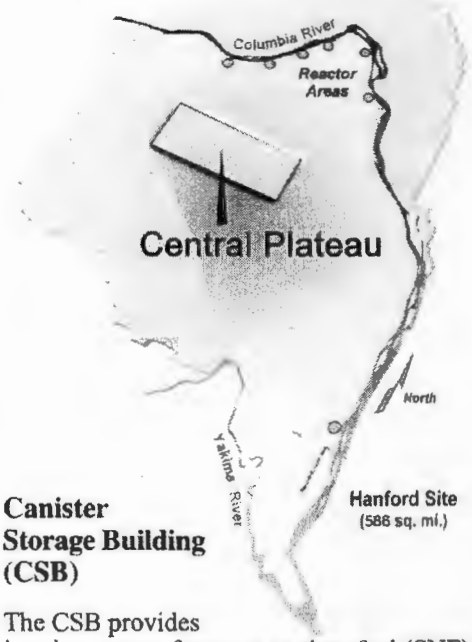
The Central Plateau is an area of approximately 75 square miles located in the middle of the Hanford Site and is 200-250 feet above the water table. Fuel was irradiated in the production reactors in the 100 Area, and chemically processed to separate and recover plutonium for use in nuclear weapons in the 200 Area. There are 900 excess facilities formerly used in the plutonium production process, including 5 massive chemical processing facilities (called canyons), as well as about 800 individual waste sites, which include both buried solid waste and contaminated soil. The Central Plateau has ongoing waste management operations, including low-level waste burial grounds, liquid waste facilities, the Waste Receiving and Processing Facility, and 177 underground high-level waste tanks.

## 200 East Area

### B Plant and the Plutonium-Uranium Extraction Plant (PUREX)

Two chemical processing plants, B Plant and the PUREX Plant, were built to separate plutonium for use in the atomic bomb. B Plant was constructed between 1943 and 1945 as part of the Manhattan Project. After its original mission ended, B Plant was modified for the recovery, separation, and purification of strontium and cesium from liquid wastes stored in Hanford's underground tanks. Operations at B Plant ended in 1985, and it was fully deactivated in 1998.

From 1956 to 1989, PUREX was the workhorse of the nation's nuclear arsenal, producing two-thirds of the U.S. plutonium inventory. About 60 metric tons of plutonium was produced at Hanford -- 80 percent of it at PUREX. PUREX was successfully deactivated in 1997 when Hanford's mission moved from plutonium production to environmental cleanup.

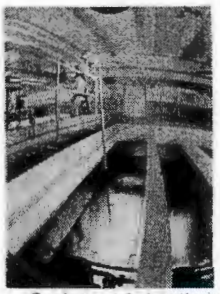



### Canister Storage Building (CSB)

The CSB provides interim storage for spent nuclear fuel (SNF) being removed from water-filled basins near the Columbia River. Containers, known as Multi-Canister Overpacks (MCO), of dried spent nuclear fuel are stored in one of the three CSB vaults. The CSB vaults are below ground level and are comprised of 220 40-foot deep storage tubes, each capable of holding two MCOs. Inside the tubes, the fuel is passively cooled in a low-maintenance, economical manner by natural circulation of the outside air. CSB was designed to provide safe storage and surveillance of the fuel for at least 40 years.

### Waste Encapsulation Storage Facility (WESF)

WESF operated from 1974 to 1985 to encapsulate cesium and strontium that was separated from high-level waste in the adjoining B Plant.



Cesium and strontium capsules underwater.

Currently, WESF safely stores 1,936 cesium and strontium capsules in deep pools of water, which cool the capsules and provide radiological shielding for workers. The stored capsules contain 130 million curies of radioactivity -- about 37 percent of the total radioactivity of Hanford Site wastes.

## 200 West Area

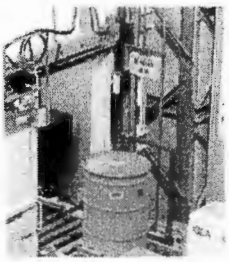
### Plutonium Finishing Plant (PFP)

PFP was built in 1948, and one year later it began to process plutonium nitrate solutions into a metallic form for shipment to nuclear weapons production facilities. The U.S. Department of Energy (DOE) operated PFP until 1989. At the end of the Cold War, many of the weapons production lines were shut down with material still in various stages of the production process. Hanford was left with large quantities of reactive plutonium materials in several different forms, such as liquids, solids, and residues. Hanford is currently using state-of-the art technologies to clean out and stabilize the remaining plutonium materials. Work at PFP is ahead of schedule -- as of August 2003, solutions are completely stabilized, residues are completely stabilized, and solids are at 44 percent completion. Workers are also beginning the difficult task of cleaning out miles of contaminated ducting throughout the PFP complex. Decontamination and removal of the ducting is part of Hanford's plan to clean out and demolish the facility by 2009.

The Plutonium Finishing Plant

### Waste Receiving and Processing Facility (WRAP)

WRAP began operations in 1997 as the first major facility in the DOE complex to handle transuranic (TRU) waste. WRAP inspects, treats, and repackages mixed low-level (MLLW) and TRU waste to ensure it meets acceptance criteria of appropriate disposal facilities, such as the Waste Isolation Pilot Plant (WIPP) in New Mexico. Once TRU characterization is complete, the waste is ready for shipment to WIPP where it is disposed underground. The mixed waste is disposed at Hanford.



A drum is sent through an x-ray machine at WRAP to view its contents.

### Low-level Burial Grounds (LLBG)

The LLBG provide disposal of low-level waste (LLW) and storage and disposal of MLLW. Some TRU waste is also retrievably stored in the LLBG. Over the past 50 years, the burial grounds have received radioactive solid wastes from Hanford's cleanup operations and from offsite generators.

### Waste Sampling and Characterization Facility (WSCF)

WSCF is composed of an analytical laboratory and seven support facilities. Its role is to analyze low-level radioactive and nonradioactive samples of soil, liquids, and air to ensure they meet regulated discharge limits to the environment. WSCF has been operating since 1994.

### T Plant/U Plant/Reduction Oxidation Plant (REDOX)

The T Plant Complex, built in 1943, was the first and largest chemical processing plant built at the Hanford Site during the Manhattan Project, and the first of its kind in the world. T Plant was originally built to extract plutonium from spent nuclear fuel. The material used in the nuclear bomb that ended World War II was processed in T Plant. The plant was shut down in 1956 and converted to a decontamination facility where radioactive and hazardous solid waste is processed and packaged to applicable state and federal guidelines. DOE also selected T Plant as the best site for safe, stable interim storage of the K Basins' radioactive "sludge." Sludge transfers to T Plant are scheduled to begin in the summer of 2003.

Workers clean off the deck of T Plant.

Another chemical processing plant, "U," was constructed in 1944 and performed nearly the same functions as T Plant. The third and final processing plant in the 200 West Area is known as REDOX. It began operations in 1952 and is now shutdown.

## For more information

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# Plutonium Stabilization

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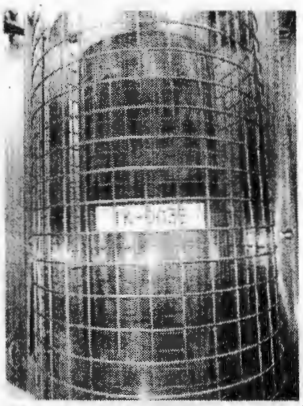
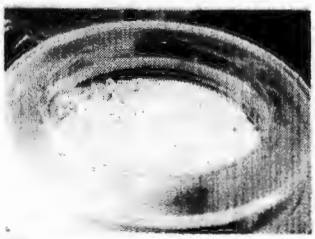
A plutonium "button."



Plutonium solutions.

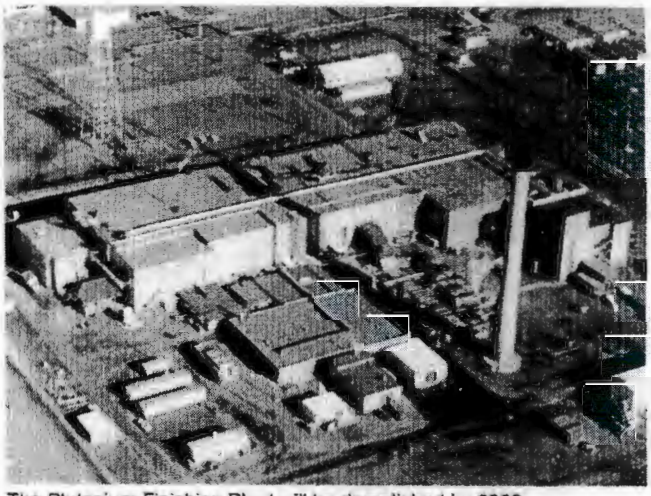
Plutonium pellets.



Plutonium fluoride.

## Background

From 1949 to 1989, U.S. Department of Energy (DOE) contractors operated the Plutonium Finishing Plant (PFP) to process plutonium nitrate solutions into a solid form (hockey puck-sized "buttons" or oxide powder) for shipment to the nation's weapons production facilities. PFP produced more plutonium metal buttons than any other American facility and plutonium for the bomb that ended World War II.



The Plutonium Finishing Plant will be demolished by 2009.

At the end of the Cold War, many of the defense nuclear material production lines were shut down with material still in various stages of the production process, leaving Hanford with a sizeable inventory of unstable materials. In addition to buttons and oxides, PFP facilities contain plutonium-bearing solutions, polycubes, and residues. If improperly handled, plutonium materials pose a danger to workers, a threat of contamination, and a risk of a runaway nuclear reaction (called a "criticality"). The safety and security measures in place to protect these materials cost approximately $100 million each year. Each plutonium form must be carefully stabilized, packaged, and readied for final disposition off the Hanford Site.

## Process and Progress

Workers have completed the stabilization and packaging of about half of PFP's inventory of nearly 18 metric tons of plutonium-bearing materials including scraps, residues, powders, solutions, chunks, and other leftovers from production. By February 2004, DOE and contractor Fluor Hanford are expected to meet the final stabilization and packaging deadline submitted to the Defense Nuclear Facilities Safety Board.

Once all of PFP's plutonium-bearing materials are stabilized and packaged, workers will begin the process of dismantling the PFP complex, and essentially taking it down to "slab on grade." This work will include breaking down and packaging for disposal about 250 gloveboxes, 6,000 feet of ventilation ducting, miles of process, drain and vacuum piping along with thousands of valves, pumps, tanks and other equipment that supported plutonium finishing operations. In all, some 61 buildings will be cleaned out and leveled -- eliminating the threat the PFP complex poses to Hanford workers and the surrounding environment.

The three major categories of plutonium materials are:

- **Solutions**. Hanford had approximately 4,270 liters of plutonium-bearing solutions -- all of which were stabilized by July 2002. Workers used a chemical (oxalic acid) to convert the liquid plutonium into plutonium oxide solids, and then heated the solids on a "hot plate" to evaporate the excess moisture and fed them into a muffle furnace for final stabilization. The resulting oxide powder was packaged into specialized containers called "3013" cans, which are now ready for final disposal.

- **Residues.** Workers are repackaging the residues into cans, which are loaded into "pipe overpack containers" or shielded drums before being shipped to the Central Waste Complex in the middle of the Hanford Site. The stabilized material will eventually be shipped to the Waste Isolation Pilot Plant in New Mexico for permanent disposal. Stabilization of plutonium residues was 86% complete as of December 7, 2002.
- **Metals, oxides, and polycubes.** Plutonium metals are brushed to remove any oxide powder, and oxides and polycubes are stabilized in the muffle furnace. Workers are packaging the plutonium into 3013 cans just like the solutions oxides described above. The cans will be shipped to the Savannah River Site in South Carolina. Stabilization of metal, oxide, and polycube items was 20% complete as of December 7, 2002.

## Accelerated Cleanup

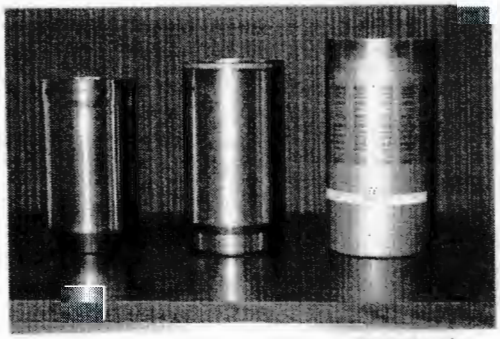
As an important element of accelerating risk reduction at Hanford, DOE and its contractor are making plutonium stabilization and plans for facility demolition a priority.

As called for in the Performance Management Plan for the Accelerated Cleanup of the Hanford Site, workers will:

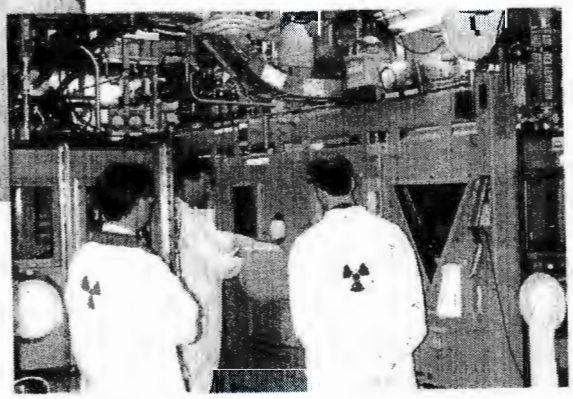
- Accelerate from 2014 to 2005 shipments of Hanford's stabilized plutonium to DOE's Savannah River Site or an alternative secure location. This would further DOE's plutonium consolidation goals for national security, dramatically reduce safety and security costs, and allow more efficient decommissioning of the PFP;
- Characterize, remove, package, and disposition sufficient amounts of the plutonium held up in equipment, glove boxes, and ventilation systems to eliminate the security area at the PFP by 2006; and
- Accelerate from 2016 to 2009 the clean out and demolition of approximately 60 structures, saving up to $500 million in lifecycle costs, including a $100 million annual mortgage cost.

This acceleration plan will enable PFP cleanup activities to be complete well ahead of the September 2016 Tri-Party Agreement milestone.

Plutonium Finishing Plant personnel weigh the oxalic acid used during the stabilization process for plutonium solutions.



Plutonium is stabilized and packaged into 3013 containers, which provide safe storage for up to 50 years.



A nuclear chemical operator demonstrates how to operate the stabilization and packaging equipment during the contractor readiness assessment of the startup of the Plutonium Stabilization and Handling Project. The complicated equipment shown here is called the "W-460" system.

# Transuranic Waste and the Waste Receiving and Processing Facility

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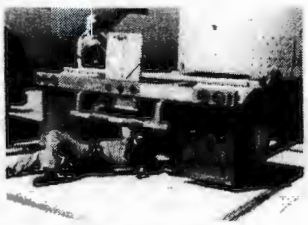
Workers load 55-gallon drums of transuranic waste into a TRUPACT shipping container.



Prior to each shipment leaving Hanford, the Washington State Patrol and/or the Oregon Department of Transportation conduct a thorough safety inspection.

A shipment of transuranic waste from the Hanford Site arrives at the Waste Isolation Pilot Plant in New Mexico. Each transport container (TRUPACT) holds as many as 14 55-gallon drums of waste.

## Background

Transuranic (TRU) waste is contaminated equipment and debris with long-lived radioactive potency and is dubbed transuranic because its radioactive isotopes are above uranium in the periodic table of elements. "Suspect" TRU is waste that has not yet been characterized as such, but because of past operations and disposal practices, it is possible that the waste contains TRU constituents in a sufficient concentration to be designated TRU waste. Currently, Hanford has over 80,000 drum-equivalents of "suspect" TRU waste, generated since 1970, stored above and below ground. About 37,000 drums and 1,200 boxes of suspect TRU waste is buried in retrievable storage in the low-level burial grounds on the Central Plateau in the middle of the Hanford Site.

In addition, a number of the 800 individual non-tank farm waste sites on the Central Plateau may contain transuranic constituents, such as plutonium, that must be recovered and processed for disposal at the Waste Isolation Pilot Plant (WIPP) in New Mexico.

As we proceed with Hanford cleanup (taking down buildings, remediating waste sites and retrieving the suspect TRU waste), more of these wastes will be generated and will need to be characterized, possibly treated, and disposed.

## Treatment, Storage and Disposal Progress

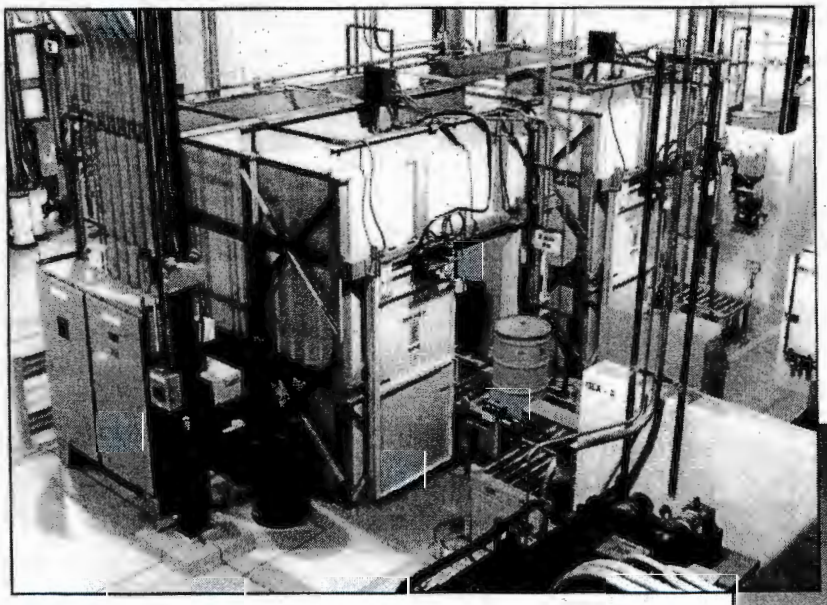
The Waste Receiving and Processing facility (WRAP) is a unique, 51,300 square-foot facility for inspecting, treating and repackaging drums and small boxes of mixed low-level waste, and for processing TRU waste in preparation for permanent disposal. Hanford is currently processing post-1970 TRU waste stored above ground. From a control room, an employee characterizes the contents of drums containing hazardous and radioactive waste by using an x-ray and measuring radioactivity. Once characterization is finished, the drum is properly labeled and prepared for transportation to permanent disposal. Operations at WRAP ensure that the waste meets the acceptance criteria of the appropriate disposal facility.

TRU waste is either stored in the Central Waste Complex (CWC), storage trenches in the ground, or at T Plant. The CWC includes numerous warehouse-type buildings that provide storage of tens of thousands of drums of waste. Depending on the characterization of the drum, it may also be stored in a trench surrounded by dirt to provide additional shielding. T Plant temporarily stores small quantities of remote-handled TRU waste and will soon be able to process it.

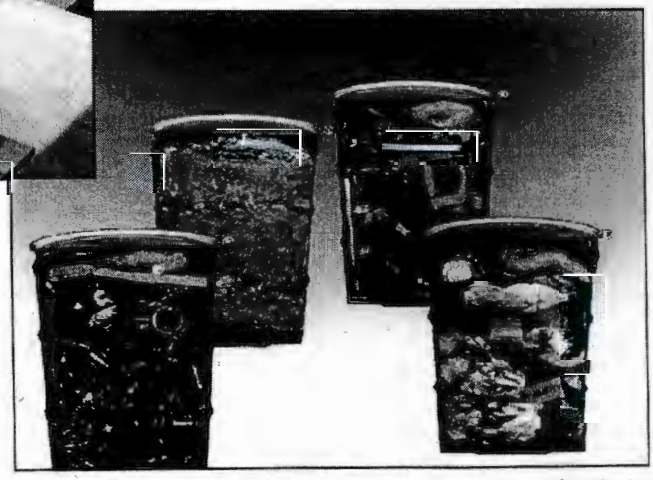
In recent months, we have focused on increasing our shipments to WIPP. By accelerating the TRU waste disposal effort, we will reduce the costs associated with continued maintenance and surveillance of TRU waste storage containers and facilities.

## Accelerated Cleanup

As outlined in the Hanford Performance Management Plan, we will accelerate retrieval of the post-1970 suspect TRU waste. Accelerating these operations will be possible by deploying mobile TRU waste processing systems, which can provide an additional capacity to certify for shipment up to 4,000 drums per year for disposal at WIPP. The mobile systems, provided and funded by another U.S. Department of Energy (DOE) field office, will allow us to significantly increase our Hanford TRU shipping rates over the next eight years to WIPP, and be used to process TRU waste from other DOE sites with small-quantities of waste. The mobile systems will also allow us to accelerate retrieval and shipping of Hanford's contact-handled TRU waste drums, finishing years ahead of the previously planned dates.



A drum of transuranic waste is run through an x-ray machine at the Waste Receiving and Processing Facility.



X-ray photos of contents in 55-gallon drums.

**For more information**

**Write:** U.S. Department of Energy
P.O. Box 550, A7-75
Richland, WA 99352

**Or Call:** (509) 376-7501

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# Low-Level and Mixed Low-Level Waste

Restore the River Corridor • Transition the Central Plateau • Prepare for the Future

A closeup view of a mixed waste disposal trench.

A truck dumping contaminated soil into the Environmental Restoration Disposal Facility.

## Background

Waste disposal is an enormous undertaking at the Hanford Site. Not only is there legacy waste from the plutonium production days, but waste is also generated as the U.S. Department of Energy (DOE) and its contractors cleanup the site. Plutonium production left about 25 million cubic feet of buried or stored solid waste in 175 burial grounds and more than 1,700 waste sites. The facilities and disposal areas for this waste are located in the middle of the 586 square mile site in an area known as the Central Plateau.

Low-Level Waste (LLW) is one category of waste at Hanford. LLW takes a wide range of forms, concentrations and hazards. It can range from very low to very high concentrations of radionuclides, but is generally the kind of waste acceptable for shallow land disposal. It is usually a mixture of contaminated equipment, dirt, tools and other debris.

Hanford disposes of LLW generated from various onsite and offsite generators. Onsite, the largest generated volume of LLW, is from cleanup of waste sites and reactor areas along the Columbia River. To date, more than four million tons of contaminated soil have been moved away from the river shoreline and disposed in the Environmental Restoration Disposal Facility (ERDF), also located in the Central Plateau.

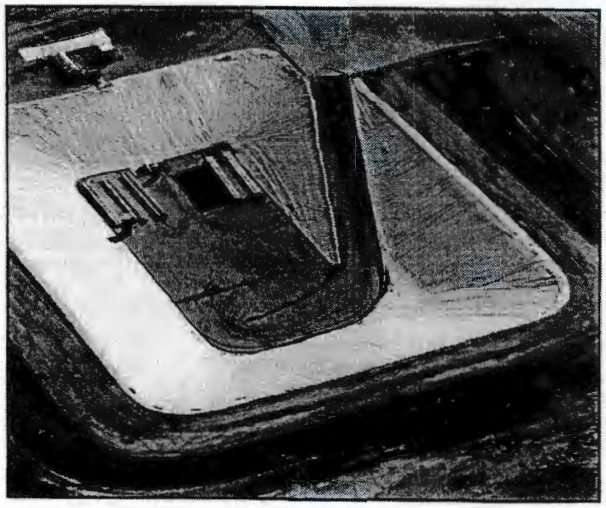
Mixed Low-Level Waste (MLLW) is another primary category of waste at Hanford. It contains chemically hazardous components, in addition to radionuclides. It is usually a mixture of contaminated equipment, dirt, tools and other debris.

## Waste Treatment

MLLW must normally be treated prior to disposal. Hanford's ability to treat some types of MLLW is limited because of the specialized equipment and facilities needed. The vast majority of mixed waste requires either stabilization or coating or applying a specially approved treatment overpack to the waste (macro encapsulation) to meet state and federal standards for disposal. Hanford's MLLW is usually treated offsite by commercial vendors, though small quantities can be treated at T Plant, one of five canyon facilities located on Hanford's Central Plateau. Treated waste is disposed in trenches that meet federal and state requirements.

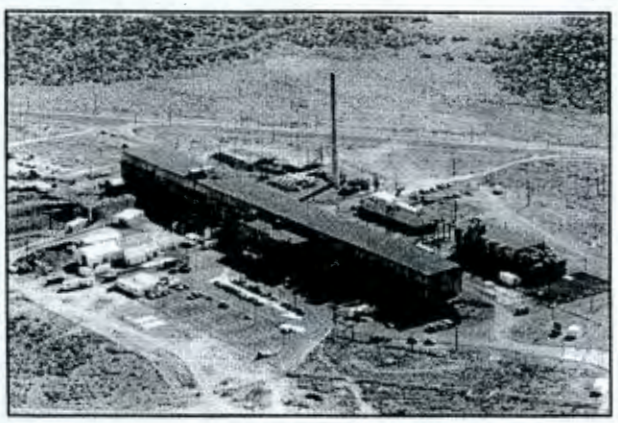
## Storage/Disposal Facilities

The Low-Level Burial Grounds (LLBGs), ERDF, T Plant and the Central Waste Complex (CWC) are used to treat, store or dispose of LLW and MLLW. The LLBGs consist of eight burial grounds that have provided for disposal for both types of waste. Since the issuance of the Hanford Site Solid Waste Environmental Impact Statement (HSW EIS) Record of Decision (ROD),



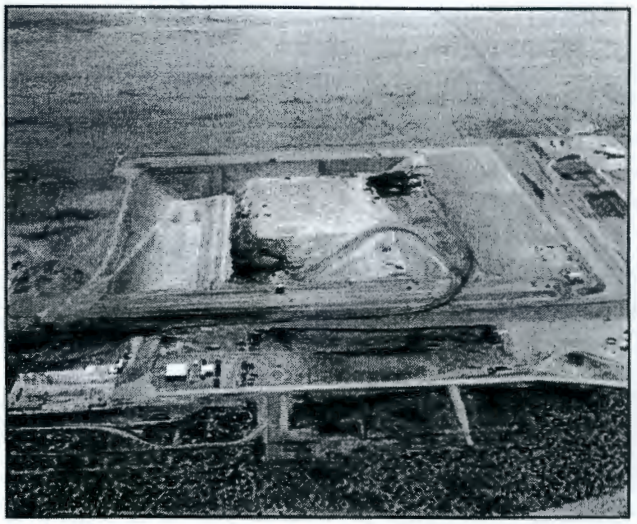
An aerial view of a mixed waste disposal trench.

disposal of LLW in the unlined trenches of the LLBGs has ceased. Now only the lined trenches in the burial grounds will be used. ERDF is a single, massive trench presently consisting of four cells and currently holds enough LLW/MLLW to fill the Empire State Building one and a half times. T Plant is being used as a decontamination and storage facility for MLLW and the CWC is used to store drums and boxes of waste.



T Plant

An aerial view of the buildings comprising the Central Waste Complex.



Environmental Restoration Disposal Facility

## Progress

DOE has completed the HSW EIS. The HSW EIS analyzes several alternatives for the treatment, storage and disposal of waste at Hanford. The HSW EIS ROD was issued June 23, 2004, and includes decisions on management of LLW and MLLW. Key decisions included in the ROD were the decision to cease disposal of LLW in unlined trenches, and limiting Hanford imports of LLW and MLLW.

## Accelerated Cleanup

DOE plans to accelerate by four years (from 2012 to 2008) the treatment and disposal of about 14,000 cubic meters of MLLW (7,000 cubic meters currently in storage and 7,000 cubic meters expected to be generated during cleanup over the next six years). DOE will continue to treat MLLW using both commercial and onsite capabilities. In addition, DOE will continue to work with state and federal regulators to determine the most cost-effective path forward for disposal of MLLW while remaining protective of the public, the environment and the workers.

**For more information**

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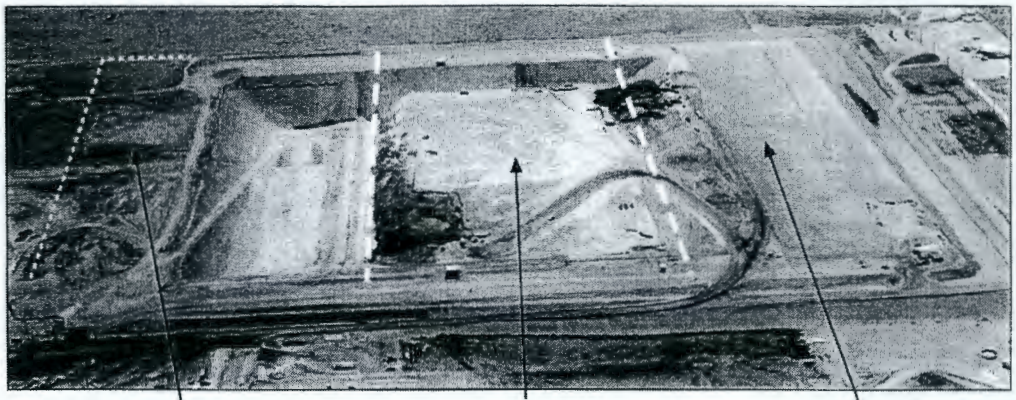
# Environmental Restoration Disposal Facility

Restore the River Corridor • Transition the Central Plateau • Prepare for the Future

Low-level waste is unloaded from a special truck for disposal in Hanford's Environmental Restoration Disposal Facility.

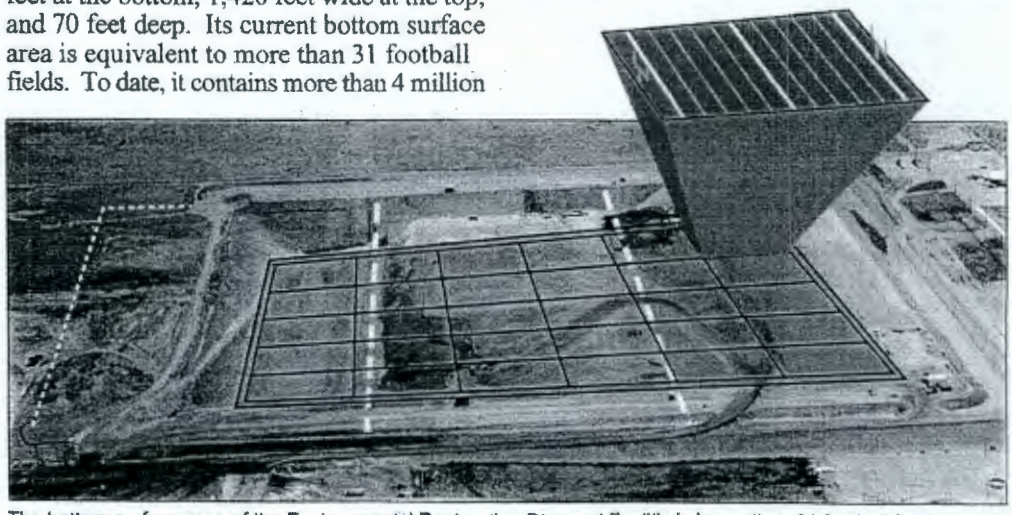
Environmental Restoration Disposal Facility




## Background

The Environmental Restoration Disposal Facility (ERDF) plays a significant role in soil remediation operations at the Hanford Site. In fact, cleanup of the Columbia River Corridor would not be possible if it were not for ERDF. The massive trench, opened in 1996, currently consists of four "cells," with two more planned for construction in the near future. Each pair of cells is 500 by 1,000 feet at the bottom, 1,420 feet wide at the top, and 70 feet deep. Its current bottom surface area is equivalent to more than 31 football fields. To date, it contains more than 4 million tons of contaminated waste -- only a quarter of what it is expected to receive throughout Hanford cleanup. If it were empty, ERDF could contain the volume of 396 Goodyear Blimps.

ERDF has both a primary and secondary liner system that contains and collects water. The water, also referred to as "leachate," contains hazardous chemicals and radioactive nuclides



The bottom surface area of the Environmental Restoration Disposal Facility is larger than 31 football fields.

## *Environmental Restoration Disposal Facility*

Workers remove contaminated soil from along the Columbia River corridor, and truck it to the Environmental Restoration Disposal Facility for disposal.

from the deposited waste. The liner system prevents these harmful substances from reaching the groundwater under the trench. In addition, as a natural barrier to groundwater contamination, ERDF sits in the middle of the Hanford Site -- known as the Central Plateau -- which the original designers chose because the distance to groundwater is more than 240 feet from the bottom of the trench. Once Hanford cleanup is complete, an engineered barrier system that acts as a roof will cover the top of ERDF to help prevent rainwater from leaching radioactive and hazardous contaminants into the groundwater.

### Process/Progress

During cleanup, heavy equipment operators at the various cleanup sites place mostly soil-type wastes into portable transport containers that can hold up to 20 tons. Once the containers travel to ERDF, another operator uses a specially designed truck to take the containers into the trench and dump the waste, which is then spread and compacted by a bulldozer.

Compaction of the waste is a key activity, watched carefully by ERDF operators, to ensure safe long-term storage of the waste without settlement cracks and crevasses. At the end of each day, ERDF operators perform tests to ensure the day's deposited waste was properly compacted before spraying the newly-deposited waste with a polymer-based fixative that prevents wind-blown dust from spreading contamination outside of the trench. ERDF receives about 3,000 tons of waste per day, and over its lifespan, expects to receive about 16 million tons of waste from Hanford cleanup.

## For more information

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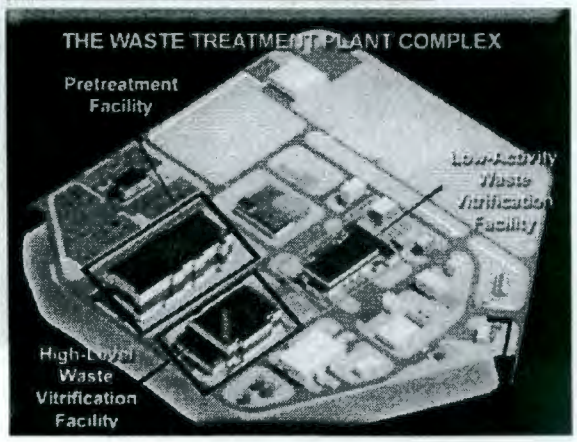
Office of River Protection

# THE RIVER PROTECTION PROJECT

*The Hanford Site is located in southeastern Washington State*




## BACKGROUND

The River Protection Project is one of the nation's largest and most complex environmental cleanup projects. Sixty percent of the nation's nuclear waste is stored in 177 aging underground waste tanks at the U.S. Department of Energy's Hanford Site in southeastern Washington. This waste accumulated from 1944 to 1989 as a result of the chemical separation processes necessary for the production and reprocessing of plutonium at Hanford for the purpose of national defense.

Most of Hanford's tanks are single-shell tanks and are several decades beyond their design life. Sixty-seven of these tanks have leaked more than one million gallons of waste into the ground, thus threatening the integrity of the Columbia River, which is less than seven miles away. To prevent further damage to the environment, the U.S. Department of Energy's Office of River Protection, through its management of the River Protection Project, is working to meet the tank cleanup challenge. The plan calls for safely removing the waste from the tanks, treating the waste for disposal, safely storing or disposing of the treated waste, and closing the tanks.

To help accomplish the tank waste cleanup, the River Protection Project team will build and operate the Waste Treatment Plant, the largest radiochemical processing facility in the world.

### FAST FACTS

- Hanford's tanks contain approximately 53 million gallons of highly radioactive waste and 190 million curies of radioactivity
- Single-shell tanks are more than 30 years beyond their design life and have leaked approximately one million gallons of radioactive waste into the ground
- The Waste Treatment Plant, which will immobilize the tank waste by turning it into glass, is the world's largest radiochemical processing facility and will cost approximately $4 billion over 10 years

## OFFICE OF RIVER PROTECTION (ORP)

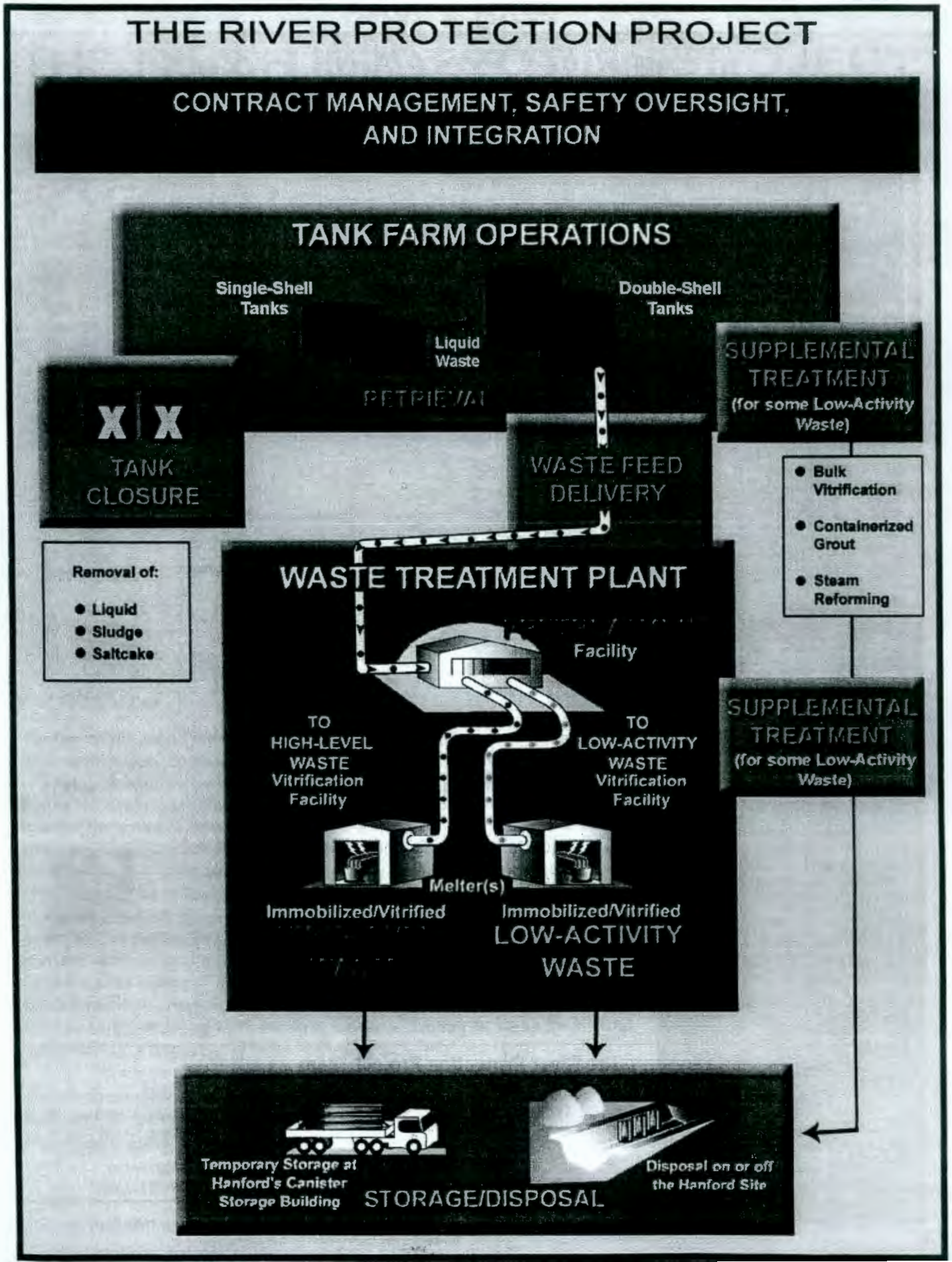
The U.S. Department of Energy's Office of River Protection manages the storage, retrieval, treatment, and disposal of Hanford's tank waste. The Office of River Protection was established by the U.S. Congress in 1998, as an independent office at the Hanford Site with the exclusive focus of solving the Hanford tank cleanup challenge. The goal of the Office of River Protection is to complete tank cleanup quickly, safely, and cost effectively. To this end, it provides contract management, safety oversight, and project integration for its prime contractors, CH2M HILL Hanford Group, Inc., and Bechtel National, Inc., to ensure that tank waste cleanup is accomplished as an integrated waste treatment operation. In order to ensure the safety of the overall project, the Office of River Protection implements an Integrated Safety Management approach for benchmarking its safety culture.

## CH2M HILL HANFORD GROUP, INC. (CH2M HILL)

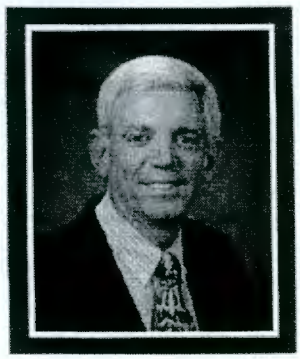
CH2M HILL Hanford Group, Inc., is the Office of River Protection's prime contractor responsible for the storage, retrieval, and disposal of Hanford's tank waste. The contractor has served in this role since 1999 and was awarded a five-year contract extension in January 2001. Specific responsibilities include: 1) the retrieval of tank waste; 2) the delivery of retrieved waste for treatment; 3) the storage and disposal of the treated waste; and, 4) the closure of tanks. CH2M HILL Hanford Group, Inc., also has responsibility for maintaining the tank farm infrastructure in a safe and stable configuration until the ultimate goal of closing the Hanford tanks is achieved.

## BECHTEL NATIONAL, INC. (BNI)

Bechtel National, Inc., is the Office of River Protection's prime contractor responsible for the design, construction, and start up of the Waste Treatment Plant. The contractor was awarded a ten-year contract in December 2000. Bechtel National, Inc.'s, responsibilities include project management, engineering/design, procurement, construction, and quality assurance relative to the Waste Treatment Plant. Washington Group International, Inc., is Bechtel's principal subcontractor on the project and has responsibilities for operations support, process technology, research and technology, commissioning, and management of environment, safety, and health processes. Bechtel National Inc., and Washington Group International, Inc., operate as an integrated team.

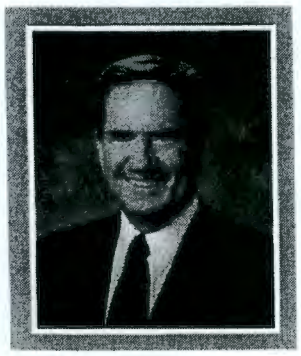

THE RIVER PROTECTION PROJECT
CONTRACT MANAGEMENT, SAFETY OVERSIGHT, AND INTEGRATION
TANK FARM OPERATIONS
Single-Shell Tanks
Double-Shell Tanks
Liquid Waste
RETRIEVAL
TANK CLOSURE
WASTE FEED DELIVERY
SUPPLEMENTAL TREATMENT (for some Low-Activity Waste)
Bulk Vitrification
Containerized Grout
Steam Reforming
Removal of:
Liquid
Sludge
Saltcake
WASTE TREATMENT PLANT
Facility
TO HIGH-LEVEL WASTE Vitrification Facility
TO LOW-ACTIVITY WASTE Vitrification Facility
Melter(s)
Immobilized/Vitrified
Immobilized/Vitrified LOW-ACTIVITY WASTE
SUPPLEMENTAL TREATMENT (for some Low-Activity Waste)
Temporary Storage at Hanford's Canister Storage Building
Disposal on or off the Hanford Site
STORAGE/DISPOSAL

# Who's Who in the River Protection Project



## Office of River Protection

Roy Schepens is Manager of the U.S. Department of Energy's Office of River Protection. Mr. Schepens is responsible for the safe storage, retrieval, treatment, and disposal of 54 million gallons of high-level, radioactive waste stored in underground tanks at the 560 square mile Hanford Site in southeastern Washington State.



## CH2M HILL Hanford Group, Inc.

Edward Aromi is President and General Manager of CH2M HILL Hanford Group, Inc. Mr. Aromi is responsible for management of the Hanford tank farms, retrieval of the tank wastes for treatment, storage and disposal of the treated waste, and closure of the tanks.

## Bechtel National, Inc.

Jim Henschel is Project Director of Hanford's Waste Treatment and Immobilization Plant Project. He is also a Senior Vice President of Bechtel National, Inc. Mr. Henschel is responsible for designing, building, and starting the world's largest complex of radiochemical processing facilities known as the Waste Treatment Plant.

**The River Protection Project Team**


| Office of River Protection | CH2M HILL Hanford Group, Inc. | Bechtel National, Inc. |
|---|---|---|
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| Richland, WA 99352 | Richland, WA 99352 | Richland, WA 99352 |
| MSIN H6-60 | MSIN H6-08 | MSIN 14-3A |
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