TSP TECHNICAL STEERING PANEL
OF THE HANFORD ENVIRONMENTAL
DOSE RECONSTRUCTION PROJECT

Fact Sheet

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The Green Run

For more than 40 years, the U.S. Government made plutonium for nuclear weapons at the Hanford Site in southeast Washington. Between 1944 and the early 1970s, radioactive materials were released from Hanford on a regular basis. Some of the releases were accidental. Others were routine emissions.

The Hanford Environmental Dose Reconstruction Project began in 1987. Its mission is to estimate what radiation dose people may have received from the Hanford releases. An independent Technical Steering Panel (TSP) of scientists and experts directs the multi-year Project. Battelle scientists at Pacific Northwest Laboratory conduct the work. Funding will be transferred in 1992 from the U.S. Department of Energy to the U.S. Department of Health and Human Services through the Centers for Disease Control.

This fact sheet details one planned release which occurred late in 1949. It is called the Green Run.

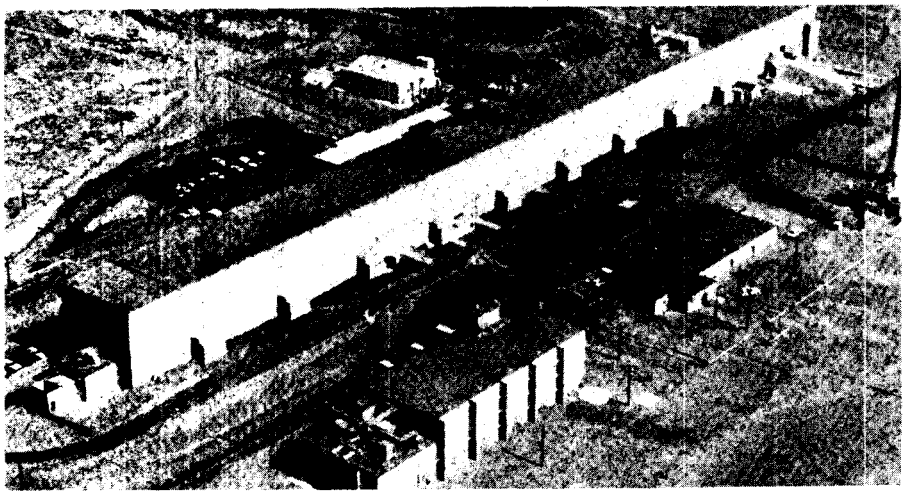
Cold War Fears Prompt Test

In December 1949, Hanford workers conducted a special experimental release of radioactive iodine-131 (I-131). Some details of the experiment are still classified. We do know that scientists wanted to measure how an airborne release of radioactive materials spread. The government would use this information to monitor the Soviet Union's emerging nuclear weapons program.

In 1949, Hanford had four nuclear production reactors in operation. Eventually, nine were built there. The reactors were used to irradiate nuclear fuel. This converted some of the uranium in the fuel to plutonium.

After discharge from the Hanford reactors, the irradiated nuclear fuel was normally stored for many weeks before processing. This "cooling the fuel" delay allowed short-lived radioactivity to decay. The cooled fuel was dissolved in nitric acid and the solution processed to separate the plutonium.

The 1949 experiment required large amounts of radioactive iodine. Therefore, "green" fuel that had cooled for only 16 days was used because it still contained large amounts of radioactive iodine. The experiment came to be known as "the Green Run."



The T Plant complex was the source of the 1949 Green Run release. It was the first chemical processing plant built at Hanford.

When reactor fuel dissolves, radioactive materials are released. These materials include large amounts of radioactive iodine. By 1949, the iodine normally was caught in filters before discharge from the plant stacks. Small amounts that did escape were usually well-diluted by the wind by the time the release traveled off site.

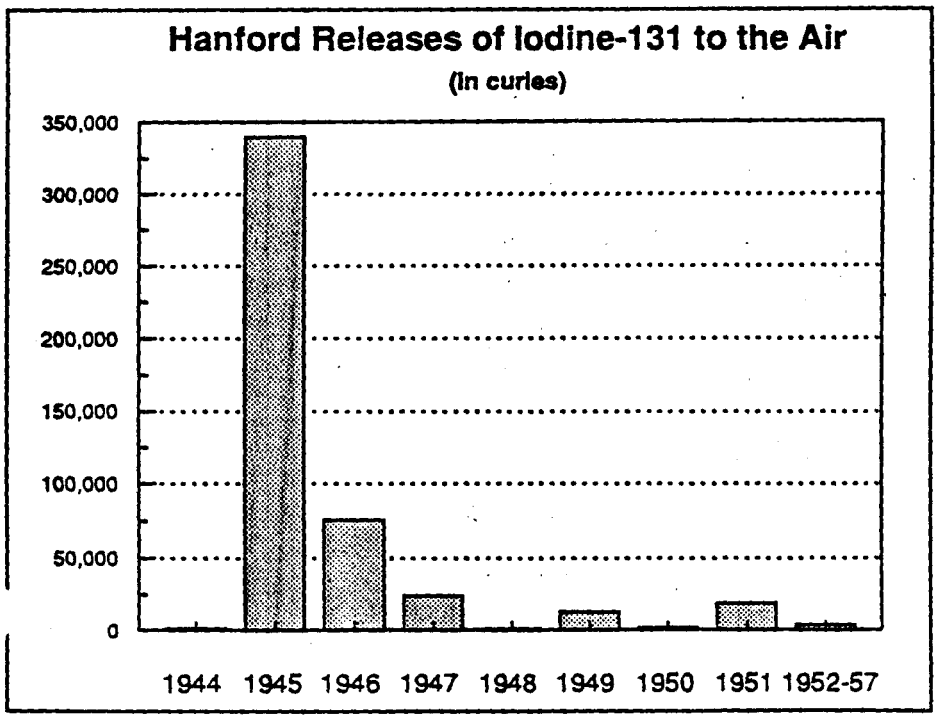
The filter system was bypassed for the Green Run to be sure that the release carried enough radioactive material to be measured.

Weather a Factor

The Health Instrument (HI) Division of the General Electric Company was responsible for worker and public health at Hanford in 1949. The Division monitored radioactivity in and around Hanford and the nearby countryside. The Division had authority to decide when reactor fuel could be processed. If weather conditions were poor and there was a danger that workers would be exposed to radiation levels above certain guidelines, dissolving would not start.

The Division set certain weather conditions for the Green Run:

1. There must be a local inversion (a layer of cold air near the ground) to help prevent stack emissions from reaching the ground before they were well-diluted. The experiment was scheduled for nighttime because that's when inversions usually occur at Hanford.
2. There must be no rain, fog, low clouds or other conditions that would prevent airborne measurements.
3. The wind speed at 200 feet must be less than 15 miles per hour.
4. Winds must be from the west or southwest so monitoring aircraft did not have to fly near the local hills.
5. Conditions must allow the radioactive emissions to stay aloft long enough to be measured.



The Green Run Proceeds

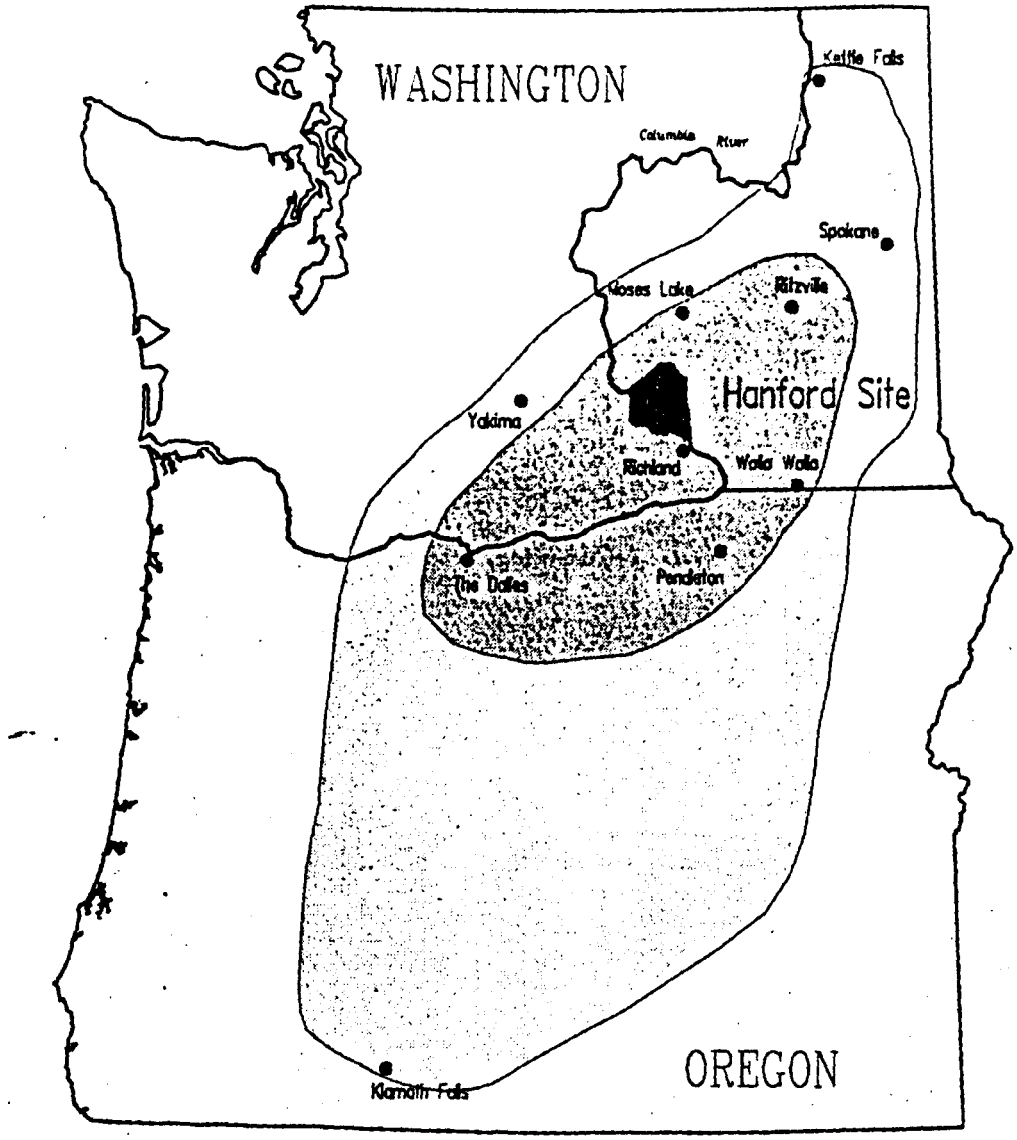
Inclement weather during the month of November delayed the test for one week. On December 1 1949, two tons of green fuel were loaded into a fuel dissolver. The plan was to dissolve one ton of the fuel when weather conditions were right. The job was expected to take 12 to 16 hours.

At about 8 p.m. on the evening of December 2, the experiment began. Workers in a facility called the T Plant dissolved the fuel jackets and rinsed the uranium metal. The Air Force wanted to begin the test at about 2 a.m. so the maximum release would occur about daybreak. Concerns about the weather led to the earlier start so the bulk of the radioactive release would occur before the inversion broke the following morning.

HI Division staff fanned out offsite -- on the ground and in the air -- with radiation measuring instruments.

The discharged radioactive material was almost entirely I-131 and xenon-133 (Xe-133). Samples of stack gas were taken through a sampling line at the 50 foot level in the T Plant stack. This line ran into a laboratory. Unfortunately, water condensed in the line and iodine collected in that water. The iodine never reached instruments in the laboratory.

Prior to the experiment, scientists predicted the Green Run release would carry nearly 4,000 curies of iodine. But the analysis method that was used after the test implied that the Green Run release carried only 60 curies of iodine. This was so low that the result was rejected and the method was abandoned.



The map shows areas where radioactive iodine-131 was found on vegetation following the Green Run release. The darker shaded area is where we believe the highest contamination occurred. Sampling data leads us to believe there was far less contamination within the lighter shaded area, although the data is somewhat incomplete. Little, if any, sampling was done outside the shaded area. It's likely small amounts of contamination reached beyond parts of the shaded area.

The highest concentrations of iodine-131 were found on the Hanford Site. Two vegetation samples taken near the 200 West gate measured 28,000 and 14,000 picocuries per gram (pCi/g) of iodine-131. Measurements in Richland reached as high as 600 pCi/g. Iodine-131 was detected in amounts ranging from 50-260 pCi/g in Walla Walla, 35-55 pCi/g in Pendleton, and 5-30 pCi/g in Spokane.

In the event of a nuclear plant accident or other mishap, current Environmental Protection Agency (EPA) standards recommend the interdiction of food stuffs with iodine-131 levels higher than 50 pCi/g.*

The Hanford Environmental Dose Reconstruction Project has not yet determined the radiation doses people may have received from the Green Run. That will be done before the end of the project.

* *The Manual of Protective Actions for Nuclear Incidents. EPA 520/1-75-001-A. January 1990.*

Scientists then analyzed the iodine-laden condensate in the air sample line using a new technique. The new analysis indicated the plant discharged about 7,800 curies of iodine, twice as much as had been predicted.

Xenon measurement results showed a release of about 20,000 curies of xenon – three times more than predicted. Xenon is considered much less radio-toxic to the body than iodine.

The 12-hour release ended about 8 a.m. on December 3. During the release, Hanford's winds were mostly northwest to southeast. However, winds at the outlying towns were blowing in various directions. As the winds blew the material around, some of the radioactive iodine came to rest on the ground, on vegetation, and on water. The HI Division collected vegetation samples in a wide area ( )und Hanford. The deposition round on the vegetation samples is shown on the map.

I-131 has a half-life of about eight days. That means that it loses half of its radioactivity in eight days. Within a few months, nearly all of the radioactive I-131 would have decayed away. Some radioactive materials have much longer half-lives.

Dr. Maurice Robkin, a member of the Technical Steering Panel, calculated the amount of iodine and xenon that could be released from dissolving one ton of green fuel. He estimated the release of I-131 at about 11,000 curies, 3,200 curies more than the government's estimate in 1949. He also estimated that 16,000 curies of xenon were released, some 4,000 curies less than what was estimated by the government ( )ntists in 1949.

Green Run A Small Percentage of Total Releases

From December 1944 through 1948, about 440,000 curies of I-131 were released from Hanford. In 1949 about 13,000 curies were released, including the Green Run. In 1950, 2,140 curies were released. In 1951, filter equipment failed and releases totalled about 18,700 curies. The Green Run release contributed about 2.3 percent of the total I-131 released from 1944 through 1951.

Since 1952, with filters in place, the amounts released got smaller and smaller. By the 1970s, less than one curie of I-131 was released annually.

The TSP announced off-site preliminary radiation dose estimates in July 1990. Some doses are high enough to suggest that there may have been health effects caused by the radioactive releases. Radiation doses from the Green Run will be included in future calculations, as will doses from all radionuclides released from Hanford.

A series of TSP Fact Sheets explain the Hanford Environmental Dose Reconstruction Project and the dose reconstruction tasks and progress. For mor information about the Project, TSP meetings, or to get public information materials, write or call:

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Estimates of the annual releases of I-131 from 1944 through 1972 were made by J.D. Anderson and reported in ARH-3026. A declassified description of the Green Run (with certain deletions) is given in the report HW-17381 DEL. Both documents are available in the Richland, Washington document reading room in the Federal Building, 825 Jadwin Avenue.

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