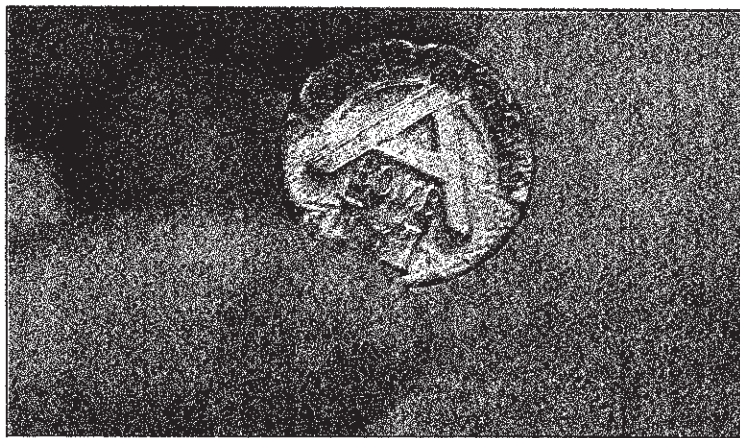


ST. LOUIS POST-DISPATCH

SPECIAL REPORT

Legacy Of The Bomb



Larry Williams/Post-Dispatch
A commemorative lapel pin given by the old U.S. War Department to Mallinckrodt Chemical Works employees who worked on the atomic bomb.

St. Louis Nuclear Waste



Larry Williams/Post-Dispatch

The Berkeley ballfields in North County lie barren. They were closed last summer because of radioactive contamination.

St. Louis's legacy of radioactive waste is a problem that defies any easy solution.

The waste is in buildings and behind fences posted with yellow and purple caution signs. It is in unmarked ditches and fields and beneath plastic tarpaulins.

In total, there are more than 2.3 million cubic yards of contaminated material in St. Louis, north St. Louis County, Jefferson County and, possibly, nearby Illinois.

St. Louis inherited the waste from the nation's race to produce the atomic bomb in World War II and from the subsequent push to make more nuclear weapons during the Cold War.

Most scientists say this low-level waste is hazardous to human health, at least to some degree. Almost all say it should be cleaned up.

The price tag for that exceeds \$700 million.

A seven-part series, which ran in the St. Louis Post-Dispatch Feb. 12-19, tells:

- How Mallinckrodt Chemical Works purified uranium for the atomic bomb.
 - How little was known about the risks of radiation.
 - How nuclear waste was dumped and spread in North County.
 - How the uranium processing plant near Weldon Spring became the area's most contaminated site.
 - How citizens of St. Charles County waged war to win federal cleanup efforts there.
 - How the government lost track of four sites where nuclear matter was processed or stored.
- The stories also discuss the ongoing health debate and, finally, the area's options for dealing with this "Legacy of the Bomb."



U.S. Department of Energy archives
Thousands of metal drums contaminated with uranium are piled on property north of Lambert Field in this photo from the 1950's.

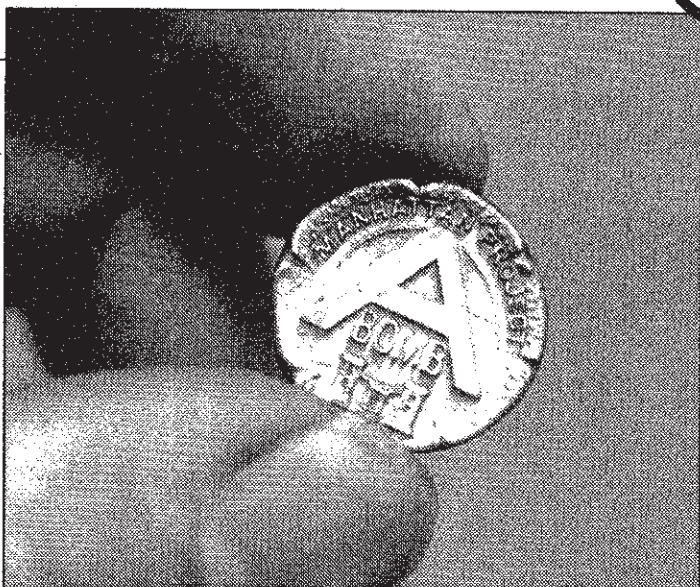
This series appeared in the St. Louis Post-Dispatch,
February 12 through February 19, 1989.



Part One

By finding a way to purify uranium needed for the atomic bomb, Mallinckrodt Chemical Works of St. Louis accomplished "a technological and industrial miracle" during World War II. Company officials and employees in this top-secret operation were "proud as sin" after they finally realized their role in the war effort. As they worked 14-hour days, seven days a week, they never dreamed that radioactive contamination might one day be a major problem here.

Page 3



Larry Williams/Post-Dispatch

After World War II, uranium workers at Mallinckrodt Chemical Works received this commemorative pin.

Part Two

Mallinckrodt was a leader in taking precautions against possible health risks from exposure to radiation. But despite some seminars and warnings to be careful, most early workers had no reason to feel much concern. After all, in those days, no one actually knew what the risks were.

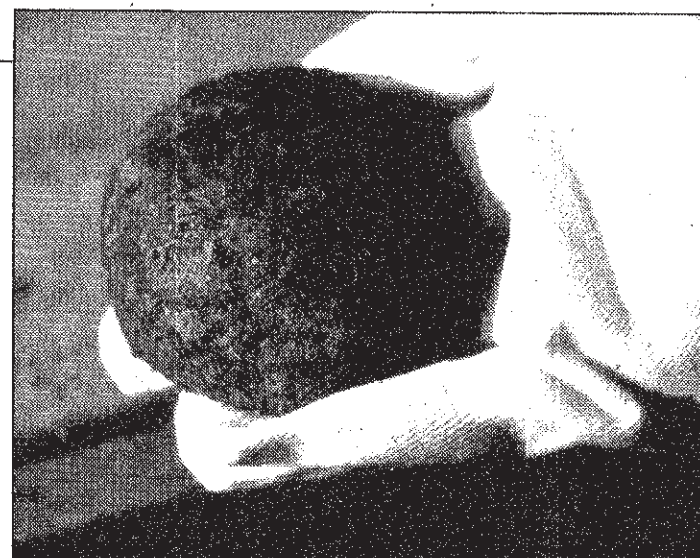
Page 5

Federal researchers now have found an elevated number of deaths from three kinds of cancer in a preliminary study of Mallinckrodt uranium workers. But much research of low-level radioactivity remains to be done.

Page 6

Federal tests show 15 buildings at the Mallinckrodt complex in North St. Louis still are contaminated.

Page 6



Larry Williams/Post-Dispatch

A paperweight of uranium metal found in the administrative offices at the abandoned Weldon Spring plant.

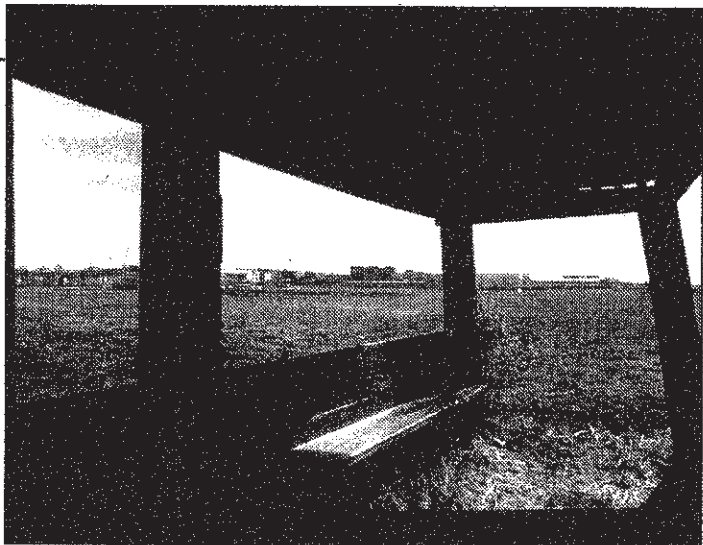
Part Three

After World War II ended in 1945, the government began disposing of radioactive waste that had piled up at the Mallinckrodt plant. Continuing their top secret operations, they transported the waste materials to a 21.7-acre landfill near Lambert Field. Eventually, the waste was spread to several other sites in North St. Louis County.

Page 7

Until 1978, few people in the St. Louis area knew about the radioactive waste here. Then, a chance meeting between a nuclear physicist from Cornell University and a nuclear-disarmament activist from St. Louis gave birth to the local protest movement against radioactive waste.

Page 8



Larry Williams/Post-Dispatch

A dugout at the Berkeley ball fields, which were closed last year because of radioactive contamination.

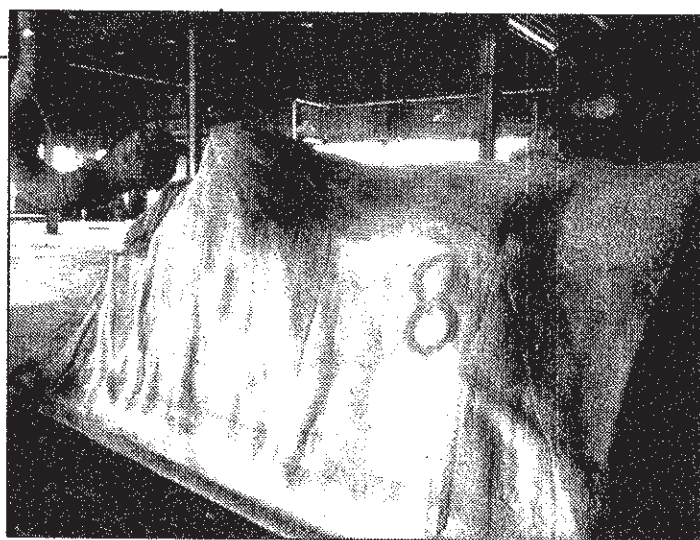
Part Four

In an effort to process more uranium during the Cold War, Mallinckrodt moved its nuclear operations into a spanking new government-owned plant near Weldon Spring. The Atomic Energy Commission proclaimed the \$57 million complex a showplace of technology. Workers called it "The clean one." But now, the abandoned plant is the single most contaminated part of the St. Louis area. The government has just begun a cleanup of the site. The estimated price tag: \$400 million.

Page 9

Charles Reed was one of several hundred men who worked on a previous attempt to clean up Weldon Spring, two decades ago. He says his exposure to contamination there ruined his health.

Page 9



Larry Williams/Post-Dispatch

Contaminated machinery at the abandoned Weldon Spring plant has been covered with plastic-like foam.

Part Five

Nobody gave the situation at Weldon Spring much thought until area residents read in the newspapers of July, 23, 1982, that waste from five states might be transported to the site, which is only half a mile from the local high school. Parents, fearing for the safety of their children immediately were up in arms. They blocked the five-state plan and successfully lobbied for a cleanup.

Page 11

Experts disagree on what what degree of exposure to radiation constitutes an "acceptable risk"; radiation levels at major sites in the St. Louis area far exceed federal cleanup guidelines.

Page 12



Larry Williams/Post-Dispatch

Mary Halliday of St. Charles County is a leader in the St. Charles County Citizens Against Hazardous Waste.

Part Six

The Post-Dispatch discovered four "forgotten sites" where radioactive material was once processed or stored in secrecy after World War II. The government had lost track of these places. There are dozens of such sites across the country.

Page 13

Hematite, in unincorporated rural Jefferson County, is home to the nation's oldest commercial uranium-fuel production plant. Radioactive waste is buried in 40 pits on the plant grounds.

Page 13



Larry Williams/Post-Dispatch

Cindy L. Fink preparing to feed material into a press that will produce uranium fuel pellets at a plant at Hematite.

Part Seven

Cleanup issues are at the forefront in the St. Louis area, 47 years after radioactive waste began building up here. Even if all the attendant political problems could be resolved, cleaning up everything could cost \$1 billion.

Page 15

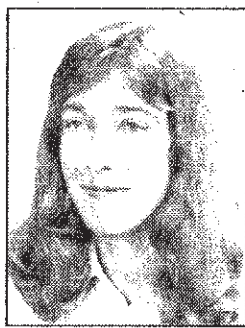
President George Bush on his way to a speech in the area, rides past a nuclear waste site and promises he will try to restore some federal money for the area's cleanup efforts.

Page 15



Larry Williams/Post-Dispatch

This sign warns that the Berkeley ball fields are closed.



Bower



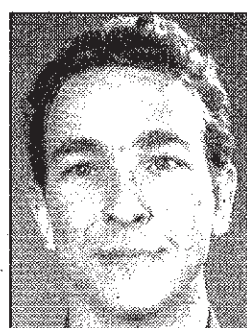
Rose



Tighe



Williams



Borgman

How This Series Was Done

Unlocking the secrets behind radioactive waste in St. Louis took months of effort by three Post-Dispatch reporters. Starting in 1987, Carolyn Bower, Louis J. Rose and Theresa Tighe acquired and pored over thousands of government documents dating from 1942 to the present.

They interviewed more than 200 people — including former uranium workers, corporate executives, government officials, scientists, technical experts, environmental activists and persons who live near contaminated areas.

What came out of their investigation was a graphic picture of how waste was generated, how it was spread haphazardly throughout the area, the difficulty in cleaning it up and the lingering confusion over how hazardous it really is.

Bower, 35, worked for the Louisville Courier-Journal and the Gastonia (N.C.) Gazette before joining the Post-Dispatch in February 1984. She was chief of the St. Charles Bureau when she began work on this series. She now covers police in St. Louis County and two neighboring counties. She is a graduate of Smith College.

Rose, 57, an investigative reporter, joined the Post-Dispatch in 1964. He has covered state and local governments, focusing on corruption, conflicts of interest and

misuse of public funds. Previously, he worked at the Providence Journal-Bulletin, the Terre Haute Star and the Turlock (Calif.) Daily Journal. He is a graduate of Bates College and has a master's degree in journalism from Northwestern University.

Tighe, 40, has worked for the Post-Dispatch since 1981. While assigned to the newspaper's bureau in St. Charles County, she became interested in radioactive contamination at the former uranium processing plant near Weldon Spring. She has written extensively on the subject. She is a graduate of the University of Missouri School of Journalism.

Others involved in the project were:

— Gerry Everding, a free-lance journalist, who has a special interest in investigating nuclear waste.

— Larry Williams, staff photographer, who shot the modern-day pictures for the series and was a consultant on the historical photos.

— Tom Borgman, graphics editor, who was responsible for graphics and layout design.

— Edward H. Kohn, assistant city editor for projects, who provided technical assistance.

The series was edited and supervised by Richard K. Weil Jr., assistant managing editor for special projects.

SUNDAY, FEBRUARY 12, 1989

LEGACY OF THE BOMB



ST. LOUIS' NUCLEAR WASTE

A Miracle With A Price

Atomic waste is one legacy of a St. Louis firm's patriotic work

By Carolyn Bower,
Louis J. Rose
and Theresa Tighe
Of the Post-Dispatch Staff
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FIRST OF A SERIES

THE Atomic Age in St. Louis began on April 17, 1942, over lunch at the Noonday Club, 319 North Fourth Street.

Chemical manufacturer Edward J. Mallinckrodt Jr. had his usual — a bowl of cold cereal. His companion, Arthur Holly Compton, the renowned physicist, did most of the eating — and the talking.

Compton was well aware of the topics of the day. Adolf Hitler's Germany was battering the Allies in Europe; Japan was on the verge of driving U.S. forces from the Philippines.

But Compton and other scientists involved in a top-secret project at the University of Chicago were distressed about something else.

They had received intelligence reports that German scientists were ahead of them — perhaps two years ahead — in developing the "ultimate weapon."

So Compton had come here on behalf of the federal government to ask his old friend to try what three other companies had deemed too dangerous. He wanted Mallinckrodt to purify uranium in large amounts for an atomic bomb. If Mallinckrodt could succeed, the United States could win the race for the bomb and win World War II.

On a handshake, Mallinckrodt began work that afternoon.

Within three months, Mallinckrodt Chemical Works was producing a ton of pure uranium daily.

It was, Compton said later, "a technological and industrial miracle."

But the miracle had its price.

As Mallinckrodt employees helped win the war, and as they proudly continued their work through the Cold War, piles of government-owned radioactive waste grew and were dispersed around the St. Louis area.

Today, more than 2.3 million cubic yards of contaminated material remain scattered across the area — in St. Louis, north St. Louis County and St. Charles County. If brought together, it would more than fill Busch Stadium.

The U.S. Department of Energy has put a \$700 million price tag on cleaning up the major portion of the waste.

That estimate does not include the cleanup of other waste in the area, including some in Jefferson County and possibly some in nearby Illinois.

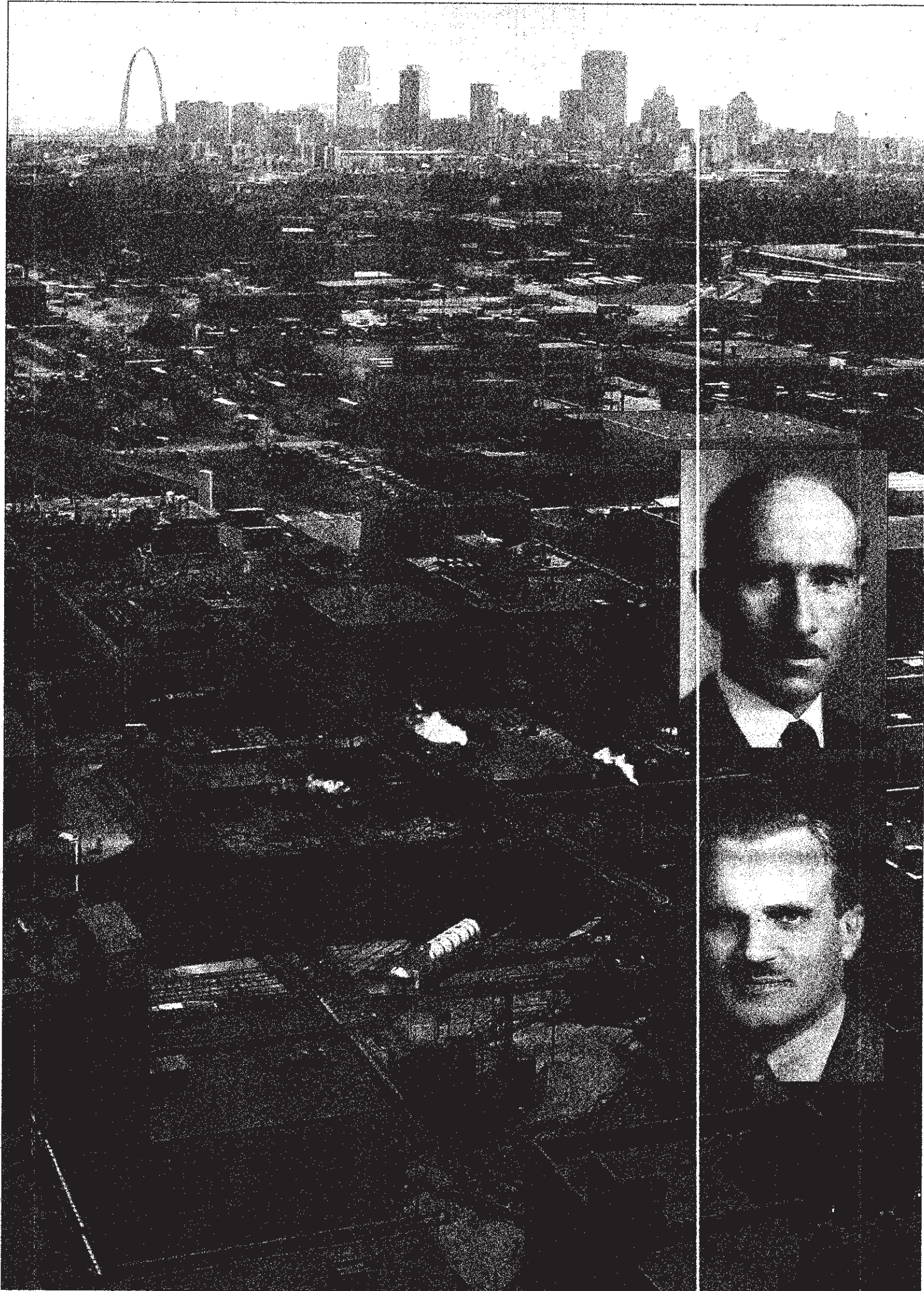
Most scientists and other experts think this low-level waste is hazardous to human health at least to some degree. Some say it poses a significant risk; others say the risk is minuscule.

Nonetheless, almost all experts say the waste should be cleaned up. For one thing, it will remain contaminated for billions of years.

If left spread out over the area, waste easily can be lost or forgotten. This already has happened with surprising frequency in just 47 years since the waste was first generated.

To understand the problem of radioactive waste here and to evaluate the options that lie ahead, it is necessary to understand what happened between 1942 and the present.

In 1942, scientists at the University of Chicago needed about 40 tons of uranium for the experiment that would prove self-sustaining nuclear reactions



Larry Williams/Post-Dispatch

possible.

No more than half a cup of uranium pure enough to sustain fission existed in the country. It had been purified in ether, a volatile chemical, in a laboratory.

The need now to produce it tons at a time was what caused Compton — a former professor at Washington University here and later its chancellor — to turn to Mallinckrodt for help.

It was a smart choice. Mallinckrodt's father and uncles had started their chemical business in 1867 on the family's potato farm between North Broadway and the Mississippi River.

By 1942, all traces of Mallinckrodt's rural beginning were gone. The company had an international reputation for the purity of its chemicals. One of its specialties was producing ether for anesthesia.

After the April 17 luncheon, Edward Mallinckrodt and his team did not even bother with blueprints. Engineers and chemists sketched their ideas on scraps of paper, or chalked them on a wall or the floor.

In a day or two, carpenters and pipefitters began turning the ideas into equipment.

They needed stainless-steel kettles and they needed motors — items unavailable during the war years. Mallinckrodt had one of his plants in New Jersey dismantle a production line and ship the equipment to St. Louis.

"People worked morning, noon and night," said Harold E. Thayer,



Mallinckrodt's Harold E. Thayer: "We were proud as all sin."

who was in charge of acquiring supplies for the project. He later became president and board chairman of Mallinckrodt.

"They worked in alleyways and corners of laboratories" trying to find ways to process the uranium safely, he said.

Mallinckrodt chemists and engineers knew they could purify uranium without an explosion if cooling took place quickly. They would mix one part of a hot liquid form of uranium with two to three

times as much cold ether.

The liquid uranyl nitrate entered the mixture at 176 degrees Fahrenheit; the ether was chilled to 32 degrees Fahrenheit. Ether boils at 95 degrees.

Mixing the ether and the uranyl nitrate was like dropping water (in this case, the ether) into a hot skillet (the uranyl nitrate). The ether would bubble up; if the pressure became too great, there would be an explosion.

Mallinckrodt workers tested

Uranium for the first atomic bomb was purified in the pink buildings with the red roofs at left center, at what was then the Mallinckrodt Chemical Works in north St. Louis. The work was carried out under the direction of company president Edward J. Mallinckrodt Jr. (top inset) after physicist Arthur Holly Compton (lower inset) asked the company in 1942 to take it on. The roofs' color is unrelated to the uranium processing.

their theory in a small experiment in an alleyway rather than in a building. Just in case.

When there was no explosion, workers installed a 300-gallon mixing tank and seven smaller tanks in Building 52. The small tanks were used for storing water, which was pumped into the large tank to wash the mixture and remove impurities.

The men who operated the contraption called it "Snow White and the Seven Dwarfs."

Refrigeration did not exist at the plant in 1942. So the ice man delivered huge blocks of ice that sat outside the building melting into cold water, which was circulated around the tanks to keep them cool. Leo Burkhart, one of the first

men in the uranium division at Mallinckrodt, says one of his most important duties was to make sure there was always enough ice.

It was also one of the hardest. Burkhart stood 5 feet 7 and weighed 118 pounds. The ice blocks frequently weighed 80 pounds or more.

As he worked in the August heat, Burkhart knew that at any moment the highly volatile ether could explode. The week before, someone on the night shift goofed and all the windows had blown out of an adjacent building.

Otherwise, Burkhart was unaware of any health hazards connected with the job.

Mallinckrodt purified all the uranium used in the experiment on Dec. 2, 1942, that proved the atomic bomb possible. On that day in a squash court under Stagg Field at the University of Chicago, Enrico Fermi triggered the first self-sustaining nuclear reaction.

Operating in secret, the government built three cities — Oak Ridge, Tenn., Hanford, Wash., and Los Alamos, N.M. — in less than two years.

In St. Louis at Washington University, physicists would use the cyclotron to produce some of the world's first plutonium, used as a trigger for atomic bombs.

Great jumps in knowledge and technology — leaps that normally would have required years of study and testing — occurred daily throughout the country during the Manhattan Project.

For many at Mallinckrodt, the toughest job was keeping everything about their work a secret. FBI checks prompted neighbors to speculate about the workers' character.

Burkhart remembers how FBI agents had quizzed his neighbors on Angelica Street. They asked about his character. Did he gamble? Chase girls? Drink heavily? Was he rowdy? Did they ever hear him talk about his work?

The questions seemed ludicrous. After all, Burkhart, 24, was married and had a small child. He had been working 14 hours a day, seven days a week.

Whenever he asked his supervisor what was going on, the supervisor would put his finger to his lips and say, "Shhh."

Burkhart had heard the material he was dealing with was radioactive, but the word had little meaning. One of his co-workers speculated that if it was radioactive it must be for radios.

Richard F. Schroeder, another uranium worker, recalls that FBI agents approached him in a bowling alley.

When the agents identified themselves, Schroeder said he immediately stammered: "What did I do?"

Nothing, the FBI men assured him. They merely wanted him to keep his eyes and ears open and give them a call if he saw or heard anything suspicious.

When Mallinckrodt began purifying uranium, most workers called it by name — although only a handful could guess how it would be used.

Executives dubbed the project Uranium Oxide S.L. 42-17. They chose the name deliberately to imply that the uranium compound was merely another Mallinckrodt chemical.

But that wasn't secret enough for military police.

Said Thayer, the former Mallinckrodt board chairman: "We got told in words of one syllable that it was a secret. We were not to say 'uranium.'"

One worker managed to miss the company lectures on that subject, and while in a nearby saloon, he mentioned that he was working on uranium at the plant.

"Five hours later, they (the FBI) were all over the bar," Thayer said. "They found him in a day. And they made damn sure he didn't talk about it again."

The incident impressed

See WASTE, Page 4

INSIDE

'Nutcracker' Crush? Ballet companies gear up for a clash of the dance classics come Christmas 3

Gregory Hines: He's acquitted himself well as an actor in both comedy and drama, but dance always comes first 3

Building Pride: Architect Eugene J. Mackey forward to showing off his city to fellow architects from all over the country ... 4

LEGACY OF THE BOMB

ST. LOUIS' NUCLEAR WASTE

Waste

From page three

everyone. The material they were processing changed overnight from uranium to Tube Alloy — after movie star Myrna Loy, some employees say.

Code names such as Biscuit, Juice, Oats, Cocoa and Vitamin were slapped on all the steps of the process. Correspondence about the project read like a breakfast menu.

Today, former uranium workers say that being kept in the dark didn't bother them. The work was exciting. They trusted their company, and they knew they were working for their country.

The workers had a lot in common. They were making good money. Mallinckrodt paid 75 cents an hour at a time when 65 cents to 70 cents was the norm. They became a family.

After work, they met for bowling and formed softball teams. They took their wives and girlfriends dancing. They went with their families on picnics.

They were young and their health was the last thing on their minds. They had no idea that — decades later — their lives and their work would become the subject of national and international health studies.

The employees always sensed the work was important. They learned just how important on Aug. 7, 1945, the day after the bombing of Hiroshima.

Newspaper and radio accounts of the bombing brought two new words — atomic and radiation — to most Americans. The words would be forever linked to death and destruction.

In 1945, the atomic bomb meant victory and an end to the war. Some military strategists estimated that an invasion of Japan would have cost a quarter-million American lives or more.

The workers were elated. Like most Americans, they had brothers and friends in the Pacific ready to storm Japanese-held beaches.

Mallinckrodt employees, such as Larry Faulkner, also knew they had done their part to win the war.

"I felt like I was doing something," Faulkner said. "My brother was taken prisoner in Germany. Two of my brothers and my nephew were decorated. My son served in Vietnam. All I can say is, 'I worked for Mallinckrodt.'"

Faulkner, who had asthma, was unable to qualify for military service. Other early uranium workers, who were either 4-F or who received deferments because of their work, voiced similar sentiments.

After the bombing, the uranium workers were given a day off — for some, only the second or third day off in as many years. Secretary of War Henry Stimson sent each worker a certificate and a silver medal the size of a nickel and bearing an "A" for atom.

The certificate was "in appreciation of effective service." It said the workers "had participated in work essential to the production of the atomic bomb."

Mallinckrodt executives put a bronze plaque alongside the entrance to Building 51, part of the first plant. It said: "In this building was refined all the uranium used in the world's first self-sustaining nuclear reaction December 2, 1942."

Mallinckrodt Chemical Works would go on for the next two decades to discover and refine ways to produce materials for the Atomic Age. The company would process thorium and mechanize processes for purifying uranium salt and metal.

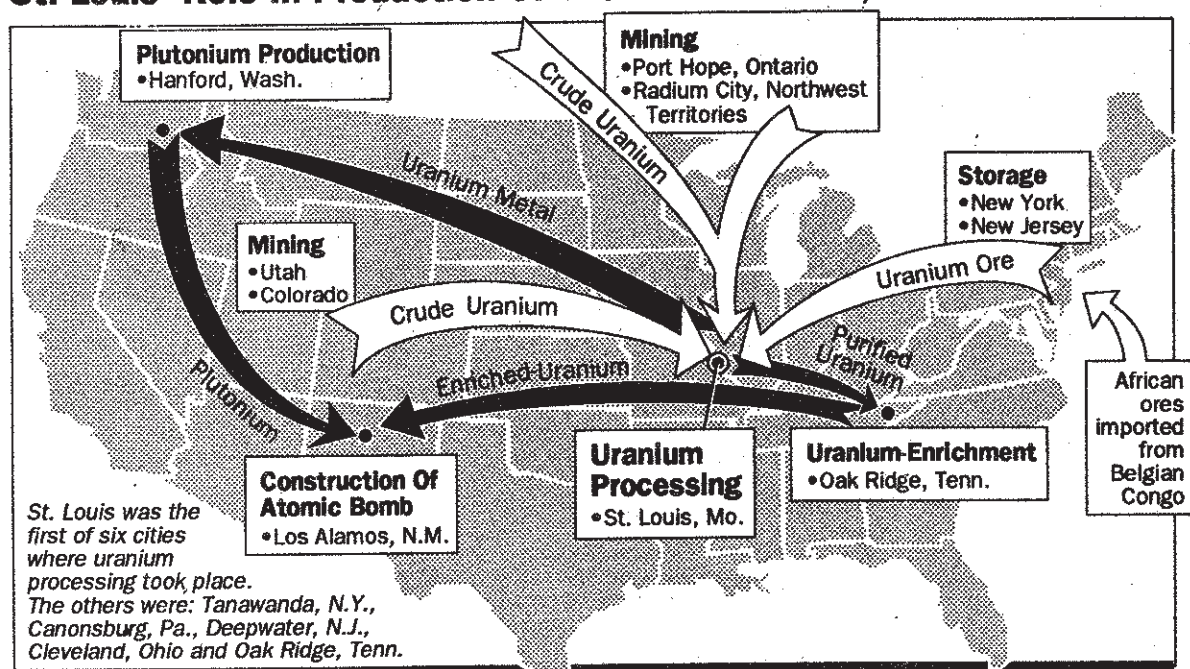
With the old Atomic Energy Commission, Mallinckrodt began the first industrial hygiene and safety program in the uranium-processing industry.

The uranium division workforce grew from 24 in 1942 to 1,050 in the early 1960s, when Mallinckrodt's uranium processing at a plant at Weldon Spring was at its peak. About 3,000 area residents worked in Mallinckrodt's nuclear operations over the years.

Propelled first by World War II and then by the Cold War, speed and inventiveness would be the earmarks of all operations.

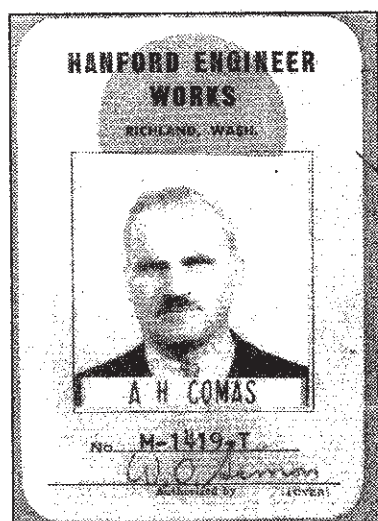
"It's almost impossible to believe now," Thayer said of his company's early accomplishments.

St. Louis' Role In Production Of The Atomic Bomb, 1942-45



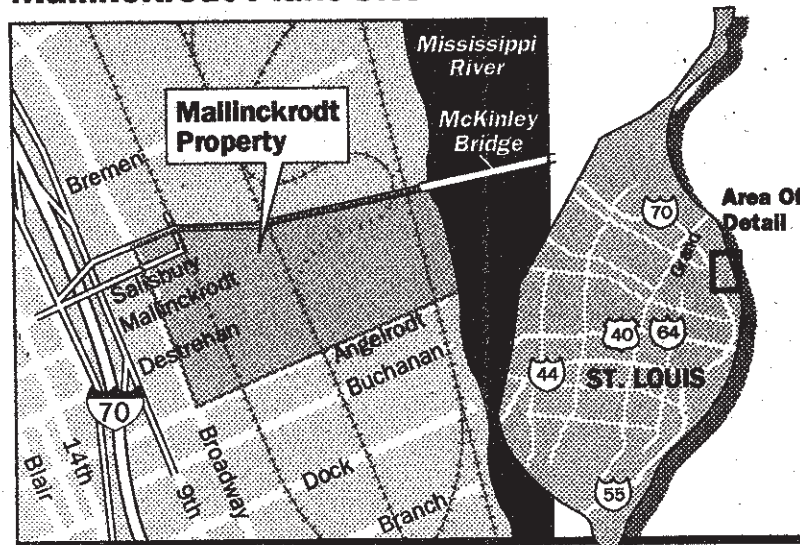
Source: Department of Energy

Tom Borgman/Post-Dispatch



Arthur Holly Compton's 1944 identification badge, bearing the alias of A.H. Comas.

Mallinckrodt Plant Site



Some property within shaded area owned by other firms.

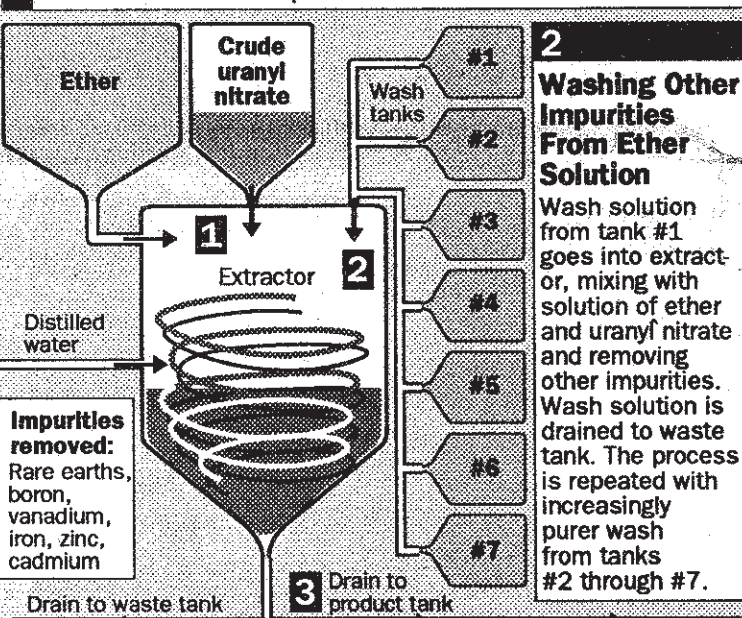
Post-Dispatch Map

Process Used In 1942 To Purify Uranium

Simplified diagram

1 Extracting Uranium Into Ether

Ether at 32°F is put into extractor. A crude yellow-crystal form of uranium (uranyl nitrate) is heated into liquid form and added at the 176°F. Heat exchangers with ice water are used to keep the mixture cool. In the mixing process, the uranyl nitrate is extracted into ether. Most impurities are drained to the waste tank.



3 Extracting Pure Uranyl Nitrate Into Water
Distilled water is mixed with the solution of ether and uranyl nitrate. Because there no longer are impurities, the uranyl nitrate is extracted from ether into the water. The solution of water and uranyl nitrate goes into the product tank to await further processing. Most of the ether stays in the extractor.

Source: Former Mallinckrodt employees

Tom Borgman/Post-Dispatch

Some Definitions Of Atomic Terms

HERE ARE definitions of some terms in the story about the start of the Atomic Age in St. Louis:

Fission: Bombarding or splitting the nucleus of an atom to release a large amount of energy and heat: the principle of the atomic bomb.

Plutonium: An element produced by irradiating uranium. It is used in nuclear weapons and as a reactor fuel. It is one of the most toxic and carcinogenic substances known.

Radioactivity: A process in which some atoms become stable by expelling particles or bursts of energy. The particles are invisible, odorless, tasteless and soundless but can cause sickness and cancer.

Thorium: A radioactive element used in making gas mantles and electronic equipment and as a fuel source for nuclear reactors. During and after World War II, Mallinckrodt processed thorium for potential use in nuclear weapons.

Uranium: A radioactive element that occurs in nature. Uranium products are used in nuclear weapons and as fuel for nuclear reactors. Uranium-235, one of several main isotopes of uranium, is a highly fissionable material.

Uranyl nitrate: Toxic, explosive, unstable yellow crystals containing uranium. Early uranium workers heated it to make it liquid during the purification process.

A seven-part Post-Dispatch series

Sunday: Mallinckrodt purifies uranium to help win World War II.

Monday: Uranium workers brush aside early health warnings. Years later, health studies look at cancer rates among employees.

Tuesday: Unknown to area residents, radioactive waste is dumped in North County.

Wednesday: How the Weldon Spring plant became the area's most contaminated site.

Thursday: St. Charles County residents wage war against federal officials.

Friday: Four "forgotten sites." Waste is buried in 40 pits at Hematite in Jefferson County.

Sunday: Options for cleaning up radioactive waste in the St. Louis area.

"It all started at a lunch. There was no contract. There was nothing but a conversation between a leading scientist and Mr. Mallinckrodt. . . ."

"You must understand that even though all this work was going on, no one really knew if it would work."

But it *did* work, and Thayer and others say they can never forget their role in helping unlock the power of the atom for the United States.

As Thayer put it, "We were proud as all sin."

Gerry Everding, a Post-Dispatch special correspondent, contributed to this story.

EVERYDAY

SECTION D

MONDAY, FEBRUARY 13, 1989

LEGACY OF THE BOMB



ST. LOUIS' NUCLEAR WASTE

Some Feared For Health Of Ore Handlers

But most workers were untroubled; no one knew what the risks might be

By Carolyn Bower,
Louis J. Rose
and Theresa Tighe
Of the Post-Dispatch Staff

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SECOND OF A SERIES

URANIUM-PROCESSING workers on the night shift filed into the lunchroom at the Mallinckrodt Chemical Works in north St. Louis for one of Mont Mason's lectures on the safe handling of nuclear materials.

Mason, just two years out of the Marine Corps, sized up his audience. Most were in their 20s, and they were cutting up and cracking jokes like bad schoolboys.

The year was 1947. Mallinckrodt had just hired Mason to find ways to protect its employees from radiation and hazardous chemicals.

Some of the men in the room had been handling uranium since 1942, when Mallinckrodt began processing the ore for the Manhattan Project, the program that resulted in the United States' first atomic bomb. They had been told what they were doing only after the bombing of Hiroshima on Aug. 6, 1945.

Mason spent much of his time trying to convince the men that materials they had been handling could be a problem.

On this night, few of the workers seemed concerned about Mason's safety lecture. A couple of them even dozed off.

Years later, one explained: "We were young, just back from the war, and Mason and these guys were talking about protons and neutrons."

"A lot of us didn't understand what they were talking about. Half of the men slept through the lectures. They tried to tell them, but you know how people are. Some of them won't listen."

Some of the foremen told the men the work might make them sterile, but most workers laughed at that suggestion.

Earl Keppel, 64, the father of seven, would later joke that he thanked God that he was sterile. "No telling how many kids I'd have if I wasn't," he said.

Mason caught some men's attention in 1947 by telling them the truth. He said that although scientists did not think radiation would be a problem, no one knew for sure what the radiation they were being exposed to would do to their health.

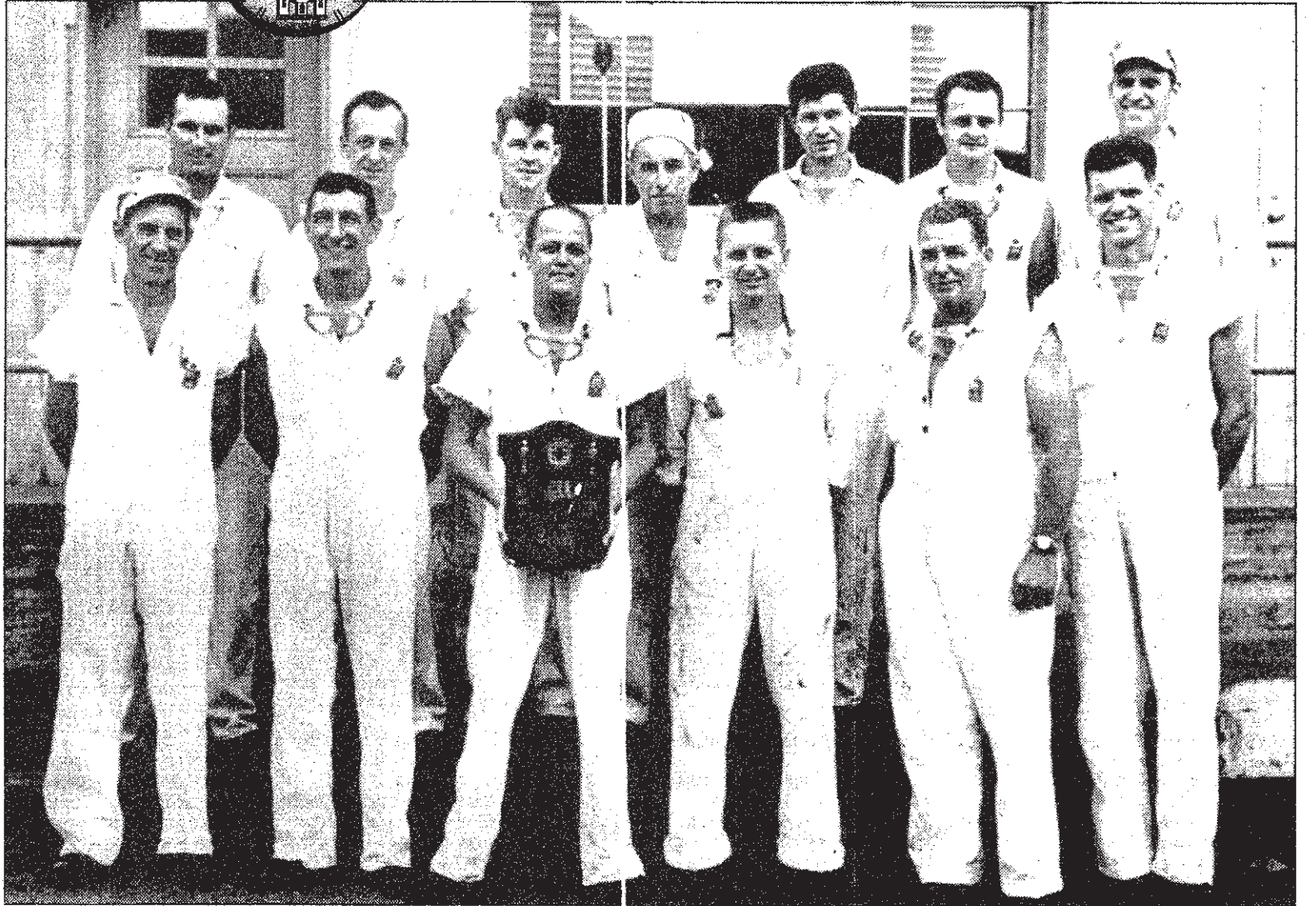
In the 26 years Mason worked for Mallinckrodt, he earned the reputation as a straight shooter. He never stopped trying to find out whether radiation had harmed the workers.

Until his death on Aug. 16, 1988, Mason pleaded with government officials for studies of the workers' health. It infuriated him that the government had never completed definitive studies of the effects on humans of the levels of radiation allowed in the nuclear industry.

In interviews during the year before his death, Mason contended that such studies would lay to rest the fears of some Mallinckrodt workers and help to quell

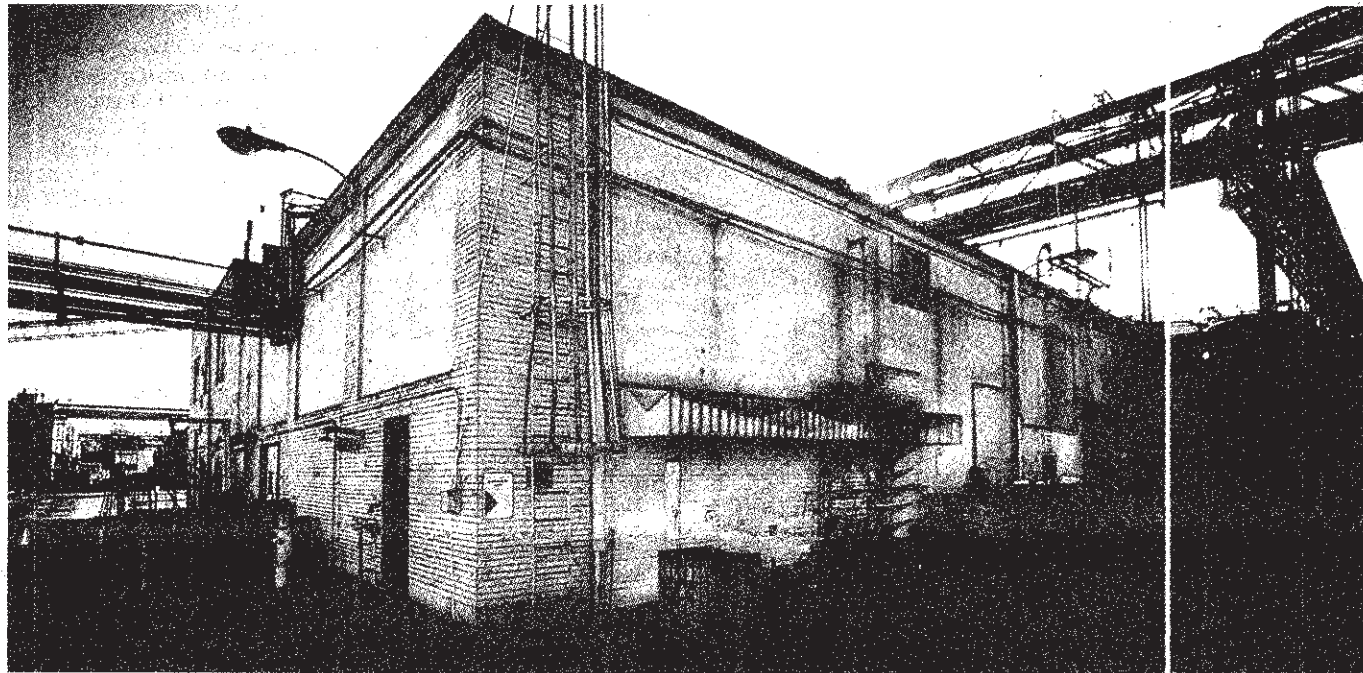


Mont Mason taught safety.



Charles Grauer

Workers on one of three shifts at Mallinckrodt's uranium division gathering for a safety awards ceremony in the mid-1950s.



Part of the Mallinckrodt complex in north St. Louis where uranium was purified for the nation's first atomic bomb.

opposition to nuclear power. Others remain convinced that reliable research would prove that the health of early workers was jeopardized and that current exposure limits are too lenient.

In 1947, the workers pushed to the back of their minds any fears they may have had. The chemical company raced to meet the government's ever-growing demand for purified uranium for nuclear weapons.

In addition to processing uranium, the company experimented with thorium.

"It was a very exciting time," Mason said. "We were literally setting a (health) criteria for uranium plants of that generation. We were starting from scratch. I had to build my own instruments to measure the radiation."

From the beginning of the nuclear work in 1942, Edward J. Mallinckrodt Jr., president of the family-owned chemical company, insisted that employees wear respirators and go to Barnes Hospital for tests. Most other nuclear plants didn't take such precautions until four years later.

In 1945, Mallinckrodt employees began wearing badges to measure radiation.

Despite the company's efforts, early workers were exposed on a daily basis to levels of uranium dust that were more than 200 times the current allowable limits.

From 1942 to 1949, most uranium processing work was done manually, and there were no limits on radiation exposure for workers.

Workers remember hand-scooping powdery uranium ore, sprinkling uranium oxide into trays, milling cakes of uranium tetrafluoride into green salt and picking beads of uranium out of waste.

In 1950, after working with the government to establish exposure limits, Mallinckrodt officials transferred 36 workers with the highest cumulative exposures out of the uranium division.

The workers were told the doses they received were not a cause for alarm, but were high enough to make it unwise for them to continue working with radioactive material.

One of the workers transferred was Arthur Tunncliff, now 72.

Tunncliff worked in Plant 4, a building on

See WORKERS, Page 6

Cancer Deaths Seem Higher For Workers; New Study Is Awaited

By Carolyn Bower,
Louis J. Rose
and Theresa Tighe
Of the Post-Dispatch Staff

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FEDERAL researchers found an elevated number of deaths from three kinds of cancer in a preliminary study of 2,731 workers who processed uranium at Mallinckrodt Chemical Works in the St. Louis area from 1942 to 1966.

The study shows that, through June 1976, seven workers died of cancer of the esophagus — more than three times the 2.1 deaths expected for the number surveyed.

Researchers also found 24 percent more deaths from leukemia than normally would be expected.

Researchers also discovered an elevated mortality rate from cancer of the pancreas among workers who had received the highest doses of radiation. The study was financed by the U.S. Department of Energy.

Most Mallinckrodt workers and state health officials were unaware of the study, published in a Swedish medical journal in 1981.

The Mallinckrodt workers processed uranium and thorium for the federal government at the company's plant in north St. Louis and at a federally owned plant near Weldon Spring in St. Charles County.

The authors of the study caution against leaping to the conclusion that the men's work jeopardized their health.

They say the study did not prove that radiation caused the cancers, adding that the elevations in the death rates were small enough to be explained by chance.

Shirley Fry, who is in charge of the research being done by Oak Ridge (Tenn.) Associated Universities, said a more complete study of the Mallinckrodt workers would be ready for publication by the middle of 1990.

She said it would include data on worker deaths through 1983. The preliminary study included worker deaths only through June 1976.

The Mallinckrodt study is part of an investigation of the health of about 280,000 current and former nuclear

See STUDY, Page 6

LEGACY OF THE BOMB



ST. LOUIS' NUCLEAR WASTE

Workers

From page five

Broadway between Destrehan and Angelrod streets. Workers dubbed it "The Dirty One."

The plant was closed in 1948 because the dust in the building could not be reduced to the levels safety officers considered acceptable.

Conditions were cramped in the two-story brick building, and the temperature in the furnace room reached 145 degrees in the summer. The workers say a film of dust covered everything. Sometimes, the dust even crept into the lunchroom and the showers.

On the plant's second floor, Tunncliff and others fired uranium oxide into metal. They mixed uranium tetrafluoride, a shiny shamrock-green salt, with magnesium and packed the mixture in a metal cylinder they called a bomb.

They would put the bombs in a furnace and heat the oven to 2,560 degrees. The mixture would explode in the tube, creating the uranium metal.

Then, former workers say, the fun would begin.

"Once, twice, maybe three times a shift, sparks, fire, hot uranium metal shot through the room," Tunncliff recalled. "We'd all dive for cover."

The hot metal escaped the container because the men hadn't yet learned to pack the mixture tight enough or to bolt the covers on securely enough, he said.

Tunncliff became animated telling stories of his youth during an interview last year at his home in south St. Louis. But the tales disturbed Anna, his wife of 47 years.

"It's a good thing I didn't know what you were doing," she said.

Anna Tunncliff has worried for years about the effects of her



Larry Williams/Post-Dispatch

husband's work on her family's health.

"I had eight miscarriages when we were young," said Anna Tunncliff, who also had two healthy babies. "I always thought it might have something to do with the radiation."

And Arthur Tunncliff, who doesn't like to dwell on such things, said: "Whenever a health problem comes up, I sort of wonder if my work could be the cause."

□

Tunncliff says that at the time he was transferred out of the uranium division, health considerations were not paramount in his mind. His biggest concern was whether he would make as much money in another division.

Uranium workers regularly put in 14-hour days and seven-day weeks to meet the ever-increasing government demands for uranium products.

To meet that demand and to handle pitchblende — the hottest



ABOVE: The wedding picture of Anna and Arthur Tunncliff. LEFT: The Tunncliffs today. "It's a good thing I didn't know what you were doing," Anna says of her husband's work.

ore ever to be processed in the United States — Mallinckrodt built Plant 6 in 1946.

Thick brick walls shielded workers from the ore, which averaged 25 percent uranium; some was as high as 70 percent uranium. Most uranium ore contains .3 percent uranium.

The soot-black, claylike ore, originally from the Belgian Congo, came to Mallinckrodt by rail in old cattle cars and was sent with such haste that the first shipments smelled like manure.

Workers who handled pitchblende were required to shower before lunch, before going home and any time they got dusty.

From 1942, men who worked with nuclear material had been issued a full set of clothing down to their undershorts.

Federal reports show that over the years the Atomic Energy Commission spent about \$300,000 for dust control and other safety measures in the Mallinckrodt

complex in north St. Louis.

By 1956, to meet production quotas, all of Mallinckrodt's plants were producing more than three times their designed capacity. By 1957, it was clearly impossible to increase production without losing control over health risks.

To solve the problem, the Atomic Energy Commission in 1957 opened a new factory — operated by Mallinckrodt — at Weldon Spring, in St. Charles County.

The plant also ran at three times capacity for most of the years before it closed in 1966.

□

Former uranium-division workers still say with pride that they never missed a production quota. They note that they always provided their government with the uranium it needed for nuclear weapons and nuclear power.

Most also believe their company did its best to protect them. "To me, it was like getting on a plane," said Carl Feisel, one of the workers. "I feel the pilot is not going to kill himself, he is on that plane, too."

Feisel began working at Mallinckrodt when he was 16, and he spent 48 years in its employ. He rose from an errand boy to a production foreman. Old Germans, as he calls them, showed him how to handle chemicals without injuring himself. He taught younger men to work safely with acids that could burn through their fingers.

Feisel, 72, who lives in north St. Louis County, does not think working with radiation posed an inordinate risk to his health.

Some other workers and their families are not so confident.

A few years ago on a slow night at the plant, a group of former uranium division employees began talking about colleagues who had died young — under 50.

In a few hours, the group had compiled a list of 40 names. More than half of the deaths, according to the group, were believed to involve leukemia or lung cancer — two

cancers associated with radiation.

Dick Schroeder, 63, a resident of North County, voices the feelings of many former uranium-division workers.

"I don't regret the work," Schroeder said.

"They didn't know anything and they still don't have the true answers. I try not to worry. I just hope I wake up each day and can play golf. What's done is done. But I pray a lot."

Gerry Everding, a Post-Dispatch special correspondent, contributed to this story.

TUESDAY: Trucking the waste to North County.

Definitions Of Terms

HERE are definitions of some terms in the story about how some Mallinckrodt workers brushed aside health warnings:

Uranium: A radioactive element whose products are used in nuclear weapons and as fuel for nuclear reactors. Uranium-235, one of several uranium isotopes, is a highly fissionable material.

Uranium oxide: Highly toxic, radioactive crystals formed in uranium processing. They may be black or red to yellow. Uranium dioxides are used to pack nuclear fuel rods. Uranium trioxides are used in uranium refining and for ceramics and pigments.

Uranium tetrafluoride: Toxic, radioactive, corrosive green crystals used in the manufacture of uranium metal. Also known as green salt.

Thorium: A radioactive element used in making gas mantles, electronic equipment and as a fuel source for nuclear reactors. During and after World War II, Mallinckrodt processed thorium for potential use in nuclear weapons.

15 Buildings Show Traces Of Radiation

By Carolyn Bower, Louis J. Rose and Theresa Tighe
Of the Post-Dispatch Staff
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DESPITE major cleanups in the past, traces of radioactive contamination have been found in or under parts of 15 buildings at the Mallinckrodt Inc. complex in north St. Louis, federal officials say.

The contamination connected with seven of the buildings may date to the Manhattan Project during World War II, when Mallinckrodt helped the United States develop the atomic bomb.

From 1942 to 1958, the company purified uranium and thorium at its St. Louis plant for nuclear weapons under contracts with the federal government.

Andrew Avel of the U.S. Department of Energy said radiological tests showed some readings in excess of federal guidelines in, around or under parts of the 15 buildings. Avel oversees federal plans for an eventual cleanup of the complex.

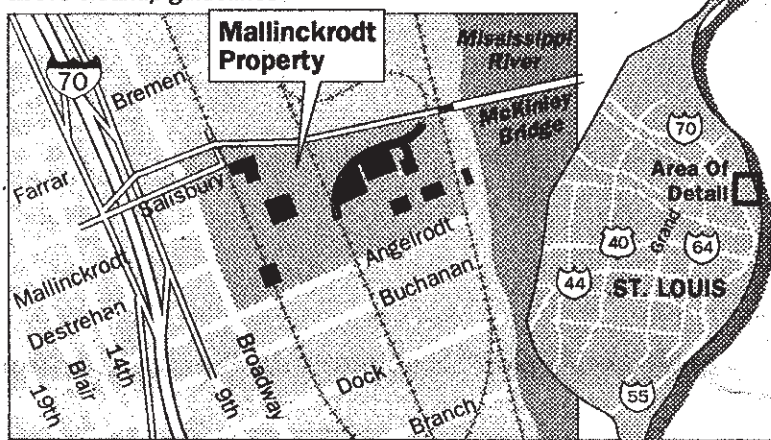
Avel said the Energy Department now estimates that 127,000 cubic yards of contaminated material must be removed from the buildings and grounds. That is nearly double an earlier estimate of 70,000 cubic yards. One source estimated the cost at \$46 million.

Mallinckrodt officers say the radiation levels are extremely low and pose no threat to workers or the public. They say the company has conducted its own radiological surveys and continually monitors the plant.

"I don't believe (employees) are

Mallinckrodt Plant Site

Black indicates areas that had levels of radioactive contamination above cleanup guidelines



Source: Oak Ridge National Laboratory Post-Dispatch Map

at risk in those buildings," said Raymond F. Bentele, president and chief executive officer of Mallinckrodt Inc. "If we thought it wasn't safe, we wouldn't have people working those areas."

Avel said scientists hired by the Energy Department conducted tests last year on Mallinckrodt's buildings and grounds, as well as at some neighboring businesses. A draft report on the survey should be completed in April, he said.

The federal government financed cleanups at the Mallinckrodt complex from 1948 to 1950 and from 1957 to 1962. In the cleanups, buildings were torn down, walls scrubbed down, soil dug up and areas backfilled.

In the early 1960s, at least 5,000 truckloads of contaminated rubble from eight to 10 buildings at the Mallinckrodt complex were hauled to a quarry near Weldon Spring in St. Charles County and dumped there.

The cleanups restored the plant to levels then considered permissible by the federal government. By 1962, the government had returned the entire complex to Mallinckrodt for

unrestricted use.

Fifteen years later, the government returned to check levels of radiation at the plant against tougher standards. A report issued in 1981 — based on a 1977 survey — concluded that many buildings remained contaminated.

Bentele said a radiological survey the company made in 1984 and monitoring data since then proved that employees were not at risk and had not been receiving any significant exposure.

He said the company would continue to monitor radiation levels in the complex until the Department of Energy "completes final remedial action."

The 1981 report made no mention of two documents that recorded the burial under Building 101 of radioactive material in 1972 and 1973. The documents, filed with the city by Mallinckrodt, showed that Mallinckrodt buried about 233,000 pounds of ore containing 4,814 pounds of thorium.

The ore was in 30-gallon steel drums buried before the warehouse was built. They were placed in trenches and covered with at least 4 feet of dirt. Plans for the warehouse called for a 10-inch-thick concrete floor.

Study

From page five

workers at fuel and weapons plants across the country.

Scientists say the studies could help determine whether the health of nuclear workers has been jeopardized by exposure to low-level radiation.

Black and female employees were excluded from the Mallinckrodt study. Federal researchers said that women were too difficult to track and that there were too few black employees to produce meaningful statistics.

Although 405 workers had died before July 1, 1976, the findings in the preliminary study were based only on 390 death certificates that researchers were able to find. The cause of death for the other 15 could not be verified.

Epidemiologists say that as a result of the 1976 cutoff, some cancer deaths might have been missed. They said there often is a lag of 20 to 30 years between exposure to low-level radiation and the appearance of cancer.

Despite this, the federally financed health studies indicate that an excessive number of the nation's nuclear workers have died of respiratory diseases and cancers.

A number of individual studies show that people who worked at some uranium and plutonium processing plants in the United States have experienced higher than expected death rates from several types of cancer.

The results vary from plant to plant, with no single cause of death common to all facilities.

The studies attributed elevated numbers of deaths among nuclear workers to leukemia, Hodgkin's disease and cancers of the lung, brain, larynx, esophagus, digestive tract, rectum and prostate.

For example, elevated levels of laryngeal cancer, pneumonia and respiratory disease were found among 995 men who worked at a

uranium processing plant in Buffalo, N.Y., between 1943 and 1949.

Researchers for the Energy Department said the number of deaths was too small to determine whether radiation actually caused the cancer.

They said other factors, such as tobacco or alcohol, could have contributed to some of the deaths; data on the workers' smoking and drinking habits often was unavailable.

Since World War II, government policy for exposure to radiation has been based mostly on what happened to survivors of the bombings of Hiroshima and Nagasaki and on the effects of radiation on animals.

But some scientists say low-level radiation is quite different from high-level radiation. They think the body's reaction to constant exposure to low-level doses may not be comparable to a one-time exposure to a high level of radiation.

Beyond that, they question the accuracy of some of the data from Hiroshima and Nagasaki.

The stakes riding on the outcome of the health studies are enormous.

Any evidence showing that levels of radiation below existing standards cause cancer or genetic damage could pressure the government and private industry

into spending tens of billions of dollars to revamp nuclear power plants and weapons factories.

Critics of the Energy Department argue that it would be far better if the studies were done by groups independent of the agency. The department finances 80 percent of all radiation research done in this country.

The critics question the ability of the agency charged with the development of nuclear weapons to pay for unbiased research.

But Fry, who is in charge of the health studies, said: "We consider ourselves independent scientists. We don't have to answer to the government for our results. We report what we find."

A group of researchers headed by Dr. Alice Stewart of Birmingham, England, plans to conduct its own health study of the 280,000 nuclear workers included in the studies being paid for by the Department of Energy.

Stewart's group received \$1.4 million to do the study as part of the settlement of a suit connected with the Three Mile Island disaster.

But, says Stewart, the Energy Department has yet to provide her with the workers' exposure records needed for the project. Her attorneys are trying to subpoena the data.

A seven-part Post-Dispatch series

Sunday: Mallinckrodt purifies uranium to help win World War II.

Today: Uranium workers brush aside early health warnings. Years later, health studies look at cancer rates among employees.

Tuesday: Unknown to area residents, radioactive waste is dumped in North County.

Wednesday: How the Weldon Spring plant became the area's most contaminated site.

Thursday: St. Charles County residents wage war against federal officials.

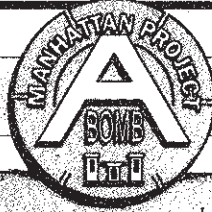
Friday: Four "forgotten sites." Waste is buried in 40 pits at Hematite in Jefferson County.

Sunday: Options for cleaning up radioactive waste in the St. Louis area.

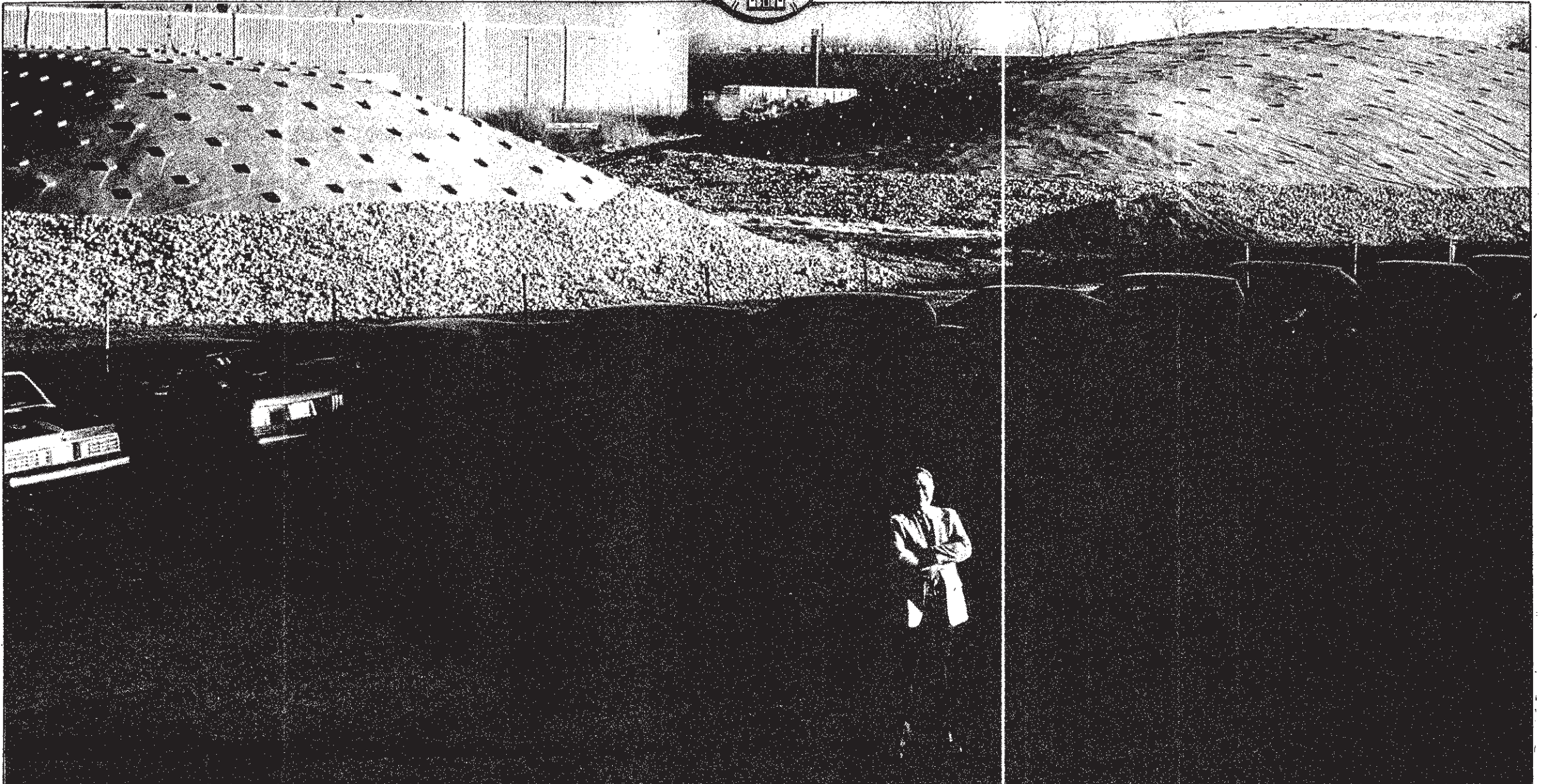
EVERYDAY

TUESDAY, FEBRUARY 14, 1989

LEGACY OF THE BOMB



ST. LOUIS' NUCLEAR WASTE



Covered mounds of radioactive waste loom behind E. Dean Jarboe on the property of Futura Coatings, the business he owns on Latty Avenue in Hazelwood.

Larry Williams/Post-Dispatch

Building A Mountain Of Radioactive Waste

Truckers were kept in the dark about what they were hauling to North County

In the summer of 1966, Leo Vasquez, 13, and his friends run out and pick up the yellow dirt that falls from trucks lumbering past his family's farmhouse north of Lambert Field.

The youngsters take the dirt and swirl it in water. They are panning for gold. Every six minutes or so, a truck rumbles east on Frost Avenue headed for Latty Avenue from an airport waste dump. The boys are determined to get rich. Despite all their efforts, they wind up with nothing.

Unknown to the boys, they are panning waste from uranium processing that resulted in America's first atomic bomb.

By Carolyn Bower, Louis J. Rose and Theresa Tighe
 Of the Post-Dispatch Staff
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 THIRD OF A SERIES

SHORTLY AFTER World War II ended in 1945, representatives of the federal government were looking for a place to store radioactive waste generated at Mallinckrodt Chemical Works in St. Louis. They wanted a place that was accessible, free from floods and sparsely populated.

The government settled on property north of Lambert Field, even though the western third of the land was in the flood plain of Coldwater Creek.

The landfill was top secret. Drivers hauling waste there were not told what they were transporting. For the first three months of operation, the government didn't even own the land.

When the government filed suit to acquire the 21.7-acre property, federal and Mallinckrodt officials refused "for security reasons" to disclose the exact nature of the waste.

Officials said the residue was neither radioactive nor dangerous. At the time, information about nuclear operations was classified. The United States was trying to preserve its lead over the Soviet Union in the development of atomic weapons.

From the mid-1940s to the mid-'50s, Tom Green and four other independent truck drivers together hauled about 18,700 tons of uranium residue to the airport dump each year, Green later recalled.

Green and two other drivers hauled at least 5,000 tons each a year; the other two hauled much less. Each load weighed between 8 and 9 tons.

Green, a Navy veteran of World War II, worked six or seven days a week. His health and exposure to radiation were never monitored. Years passed without a vacation. His son, Mike, remembers that his father was too busy hauling the waste to come watch him play Khoury League ball.

Some of the residue Green hauled was



U.S. Department of Energy Archives

from ore that originated in the Belgian Congo. He called it pitchblende, "the richest dirt in the world."

By the time the residue got to Green's truck, much of the uranium was gone, leaving high concentrations of radium, another highly radioactive substance.

Many times at the airport site, the

pitchblende waste would stick to Green's shoes. When a worker held a Geiger counter to measure the radioactivity in Green's truck, the instrument's needle "would jump all over the place," he told his family.

In the winter when it snowed, the waste would turn into a quagmire. Green's truck

Thousands of metal drums contaminated with uranium are piled on property north of Lambert Field in this photo from the 1950s.

would slip and slide; sometimes he had to push it from the muck.

Friends said Green never feared the radioactive material during the 12 years that he hauled it. But after he got cancer, he said the job might have cost him his life.

Green died on June 8, 1979, at the age of 63. His death certificate attributes the cause to cancer of both lungs. Green smoked cigarettes for most of his life; he stopped several years before his death.

The place where Green dumped the waste turned from a green and brown patchwork of farm fields into a moonlike world.

A huge yellow mountain, the remnants of Colorado ore, rose from flat land on its western boundary. A chocolate brown peak, the residue of ore from around the world, stood to the east.

Row after row of rusty 30-gallon and 55-gallon black drums stretched as far as the eye could see from Brown Road, now McDonnell Boulevard, to Banshee Road.

Workers from Mallinckrodt toiled around the site on bulldozers and trucks, reshaping the earth to make room for more waste, and they hand-packed radioactive residue in drums.

Richard F. Schroeder, now 63, said it was fun making mountains, moving them,

See WASTE, Page 8

LEGACY OF THE BOMB



ST. LOUIS' NUCLEAR WASTE

Waste

From page seven

carving out mesas and roads. "That's why I never minded going to work," Schroeder said. "Everything was so interesting." Sometimes the workers drove their cars on top of the piles to watch the planes fly in and out of Lambert Field to the south. The mounds, perhaps 40 feet tall, were so high the workers could feel the heat from the aircraft engines. Schroeder remembers selling drums that had contained uranium ore to merchants, who would resell them.

Bruno Bevolo tells about the day they buried the pickup truck. "An AEC (Atomic Energy Commission) man came out and said the truck was too hot, don't use it anymore, bury it," said Bevolo, a foreman at the airport. "We got a backhoe and dug a hole right there. They wouldn't let anybody have it. I said, 'That's too bad.' I could have used a truck." Bevolo, now 72, said it bothered him that the trucks tracked muddy residue along McDonnell Boulevard and that when the drivers washed out the trucks, the residue overflowed into Coldwater Creek. "I bitched like hell," Bevolo said. "I told them, 'You people are messing up the creeks.' All they kept saying was, 'Don't worry about it.'"

Bevolo and Schroeder, who often play golf together now, tried to keep the radioactive material from spreading.

Before dumping truckloads of waste in railroad cars headed for reprocessing plants in other cities, Schroeder would line the cars with wax paper and stuff rags in the holes.

Then he'd wet the dirt to keep the dust down. "I always hoped somewhere along the route someone would wet the stuff down again," Schroeder said. He was never told where the material went.

There wasn't anything the workers could do about the wind that blew the powdery residue toward a cornfield that later became the Berkeley ballfields. Bevolo said: "I saw them putting in those ballfields right next to the place. I said, 'That's too close.' But they said, 'Don't worry about it.'" Last year, federal officials confirmed that the ballfields contain radioactive contamination. They have said, however, that the ballfield area poses a hazard only if someone eats the dirt.

The city of Berkeley closed the fields last April 19; they remain closed.

In the summer of 1966, the trucks were rolling again, this time hauling waste from the airport to an industrial park on Latty Avenue about a mile to the north.

A Los Angeles firm, Continental Mining & Milling Co., bought the material in an effort to recover valuable minerals such as copper and cobalt. Workers for companies along Latty Avenue remember the caravan.

"The dirt would fall off the trucks," said Skip Cothran, now 59, who drove a forklift for Wagner Electric Co. at the time.

There was waste all over Hazelwood and Latty (avenues). Sometimes if it rained, the stuff got so thick and sticky it looked like cow manure.

Velma Vasquez, mother of one of the boys who had played with the radioactive dirt, didn't think much about the dirt falling from the trucks. "Nobody considered it as radioactive," said Vasquez, now 63.

But today her yard may be part of a cleanup. Last fall, Bechtel National Inc. completed drilling holes up to 100 feet into her property to see how far the contamination spread.

Less than a month after Continental Mining & Milling Co. moved the dirt, the company went bankrupt. Several years later, Cotter Corp., a subsidiary of Commonwealth Edison, a utility based in Chicago, bought the residue and over the years shipped most of it to its plant in Canon City, Colo.

But enough thorium, uranium and radium seeped into the ground and remained in the buildings that the property remains contaminated. Berkeley ponce Maj. Louis Charboneau — then a patrolman — moonlighted about 40 hours a week between 1967 and 1971 as a private security guard at the Latty site. Security officers like Charboneau wore no badges to detect exposure to radiation.

"They told us there was no danger," Charboneau said. Charboneau, 54, knows that scores of neighborhood children played in

the sandy piles of radioactive material on Latty Avenue. But he doesn't think the children were harmed because he thinks he has spent more time there than they did, and he thinks the radiation hasn't affected him.

Three of the children were the sons of Ceil and Jim Bogowith. With their dogs and bows and arrows and BB guns, the boys, then ages 8 to 15, played off and on from 1966 until the early 1970s around the piles of dirt and in the creek.

Ceil Bogowith said she wasn't aware that the radioactive material at Latty Avenue could be a problem until she heard environmentalists discuss the dangers at a meeting in Florissant in 1979.

"I was quite angry," she said. The Nuclear Regulatory Commission arranged for Kenneth Bogowith and Richard O'Brien — the two boys who had played at Latty Avenue the most — to fly to Oak Ridge, Tenn., for tests. The families were told that the boys were fine.

But federal officials cautioned that they were unable to determine whether the boys had inhaled radon. Radon gas, which has been linked to cancer, is present at the site.

Kenneth Bogowith, now 25, joined the Navy and worked on nuclear submarines. He says he has no qualms about his health. His mother says she has come to accept the situation, but she is not happy about it.

O'Brien, now 24, is not worried about his health, family members say.

In the meantime, in 1973, radioactive material had secretly been trucked to Bridgeton from Latty Avenue. A St. Ann company had a contract to dry the waste at Latty Avenue and send it to Cotter Corp. in Colorado.

Instead, the firm, B&K



Velma Vasquez's yard may be part of a cleanup effort.

Larry Williams/Post-Dispatch



Larry Williams/Post-Dispatch

Activist Kay Drey joined the fight against nuclear waste.

Chance Sparked Crusade To Clean Up Waste Here

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UNTIL a chance meeting in 1978 between a Catholic nun in St. Louis and a nuclear physicist from Cornell University, few residents even knew there was radioactive waste stored in the St. Louis area.

Sister Mary Ann McGivern was returning by plane to St. Louis from New York, where she had attended a meeting on nuclear disarmament. McGivern found herself seated next to Robert Pohl, a physicist on his way to testify at a hearing on uranium mining on Indian lands in the West.

As they chatted over dinner, Pohl asked McGivern whether she was fighting to have the nuclear waste in the St. Louis area cleaned up.

"What waste?" she asked. The waste on "Laddie Avenue" in south St. Louis, Pohl replied. He told her he had just read about it in a report about waste from the making of the atomic bomb.

Even with Pohl's mispronunciation of the address, it took McGivern and friends only two weeks to find the material on Latty Avenue in Hazelwood in North County.

It was time for a new crusade, and McGivern knew just the person to lead the fight. That was Kay Drey, the tall, slender activist from University City who had been instrumental in the campaign that thwarted Union Electric Co.'s plans to build a second nuclear reactor in Callaway County.

Once briefed by McGivern, Drey threw herself at the new problem. Her basement became a repository of documents on radioactive waste in the St. Louis area. Today, her library is the starting point for people who want to study the problem. Even officials from the U.S. Department of Energy and the Nuclear Regulatory Commission have used it.

As she learned about the history

of radioactive waste in the area, Drey bombarded political leaders with letters, petitions and protests. Typically, she would spend hours drafting what she wanted to say.

In 1979, Drey recruited about 40 people in North County for a pitched battle with the Nuclear Regulatory Commission, which then had responsibility for the waste at Latty Avenue.

The fight began after the NRC made public plans to truck contaminated material from Latty Avenue and combine it with other radioactive waste at a 21.7-acre federal site north of Lambert Field. Once the Latty waste was deposited there, officials wanted to pave over part of the property and turn it into a driver-training course for local police departments.

Drey and William Crow, an official with the Nuclear Regulatory Commission, sparred frequently at municipal meetings.

Crow said the plan was a way to get the waste safely consolidated in one place.

"You get as much radiation standing next to that dirt as (you do) standing next to a human being," he said.

Drey countered: "Some communities say, 'Support your local police.' Here in St. Louis we say, 'Irradiate your local police.'"

She produced a federal report showing that radioactive waste already was leaking from the site adjacent to the airport into Coldwater Creek, which flows through residential neighborhoods in much of north St. Louis County.

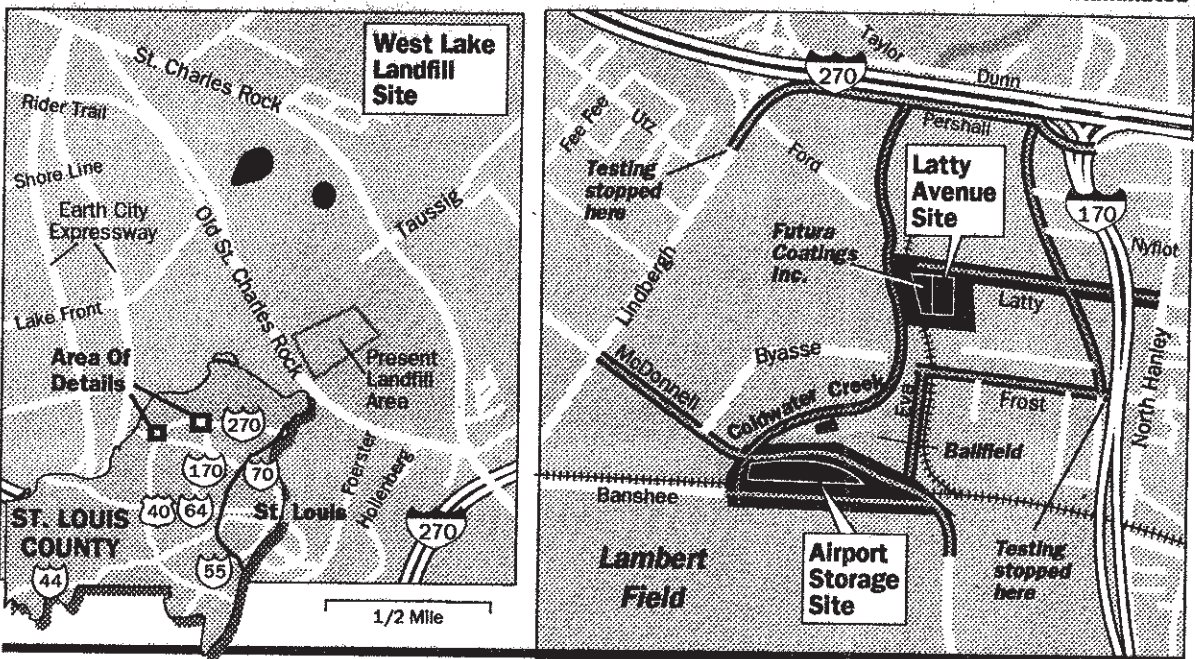
Because of the uproar caused by the environmentalists, the contaminated material stayed at Latty.

Drey views it as only a partial victory. "It's one thing to stop something, but we've never been able to get them to move it away," she said.

Crow says politics, hysteria and emotionalism killed a good plan.

North County Waste Sites

Black indicates areas where contamination was found



Post-Dispatch Map/Tom Borgman

Construction Co., working with four other trucking firms, hauled 8,700 tons to West Lake landfill.

It wasn't until three years later — when an anonymous source tipped a Post-Dispatch reporter — that the unauthorized dumping came to federal attention.

After 15 years, uranium, radium and thorium have seeped through the landfill to nearby property. Experts think there may be 170,000 cubic yards of contaminated material in the landfill now. No one knows for sure.

Several years ago, West Lake employees called Gilbert Schroeder, a farmer from Hazelwood, and told him that people might test for radioactive contamination on land he farms west of the landfill. Schroeder has grown soybeans there for 10 years.

Government memos indicate that thorium-230 and radium-226 have been found in the field. Although the radioactive substances substantially exceed amounts normally found in soil, they are below levels at which the government requires a cleanup.

When a Post-Dispatch reporter told him about the findings, Schroeder said no one had ever called him back to tell him about the test results. He added that he wasn't particularly surprised and intended to continue farming there. Soybeans grown in a contaminated area would have radiation levels higher than background radiation, but they would not endanger health, federal officials say.

In the mid-1970s, Herb Thies, who has farmed in the area for decades, was trying to grow crops at the Latty Avenue site. His efforts failed. "That land just wouldn't grow

anything," said Thies, 58. "I put in soybeans. I planted early in the spring, and, after May and June, there was nothing to harvest.

"The outer edges worked, but the middle — it was dead dirt. It never came out right."

Thies was allowed to farm the land because the Atomic Energy Commission had declared it clean in 1974.

Two years later, the Nuclear Regulatory Commission, a successor to the AEC, said the Latty site remained contaminated. The Health and Safety Research Division of Oak Ridge National Laboratory also found excessive radioactivity.

But nobody told E. Dean Jarboe.

In 1977, Jarboe, whom associates consider a shrewd businessman, paid \$115,000 for 3.5 acres of property in the 9000 block of Latty Avenue. He made it headquarters for his plastic-coatings business.

Three days after closing the deal on the property, Jarboe learned from federal officials that his property was contaminated.

"I watched one guy come in the door, and then two and then three, and I said, 'What the hell is going on?'" Jarboe, 62, recalled in an interview at his Futura Coatings office. "About nine of them came in. We all sat down and they said, 'You can't use that property.'"

The officials told him it was contaminated with radioactive waste. "I was shocked," continued Jarboe, 63. "I mean I had no idea. I wouldn't have bought this."

Jarboe and his sons spent the next year with other workers digging up contaminated dirt and tearing out radioactive buildings.

In 1980, he thought he had the perfect solution to the waste problem and the future of his business.

On the theory that the government would have all the waste cleaned up and shipped away from Latty Avenue in two years, Jarboe paid about \$100,000 for about seven more acres of contaminated property.

Jarboe thought it was a sweet deal. The government would consolidate all the waste on the new seven-acre parcel next to his business offices. He would get \$15,000 from the government to temporarily store the waste there.

Once the radioactive material was gone, his business could expand.

Nearly a decade later, he's still waiting.

Every morning as he walks into his office, he sees two mounds of radioactive waste looming beside his corporate headquarters.

Jarboe employs 85 people in his business of supplying roof coatings, wine-tank coatings and — a new venture — plastic liners for hazardous-waste disposal sites.

Sitting in his office at the site, Jarboe reflected on the problem. The government paid him \$100,000 for the plastic tarps that cover the radioactive piles on his property, but that's little consolation.

"Look, I don't know what I'm going to get out of this except a clean piece of property," he said, adding: "I may not even be here when that happens."

"You can't sue the government. I tried that in the beginning. I couldn't find anything to sue them for. That's what my legal staff told me. You can't do it."

Gerry Everding, a special correspondent of the Post-Dispatch, provided information for this story.

Atomic Surprises For Buyers?

IN HAZELWOOD, a businessman can buy warehouses without knowing they are too radioactive to use.

In Berkeley, there is nothing to prevent homeowners from selling homes and yards without disclosing that they are radioactively contaminated.

It could happen anywhere in Missouri. No state law requires the mention of radiological contaminants in any real-estate transactions or deeds.

R. Roger Pryor, an

environmentalist in University City, says it is outrageous that someone could buy radioactively contaminated property without notification.

"Clearly, the information should be made available to the public," said Pryor, who is program director for the Coalition for the Environment.

Officials with the U.S. Environmental Protection Agency say the buyer of the property where radioactive waste once was dumped may be held just as responsible as past owners.

'Solution': Redrawing Maps

RADIOACTIVE material stored in the floodway of Coldwater Creek jeopardized flood insurance coverage last winter for thousands of homeowners and business owners until Hazelwood and federal officials came up with a novel solution.

They simply redrew the flood maps so the 3,700 cubic yards of contaminated dirt ended up on the other side of the line.

The dirt had been dug up during installation of a sewer line for Hazelwood and Berkeley along Latty Avenue.

With Hazelwood's permission, the contaminated dirt had been placed in the flood plain in 1986 by the U.S. Department of Energy. Coldwater Creek flows more than 13 miles through north St. Louis County, past back yards and businesses.

The dirt was supposed to remain in the flood plain only temporarily, but it stayed.

The Federal Emergency Man-

agement Agency ordered Hazelwood to remove the contamination, saying that the dirt had altered the flood plain. The agency voiced fears that the dirt might spread radioactive contamination downstream. There is a one-in-100 chance of the contaminated material being inundated by flood waters in any given year.

Officials of the agency told Hazelwood that if a solution were not found, it could lead to canceling flood insurance in that city, as well as cutting off future federal loans and grants.

In the absence of proof of flood insurance, most institutions will not make loans to homeowners or businesses in flood plains.

But Hazelwood couldn't find any other entity to accept the radioactive material.

There seemed to be no solution. Then someone suggested redrawing the flood map. Now the side of the creek containing the radioactive dirt is officially out of the floodway.

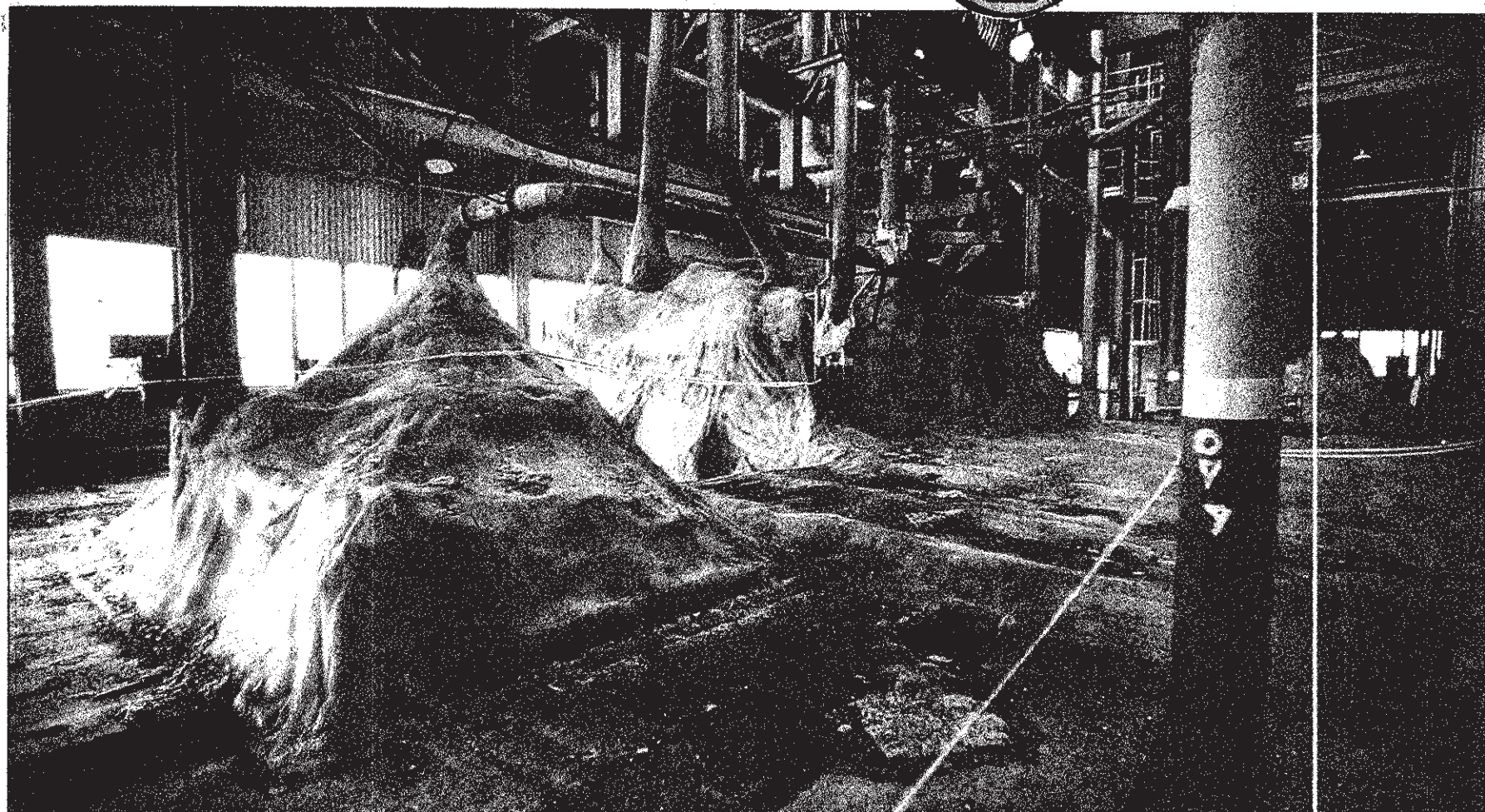
A seven-part Post-Dispatch series

Sunday: Mallinckrodt purifies uranium to help win World War II.
Monday: Uranium workers brush aside early health warnings. Years later, health studies look at cancer rates among employees.
Today: Unknown to area residents, radioactive waste is dumped in North County.
Wednesday: How the Weldon Spring plant became the area's most contaminated site.
Thursday: St. Charles County residents wage war against federal officials.
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Sunday: Options for cleaning up radioactive waste in the St. Louis area.

LEGACY OF THE BOMB

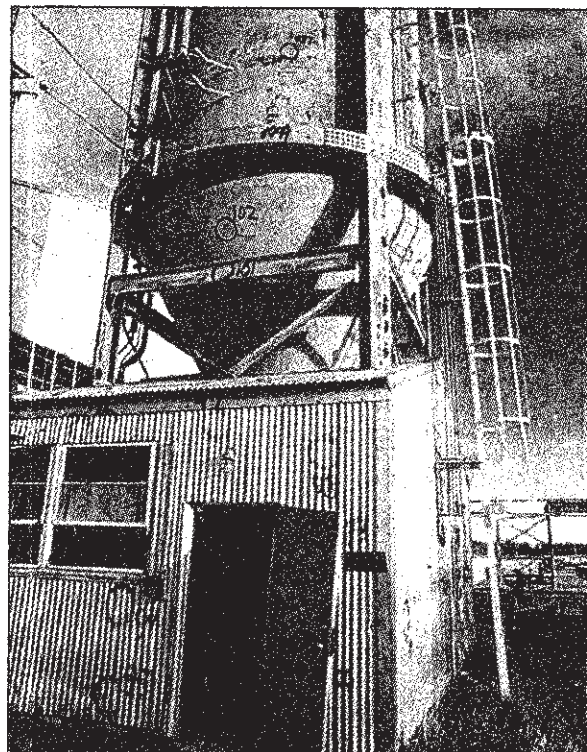


ST. LOUIS' NUCLEAR WASTE



Larry Williams/Post-Dispatch

LEFT: Machinery at the old uranium plant near Weldon Spring contaminated by radioactivity has been covered with plastic-like foam and labeled for inventory. BELOW: Markings on one of the 68 buildings at the plant show where readings for radioactive contamination have been taken.



Larry Williams/Post-Dispatch

Contamination Of 'The Clean One'

How Weldon Spring went from model to mess

By Carolyn Bower, Louis J. Rose and Theresa Tighe
Of the Post-Dispatch Staff
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FOURTH IN A SERIES

LIKE an abandoned set from a science-fiction movie, the Weldon Spring complex sits behind a 6-foot wire fence off Missouri Highway 94, two miles southwest of Highway 40.

Rusted steel buildings rise from farmland taken by the government for the production of high explosives in World War II. The site later was developed into a plant to process uranium for the country's nuclear arsenal.

Viewed up close, the 68 buildings are crumbling from age and neglect. Steel drums, fork lifts, trucks and other equipment lie rusting in the factory yard. The buildings, equipment, thousands of drums and tons of soil are contaminated with radium, uranium, thorium, nitrates and myriad other chemicals.

The complex is so contaminated that federal officials require visitors to check in with a guard and, for the most part, stay in federal vehicles while at the site. No one is allowed to walk in certain areas without latex rubber boots and protective clothing.

Bright yellow and purple signs warn of radioactive contamination in and around the buildings.

Several years ago, the Army sprayed thick orange polyurethane foam on some particularly hot equipment in one of the buildings to prevent the spread of contamination.

When the Atomic Energy Commission opened the plant in 1957 to process uranium, the agency proclaimed it a showplace of technology. The complex employed about 1,000 people and attracted visitors from several countries.

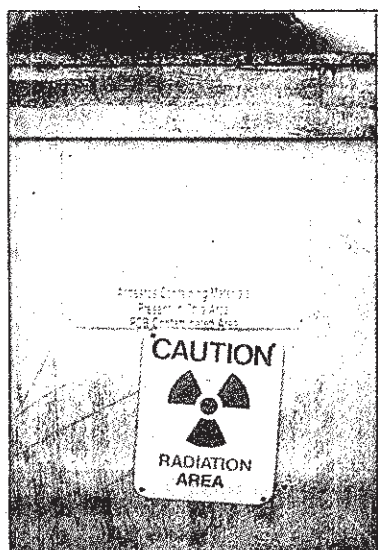
One-fourth of the \$57 million construction cost went for measures to protect workers from radiation.

Workers called the plant "The Clean One." It eliminated many of the processes at the old Mallinckrodt buildings in St. Louis that involved handling uranium by hand.

"The new plant was all automated," said Paul P. Englert, a resident of St. Charles, who was an operator in the uranium refinery. "With a dial you could speed up production."

Hoppers, each holding between 5 and 10 tons of uranium, would dump their contents automatically into 10,000-gallon tanks containing acid as part of the new, improved process of purifying uranium.

From the start, the plant produced beyond its



Larry Williams/Post-Dispatch

Warning signs on a door to one of the buildings at the old uranium-processing plant.

capacity in order to meet the government's demands. Designed to process 5,000 tons of yellow uranium ore a year, the plant actually averaged 16,000 tons a year from 1958 to 1964.

Englert and other workers remember conserving every precious gram of uranium.

If the material got too hot, the lids on large pots used in one stage of the refining process would blow off, spewing puffs of orange uranium trioxide all over. The workers would wash down the spilled powder and pump the liquid back for further processing.

Even rainwater became a source of uranium. Workers recount how they would capture rain that fell on roofs where uranium dust may have collected. The water was funneled inside the plant so the uranium could be separated out.

Radioactive residue and acids were disposed of by pumping them into several outdoor ponds at the plant, called raffinate pits. Today the ponds cover 25 acres. The mucky residue is 15 feet deep in places.

Pipes were run from the pits to a sewer line. If it rained and the pits filled, any overflow would drain southeast from the plant toward the Missouri River.

Robert J. Toomey, a retired Mallinckrodt employee, remembers when strange-looking frogs began appearing on the banks of the pits.

The frogs had bumps on them where bumps shouldn't have been, Toomey said, adding: "We didn't know if it was from the acid or what."

Many workers didn't worry about radiation.

Richard F. Schroeder, a retired Mallinckrodt worker, explained their feelings:

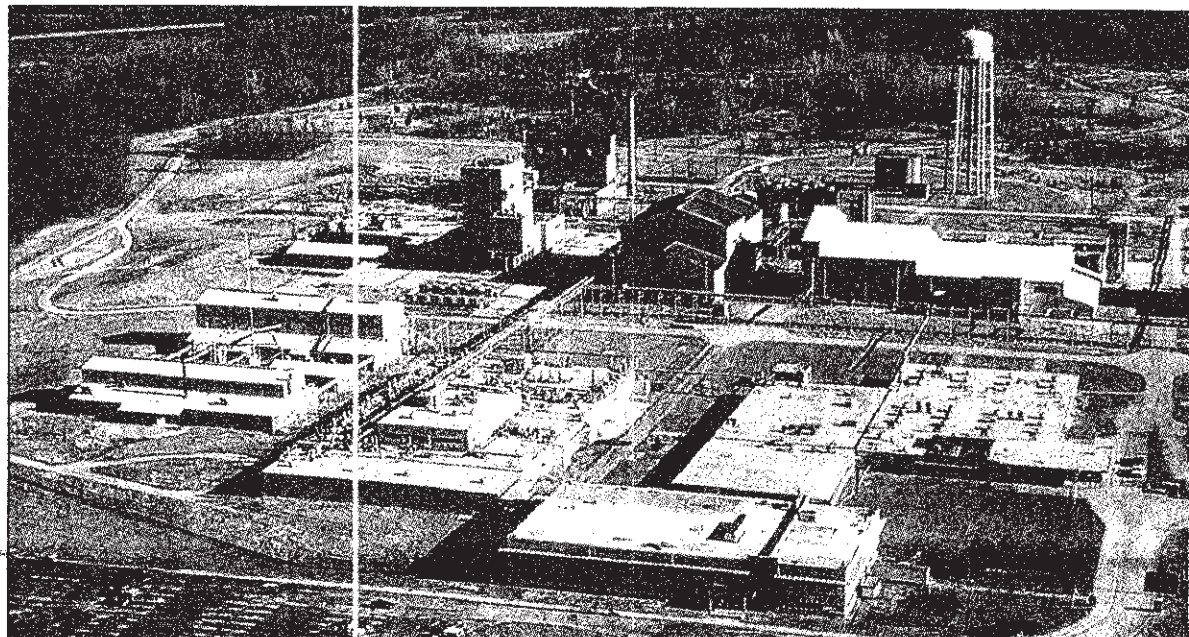
"It's all invisible, right? It's like standing somewhere and the wind's blowing. You can feel the wind, but you cannot feel radiation. You don't know what it's doing."

"I don't think any of us at the time worried about it," said Schroeder, now 63. "It was just another job."

Englert remembers when a conveyor belt carrying a 55-gallon drum of uranium ore got jammed. When a worker reached up to get the drum loose, it tipped, spilling its contents on him.

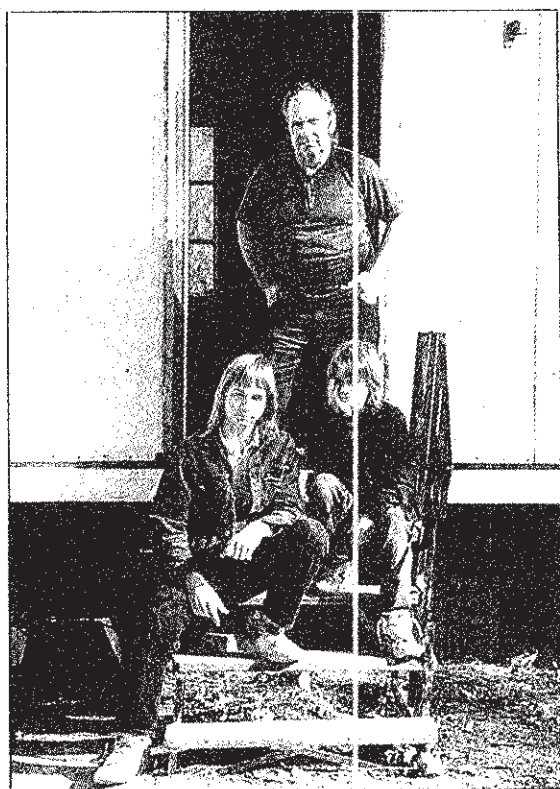
The worker's superiors wanted to send the man to Oak Ridge, Tenn., for tests and medical treatment, but he refused.

For many workers, the risks of accidents involving sulphuric, hydrofluoric and nitric acids used



Larry Williams/Post-Dispatch

An aerial view of the old uranium-processing plant, where a federal cleanup is under way.



Gary Bohn/Post-Dispatch

Charles A. Reed standing outside his trailer with his sons Eric (at left) and Jesse.

Worker Carries Scars Of Cleanup

By Carolyn Bower, Louis J. Rose and Theresa Tighe
Of the Post-Dispatch Staff
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IN 1968, Charles A. Reed used a jackhammer to break down a radioactively contaminated floor at the Weldon Spring uranium processing plant. Brown chips of brick would fly upward, and yellow-green paste from beneath the bricks would soak his leather work boots and gloves.

"Some of the younger guys were careful not to let stuff get on them," said Reed, a swarthy man of Cherokee-Indian descent.

"But me, I get on a job like digging a hole... and I wallow in it... All I think about is digging that hole."

Reed, now 52, proudly displays like war wounds the sores on his arms and legs. Frequently, he rolls up his trousers to show his hairless shins — as bare as a baby's legs.

He traces the problems to his work 21 years ago.

In 1968, Reed worked with several hundred carpenters and laborers to remove radioactive material from three of the 68 buildings at the plant in southern St. Charles County. The plant had stopped

See REED, Page 10

See WASTE, Page 10

LEGACY OF THE BOMB



ST. LOUIS' NUCLEAR WASTE

Waste

From page nine

at the plant caused more anxiety than the threat of radiation. Hydrofluoric acid was a special concern. Some described it as "fast-acting leprosy."

Special cards were issued to workers to alert doctors about the acids used at the plant. Employees tell how friends who got acid on their fingers at work later would wake up during the night to find their hands swollen to twice their usual size.

The late Mont Mason, a health physicist at the plant, recalled in an interview last year: "I had some people who took knives in the middle of the night and split their hands open, they hurt so bad."

By 1963, the plant started receiving enriched uranium from Oak Ridge, and workers were warned that passing the enriched material over other enriched material could set off an explosion.

The Weldon Spring plant also worked on recovering uranium from waste material shipped from Oak Ridge.

"It came on boxcars in drums," Englert said. "It looked like mud. They'd dump it in tanks. It looked like someone had cleaned up a plant and sent us the old sludge."

Empty drums that once contained uranium residue were collected near the Weldon Spring plant. Workers remember a man coming to inspect the drums. They say he took thousands of them to another site, where he had them pressed into blocks for sale to a junk dealer.

"The drums were supposed to be washed out, but you could see stuff stuck there in them," said Bruno Bevolo, a retired Mallinckrodt worker.

Late in the summer of 1966, Mallinckrodt officials took workers aside and told them that the Weldon Spring plant was going to close. The AEC contract for processing uranium was being shifted to National Lead Co. in Fernald, Ohio. It was a bitter blow; Mallinckrodt people had designed the process and had even helped train the people at Fernald.

Workers at Weldon Spring were incensed or heartbroken. Some of the men say they cried when they heard the news.

The workers had become a family. Now some of them would be without jobs.

Company officials say Mallinckrodt got out of the uranium business because the demand for purified uranium had decreased and the government shifted production to the newer plant at Fernald.

But most of the workers insist it was "politics," arguing that Ohio's congressional delegation outmaneuvered the Missouri delegation.

The Atomic Energy Commission ordered Mallinckrodt to place the plant on standby. Mallinckrodt fulfilled its contract and ceased production by the end of 1966.

One of the last 35 men to work in the refinery at Weldon Spring was Paul Englert. "They cleaned up real good," he said. "They washed down the place and wiped it with rags and everything."

Other parts of the plant looked more like people had left in a hurry.

Some environmentalists in St. Charles County suggest an atomic accident might have closed the plant. But workers and company officials say that isn't the case, and there is no indication of an atomic accident in government records.

Today, the plant is a spooky place. The roofs are falling in, and clumps of mold grow on the floor and walls. But otherwise, it is as if the workers would return tomorrow.

Coffee cups sit on tables in the cafeteria. China and glasses are piled in dishwashers in the kitchen. Hundreds of unused beakers, flasks and test tubes sit in drawers and cabinets in the laboratories. Aspirin, bandages, tongue depressors, blood pressure cuffs and other medical supplies sit in the infirmary, ready for use.

For 20 years after the 1966 closing, every contractor and every government agency that entered the plant was surprised at the amount of radioactive material that remained.

In 1967 and 1968, representatives of National Lead of Ohio went to the Weldon Spring plant to see what they could salvage for the plant at Fernald.

National Lead was given its pick of contaminated stainless steel pipe, valves, vessels, spare parts and other equipment. A total of 20 rail cars and one truckload of material were shipped to Fernald.

The amount of uranium oxide found after the plant closed defied all previous expectations.

When a worker removed a ventilation pipe, uranium dust began to pour out.

He got a broom and a shovel, and he alternately swept and scooped and poured the dust into barrels.

Twenty barrels of the oxide sweepings were sent to Fernald. Eventually, National Lead recovered \$75,000 worth of uranium oxide from the barrels and other steel pipes and equipment.

For several months, workers for the Daniel Hamm Co., a St. Louis subcontractor that helped to load the material for National Lead, lacked protection on the job. They had no badges to measure radiation

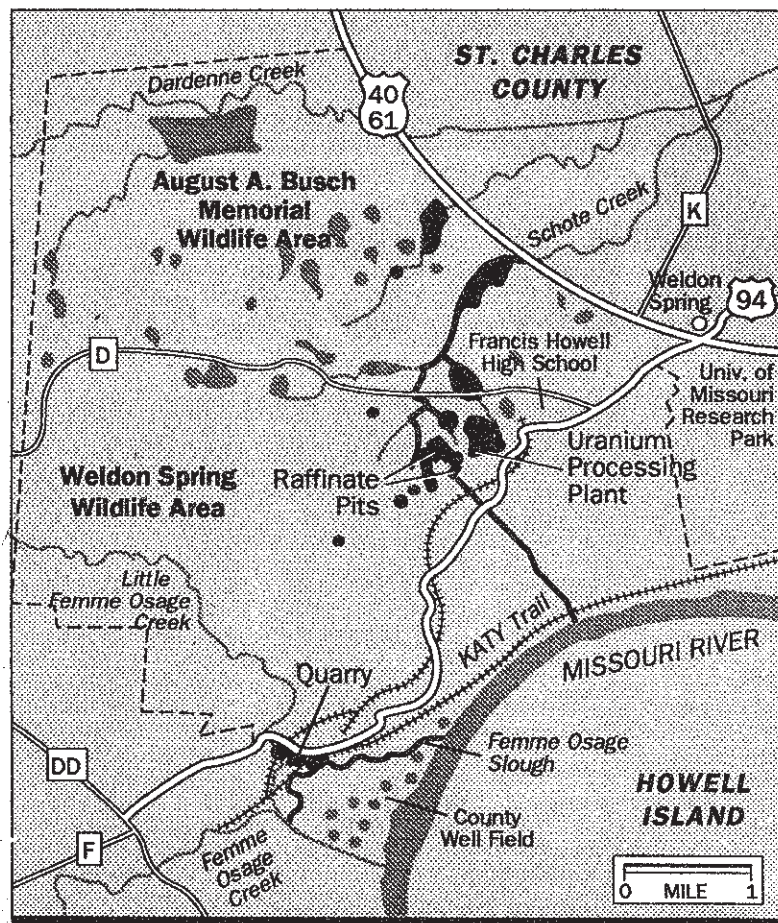


Larry Williams/Post-Dispatch

Tanks inside one of the uranium-processing plant buildings that were installed for the planned manufacture of Agent Orange. Those plans were scrapped because of radioactivity.

Radioactive Contamination At Weldon Spring Site

Black areas indicate where contamination was found



Source: Department of Energy

Tom Borgman/Post-Dispatch

exposure, no rubber shoes, no gloves and no respirators.

In 1968, during an ill-fated Weldon Spring cleanup attempt conducted by the Army, seven truckloads and 81 rail cars of contaminated material were shipped to David Witherspoon Inc. of Knoxville, Tenn.

The Witherspoon firm planned to decontaminate the equipment to conform with the standards of the day and then reuse it.

One of the laborers collecting materials for shipment to Witherspoon was Roger L. Pryor, now business manager of Laborers Local 660 in St. Charles.

"We put pipes, electric motors, stainless steel tanks in the cars," Pryor said. "They weren't clean. Some of that stuff had that yellow cake in it. All that stuff was hot. Most of it was contaminated."

During the 1968 cleanup, the government dumped 900 truckloads of radioactively contaminated material into an old quarry, four miles south of the plant.

The quarry already contained rubble from the Army's manufacture of high explosives — TNT and DNT — in the 1940s.

It also contained tons of radioactively contaminated rubble from Mallinckrodt's Destrehan Street plant in St. Louis. That material included toilets, mahogany stairs, thousands of drums of thorium and residue from the uranium processed for the first atomic reaction.

During the 1960s, teen-agers dared each other to swim in the quarry.

Over the decades, warning signs were removed from the quarry area and a chain-link fence surrounding it was torn.

People had little idea of how contaminated the Weldon Spring plant was. The federal government routinely received proposals for its use.

St. Charles County wanted to use part of the plant for a home for low-income elderly people.

The University of Missouri and

Francis Howell High School each wanted the complex for classroom space. Fred T. Wilkinson, then Missouri's corrections director, wanted to put a maximum-security prison there.

The groups all lost interest when they learned the extent of the contamination.

Army Corps of Engineers security guards frequently caught curious teen-agers trespassing at the plant or stealing Army gas masks and other equipment.

In 1986, employees of the U.S. Department of Energy and its contractors arrived at the plant to start a 12-year, \$400 million cleanup. Even they were surprised at the condition of the plant.

About 100 pounds of pure uranium metal were found scattered around the plant grounds and 1 ton of thorium was found in an abandoned building.

An estimated 214 tons of uranium and 129 tons of thorium remained in the pits.

Water bubbled up from broken water lines at the rate of 200,000 gallons a day. It carried uranium, thorium and radium into the August A. Busch Memorial Wildlife Area.

The leaks have since been fixed. But during heavy rain, contaminants still flow off the site into the streams and lakes of the Army Reserve and the Busch and Weldon Spring wildlife areas. The U.S. Geologic Survey has found that contamination from the pits has leaked at least 100 feet into the ground water.

In addition to all the radiological waste, there were large volumes of chemical wastes and acids.

Rodney Nelson, manager of the cleanup, said that the greatest surprise for his team was the discovery of carcinogenic nitrates from the processing of TNT and DNT during World War II.

Said Nelson of the cleanup, now expected to extend past the year 2000, "We never expected it to be this complex."

Gerry Everding, a Post-Dispatch special correspondent, contributed information for this story.

Reed

From page nine

processing uranium in 1966.

The Vietnam conflict was heating up. To combat the North Vietnamese guerrillas, the Army wanted to use the plant to produce Agent Orange, a highly toxic herbicide used to defoliate the Vietnam jungle.

After spending \$2.8 million and collecting 6 tons of uranium oxide in 1968, the Army abandoned its efforts to clean the three buildings. By then, the Army realized it would cost more than \$30 million to reduce the radiation to levels in which people could work.

The cleanup was a total failure; some say luckily so. If it had succeeded, federal officials today might have had dioxin, a contaminant in Agent Orange, to add to the list of poisons at Weldon Spring.

As he worked in 1968, Reed occasionally would rest with his stomach on the hammer and holler to a man with a Geiger counter to take a reading.

"The closer the man would get, the more that counter would rattle," said Reed, who was 32 at the time.

Reed is convinced that working on the 1968 cleanup caused his skin cancer and shooting pains and numbness in his feet and legs. Those problems, he says, make it impossible for him to earn his living as a laborer.

Reed is divorced and lives in a trailer in rural Warren County with his sons, Eric, 15, and Jesse, 12. They live on about \$500 a month Reed gets from a laborers-union disability pension.

A physician who examined Reed, Dr. Vincent Palermo, said there was no doubt that radiation damaged Reed's feet and legs. But Palermo, a former pathologist at St. John's Mercy Medical Center in Creve Coeur, and other doctors say it would be difficult to prove that radiation caused the pain and numbness that Reed says prevent him from working.

Each summer for the last few years, Reed has picketed on certain days along Highway 94 outside the Weldon Spring plant. His large sign protests the conditions under which he worked and urges protection for any future workers brought into the plant.

Definition Of Terms

Agent Orange: A military code name for a chemical defoliant mixture that contains the toxic substance dioxin. Agent Orange was used in the Vietnam War. The name derives from the color used on its containers.

DNT: The compound, known as dinitrotoluene, is associated with the production of the explosive TNT. The substance 2,6 DNT causes cancer in laboratory animals. The U.S. Army produced TNT near Weldon Spring during World War II.

Nitrates: A salt of poisonous nitric acid, associated with the production of DNT and TNT.

Radium: A radioactive, highly toxic solid used in cancer treatments, in industrial radiography and as a source of neutrons and radon.

Raffinate: Residue. The remains after extraction or refining of uranium.

Thorium: A radioactive element. Thorium is used in making gas mantles, electronic equipment and as a fuel source for nuclear reactors. Mallinckrodt processed it for possible use in nuclear weapons.

TNT: The compound, known as trinitrotoluene, is an explosive. TNT was produced near Weldon Spring in World War II.

Uranium: A radioactive element. Uranium purified by Mallinckrodt Chemical Works Co. was used in the first atomic bomb. Uranium products are used in nuclear weapons and as fuel for nuclear reactors. Uranium-235 is a highly fissionable material.

A seven-part Post-Dispatch series

Sunday: Mallinckrodt purifies uranium to help win World War II.

Monday: Uranium workers brush aside early health warnings. Years later, health studies look at cancer rates among employees.

Tuesday: Unknown to area residents, radioactive waste is dumped in North County.

Today: How the Weldon Spring plant became the area's most contaminated site.

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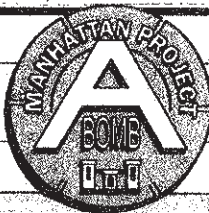
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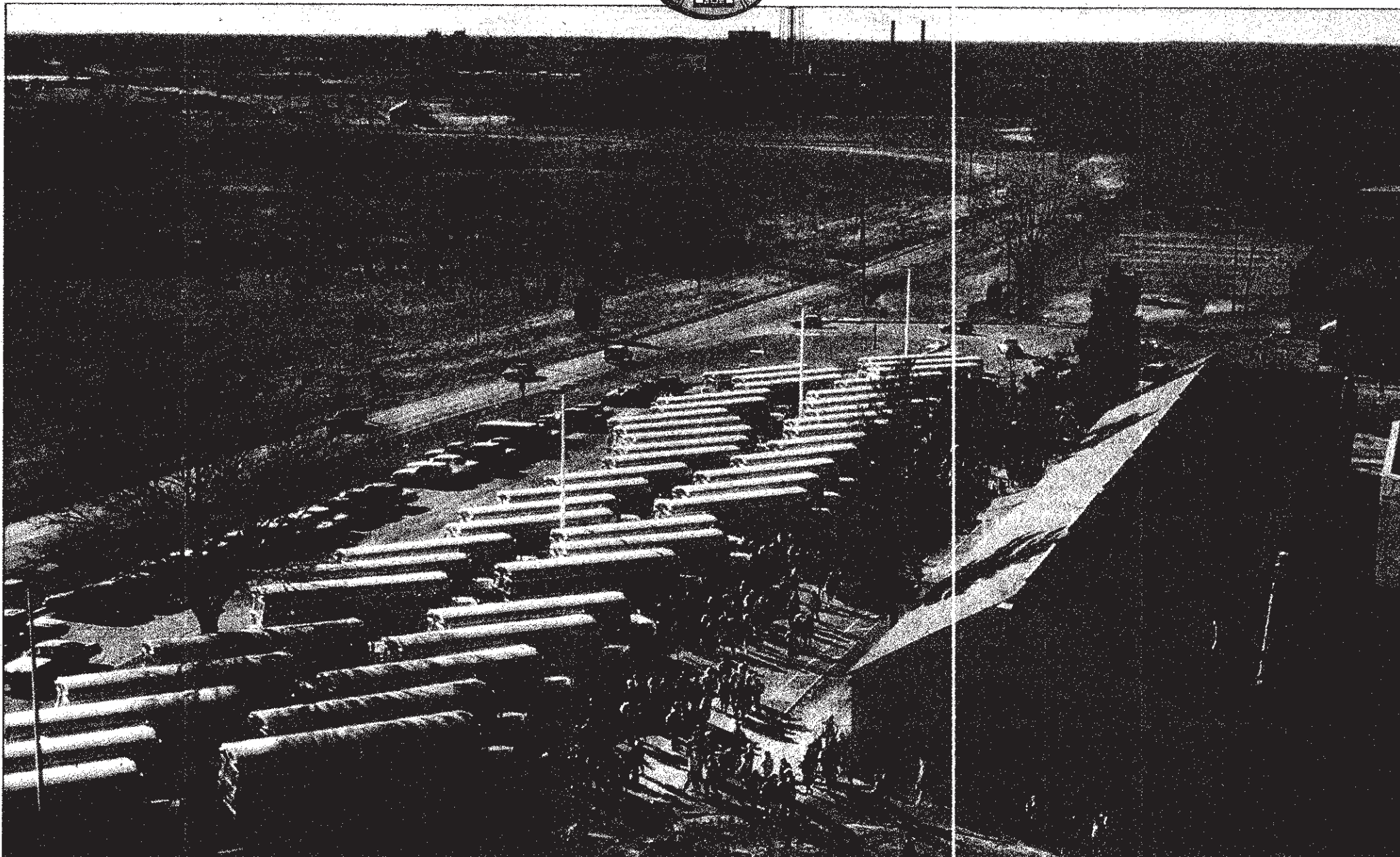
THURSDAY, FEBRUARY 16, 1989

11

LEGACY OF THE BOMB



ST. LOUIS' NUCLEAR WASTE



Francis Howell High School is a half-mile away from the old uranium plant near Weldon Spring. The plant is marked by the water tower.

Larry Williams/Post-Dispatch

Parents Fight Health Threat

Cleanup of plant brings questions but few answers

By Carolyn Bower,
Louis J. Rose
and Theresa Tighe
Of the Post-Dispatch Staff

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FIFTH OF A SERIES

ROGER NELSON, a feisty man, looks forward to bantering with students as he arrives at Francis Howell High School in St. Charles County. He is there on a mission on this third day of April 1987.

He knows that some students will express fears that they will get cancer or become sterile during the federal cleanup of radioactive contamination at an abandoned uranium processing plant half a mile away.

Nelson, a safety officer on the Weldon Spring cleanup, wants to assure them that they will be safe. His daughter, Corina, attends the school.

As his presentation begins in the school library, Nelson displays a Geiger counter that chirps continually — proof, he says, that radiation exists everywhere. Nelson tells the nearly 150 students that the chances of getting cancer from the radiation are remote.



Larry Williams/Post-Dispatch

Roger Nelson, head of safety for the cleanup near Weldon Spring, displays a petri dish filled with a uranium compound.

In the audience is Mary Halliday, a homemaker who is a founder of St. Charles Countians Against Hazardous Waste. Halliday knows that scientists and doctors disagree about the danger of low-level radiation. She also knows that most scientists believe exposure to radiation increases the risk, however slightly, of cancer.

Halliday wants the high school closed or relocated during the planned \$400 million cleanup. Otherwise, she plans to take her son, Jason, out of the school. She challenges Nelson's statements.

Through the library windows, students can see the



Larry Williams/Post-Dispatch

Waste pits near the two Weldon Spring wildlife areas are filled with uranium, thorium, radium and nitrates. Ducks and geese light on water in the pits.

distant ruins of the sprawling Weldon Spring complex. Some buildings are so contaminated that visitors are prohibited from entering them. Mallinckrodt Chemical Works purified uranium and thorium at the plant off of Missouri Highway 94 for the federal government from 1957 through 1966.

During his talk, Nelson asks students to pass around and examine a sealed petri dish containing a uranium compound. By the time it gets back to Nelson, it has a crack in the top. And that triggers a confrontation.

Halliday and her colleagues accuse Nelson of endangering the students' health.

Nelson says the petri dish — even with a crack in it — is safe. He says youngsters would have to eat the compound for it to pose a real threat to their health.

A threat, real or perceived, to the health of children turns parents into instant activists.

Nowhere is that more evident than in St. Charles County. The environmental movement there was born 2,000 strong in 1982, when the U.S. Department of Energy proposed permanently storing radioactive waste from five states at the abandoned uranium processing plant just upwind from Francis Howell High School.

The federally owned site is between the August A. Busch Memorial and Weldon Spring wildlife areas, where thousands of families hike, fish and hunt.

During heavy rains, uranium dust washes off the plant grounds into both wildlife areas.

The buildings at the plant still contain uranium and thorium. Radioactive and chemical sludge fill four waste ponds on the plant grounds and a quarry, four miles to the southwest.

The quarry leaks and the ponds seep into the groundwater. The quarry is less than one-half mile from wells that supply about 63,000 St. Charles County residents with drinking water. Officials say the contamination has not reached the well field.

Nobody gave the situation much thought until July 23, 1982, when residents read in the newspaper that the Department of Energy wanted to dispose of radioactive waste from five states at the plant site.

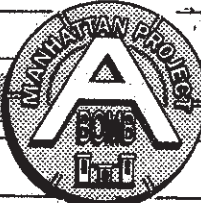
One of those readers, Meredith Bollmeier, a mother and homemaker who lived within walking distance of the plant, swung into action.

With the help of five other mothers, a chemist and a member of the Francis Howell School Board, Bollmeier mobilized the county.

More than 2,000 residents turned out in the Francis

See WASTE, Page 12

LEGACY OF THE BOMB



ST. LOUIS NUCLEAR WASTE

What's Safe? Experts Differ On Radiation

By Carolyn Bower,
Louis J. Rose
and Theresa Tighe
Of the Post-Dispatch Staff
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HOW DO YOU decide whether it is safe to live or work near a radioactive waste site in the St. Louis area? The answer depends on whom you ask. Environmentalists are likely to say the low levels of radiation at St. Louis sites are a risk to your health. Some government spokesmen are likely to say there is no health threat unless you eat the waste.

Neither group is lying. People disagree because no one knows the effects of low-level doses of radiation.

Because radiation can cause cancer and genetic damage, scientists have studied the effect of low-level radiation on people's health. But the studies do not include enough people to offer undisputable answers. After all, one in every four people in the country dies of cancer, and there are many causes.

In the 1940s, scientists believed

there was a threshold below which radiation exposure would not hurt a person. Now, nearly all scientists agree that exposure to any level of radiation poses a risk — no matter how small — of cancer and genetic effects.

That is why when officials set exposure standards they say that a level of radiation is permissible or poses an acceptable risk, never that the dose is safe.

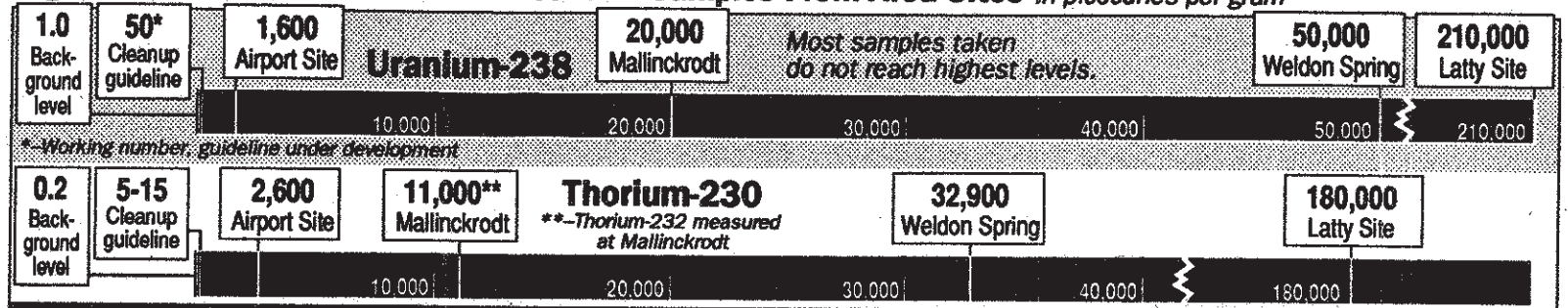
Scientists today disagree about how much cancer is caused by radiation exposure.

Most scientists in the United States say the laws that currently regulate exposure are either too strict or just fine. The International Commission on Radiation Protection shares this position. Some researchers say that the additional cancer caused by the low levels of radiation allowed by law may be too small to measure.

Most authorities believe that anywhere from 10 to 500 people will die of cancer for every million people exposed to one rem, a measure of exposure to radiation.

But Karl Z. Morgan of Atlanta, the physicist who laid the groundwork for radiation exposure standards,

Highest Levels of Contamination Found In Samples From Area Sites In picocuries per gram



Source: Department of Energy

Tom Borgman/Post-Dispatch

This chart uses just two of the many radioactive substances at four major waste sites to show how the highest readings exceed cleanup standards. Numerous readings taken on each site show radioactivity ranges from very high to almost nonexistent.

now says that no fewer than 1,000 and more likely 3,000 people will die of cancer for every million people exposed to one rem.

Morgan and some others say the standards are eight to 10 times too lenient and may cause needless additional cancer deaths.

Current regulations are based on animal studies and mathematical calculations based on what happened to people exposed to high levels of radiation. Morgan and others say that low-level radiation may work in an entirely different way from high-level radiation. They say standards need to be based on human experience. Britain recently made its radiation exposure regulations more stringent.

Although they would disagree on the size of the risk, most scientists say that the threat to a person's health from sites in the St. Louis area is statistically small.

But scientists also say the effects

of radiation are cumulative. We are exposed to radiation from the sun, rocks, X-rays, fallout from nuclear weapons and consumer goods such as mantles for gas lanterns.

Radiation's effects on a person's health also depend on such things as age, sex and length of exposure. Dr. Alice Stewart, a British scientist, says children and pregnant women, among others, may be at greater risk.

If a pregnant woman is exposed to low-level radiation, her child may develop cancer, Stewart said.

Scientists involved with nuclear medicine and nuclear energy say that the risk from exposure to radiation from nuclear power plants, nuclear medicine and radioactive waste cleanups is no greater than other risks that we accept in exchange for modern convenience.

In 1987, for example, 46,000 people died in traffic accidents. Actuaries deemed 13 deaths an

acceptable risk in figuring the insurance cost of the construction of the Gateway Arch in the 1960s. No construction worker actually died on the project.

Most people seem willing to accept a comparable risk from radiation in exchange for medical treatment.

But people seem less willing to accept the risk of radiation from nuclear energy and plants that produce nuclear weapons.

Environmentalists base their opinion that the risk is unacceptable on research by Morgan and others. They point out that over the last five decades, radiation exposure guidelines have changed four times, each time becoming more strict. And they cite the Department of Energy's history of secrecy about radioactive pollution.

So, how do you decide? The only way you can decide is by finding out the levels of radioactivity present at a site.

comparing them to current standards and bearing in mind that some people say those standards are too lenient. You also will have to consider your family medical history and determine how much radiation you are willing to accept in your life.

Dr. Karl Wilson of St. Charles County, director of Four County Mental Health Services Inc., has looked at the facts and says he is apprehensive about letting his daughter, now a sixth-grader, attend Francis Howell High School during the dismantling of an old uranium plant nearby.

Wilson said: "The nightmare as a parent is: What if they find out there was a risk years later? I don't want it to be my child they find out on."

On the other hand, many of the people who work at the cleanup say they will be perfectly comfortable sending their children to Francis Howell during the demolition.

Waste

From page eleven

Howell gymnasium to protest the project at a public hearing on Aug. 10. Energy Department officials say such meetings usually draw between 10 and 70 people.

Federal officials attribute the size of the crowd to the proximity of the site to the high school and people's concern for their children.

Bollmeier agrees.

Before reading that newspaper account, Bollmeier's activities outside her home had been limited to a few interior-decorating consultations for friends or relatives.

Now she was an instant activist. She rapidly developed the courage to pass around petitions and hold news conferences. She learned everything she could about radioactive waste.

"I was like a mother tiger," she said. "I felt a threat to my family and my community. I didn't understand what uranium and thorium were at the time, but radioactive waste — any kind of radioactive waste — seemed like bad news."

Bollmeier began spending every free hour reading federal reports on the plant and quarry, and crawling around the wildlife area with a Geiger counter to measure radiation and a flask for taking water samples. She is now the paid executive director of St. Charles Countians Against Hazardous Waste.

But in the summer of 1982, all she was trying to do was get a crowd out to that first hearing.

"When we saw the stream of cars coming down (Highway) 94, we were ebullient," Bollmeier recalled. "We had collectively thrown the biggest party in town."

The crowd jammed the gymnasium; some people had to be turned away. More than 40 people spoke. Not one was in favor of storing the waste at Weldon Spring.

One speaker threatened to blow up the bridges across the Missouri if the Energy Department tried to bring in the waste.

Kenneth Rothman, who was lieutenant governor at the time, said, "This is the worst possible spot for a radioactive dump or an atomic dump site anywhere in the state."

The crowd cheered. Officials of the Department of Energy said radioactive runoff was no threat to wells in the county because most wells were dug 700 feet into the earth.

The crowd moaned. "Mine's 175 feet," one man shouted. "Mine's 200," yelled another.

After the meeting, agency officials said the crowd was one of the most vocal and hostile they ever had encountered. Eventually, the government dropped its plan to bring in waste from five states.

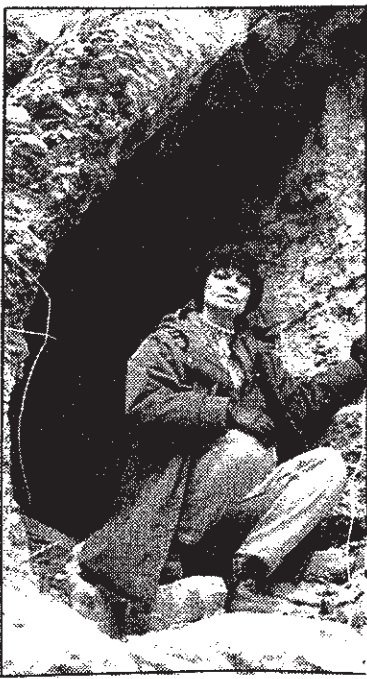
Lea Keller, one of the agency's representatives at the meeting, recalls feeling frustrated that night because the Department of Energy never had a chance to present its case.

"I looked around. I saw the banners. I heard the cheering, boing and jeering," he said. "I was frankly convinced nothing of value would be accomplished. The people had come to vent their frustration. So we listened, and we left."

Keller, 60, retired two years ago. He spent 30 years working for the federal agencies charged with developing atomic energy for power and defense.

Keller said it is one of the disappointments of his career that he was unable to convince residents in the St. Louis area that the risk is minimal.

"Someone would have to camp on any of the (radioactive waste) sites in the area for 24 hours a day for 50 years to get a dose that can be statistically linked to cancer," he said.



Larry Williams/Post-Dispatch
Meredith Bollmeier in front of a cave in the quarry near Weldon Spring that is filled with hazardous waste.

Bollmeier countered: "We have studied enough federal reports to know how they present select information more protective to the Department of Energy than to the welfare of the citizens of St. Charles."

At the heart of the fears of residents of St. Charles County is concern over childhood leukemia there.

Prodded by area mothers, state health officials took a look at a number of leukemia cases that had occurred in the county.

The state found that 13 children, ages 14 or under, in St. Charles County were diagnosed as having leukemia during a five-year period in the 1970s. That is almost twice the expected rate.

The 13 leukemia cases occurred from 1975 through 1979 — with six cases discovered in 1979 alone. Seven cases would have been normal for the five-year period. Eight of the 13 leukemia victims died.

But in July 1986, after three years of investigation, the Missouri Department of Health announced there appeared to be no evidence linking the unusually high number of leukemia cases to radiation from the old processing plant.

Members of St. Charles Countians Against Hazardous Waste questioned the methods used in the study.

John Crellin, the state epidemiologist who did the study, acknowledged there were significant gaps in the data the Energy Department gave him for radiation dose estimates.

Over the years, the St. Charles Countians became masters at questioning officials and nudging state and federal agencies into action. They are credited with bringing the radioactive waste near Weldon Spring to federal attention and pressing until the government

agreed to finance a cleanup.

But it was a bit of election-year one-upmanship that produced the federal commitment to spend money.

In 1984, Walter Mondale, the Democratic nominee for president, was scoring points against Republican incumbent Ronald Reagan by attacking Reagan's record on the environment. He would make his speeches on this topic at hazardous-waste sites.

Four days before Mondale was scheduled to tour the Weldon Spring plant, Reagan stole center stage by announcing a 10-year, \$357 million cleanup of the site.

Under a revised plan, the work was scheduled to take 12 years and cost \$400 million.

But because of proposed budget cuts, managers on site say that both the cost and the length of time for the cleanup could double.

In July 1986, the Department of Energy set up the first of what would eventually become an encampment of 25 house trailers on the old plant grounds.

Rodney Nelson, a Wisconsin farm boy who grew up to be an engineer and public servant, was one of the first to arrive.

Nelson (no relation to Roger Nelson) is the on-site manager of the cleanup for the Department of Energy. Nothing in Nelson's experience had prepared him for the suspicion he would encounter in St. Charles County.

One afternoon, Nelson asked his colleagues: "Do people really believe that scientists and doctors in this country are in a conspiracy to keep the truth about the dangers of radiation from people?"

Press aide Martin Janowski responded that yes, some people believe that.

Later, Nelson learned the extent of people's fears when he met a woman at a cocktail party. She told him she never opens the windows of her home lest her family be exposed to a particle of radiation from the plant.

Nelson and his family feel quite secure in their home in Lake Saint Louis, which is downwind from the plant. But he finds it hard to answer when someone asks him whether it is safe to move to St. Charles County. "I understand radiation, and I live here," Nelson said. "But there are people who will tell you there is no safe level of radiation, period."

On a personal level, Nelson has won the trust of many county residents. Still, environmentalists question whether scientists know enough about radioactive waste storage and the dangers of low-level radiation to do an adequate job.

Mary Halliday, the treasurer of St. Charles Countians Against Hazardous Waste, says she feels Nelson is sincere.

"I believe Rod Nelson and the other people cleaning up the site will do everything they can to protect people," she said. "But as long as doctors and scientists disagree about the dangers of radiation, I won't risk my child's health by leaving him at school."

Gerry Everding, a special correspondent of the Post-Dispatch, provided information for this story.

A seven-part Post-Dispatch series

Sunday: Mallinckrodt purifies uranium to help win World War II.

Monday: Uranium workers brush aside early health warnings. Years later, health studies look at cancer rates among employees.

Tuesday: Unknown to area residents, radioactive waste is dumped in North County.

Wednesday: How the Weldon Spring plant became the area's most contaminated site.

Today: St. Charles County residents wage war against federal officials.

Friday: Four "forgotten sites." Waste is buried in 40 pits at Hematite in Jefferson County.

Sunday: Options for cleaning up radioactive waste in the St. Louis area.

FRIDAY, FEBRUARY 17, 1989

13

LEGACY OF THE BOMB



ST. LOUIS' NUCLEAR WASTE

Rediscovering 4 Forgotten Sites

Government lost track of nuclear operations here and nationwide

By Carolyn Bower,
Louis J. Rose
and Theresa Tighe
Of the Post-Dispatch Staff
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SIXTH OF A SERIES

PROPPED UP in his bed at Cochran Veterans Hospital, Tom Green described how he had worked for 12 years as a truck driver hauling radioactive material in the St. Louis area.

He spoke at a fast clip as Kay Drey, a local environmental activist, struggled to take notes.

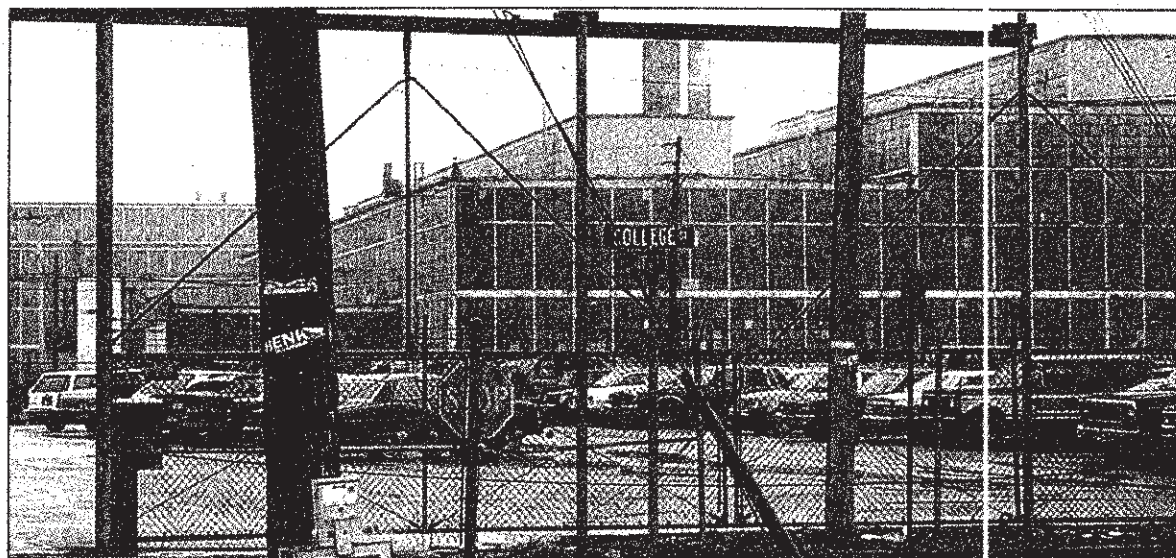
Drey had never met Green before, but she knew from his family that he was seriously ill with cancer of both lungs. Green, who had been a smoker, blamed the cancer on radiation exposure from his job.

As they talked in 1979, Green had no way of knowing that nearly a decade later his comments would lead to the discovery and testing of a potentially contaminated site long forgotten by federal officials.

Green, then 63, told how he had driven truckloads of heavy uranium ingots across the McKinley Bridge to a plant in Madison during the latter half of the 1950s.

He described how the barrel-shaped ingots, 18 inches in diameter and height, were heated and reshaped at the plant at College and Weaver streets then operated by Dow Chemical Co.

Three months after his conversation with Drey in the hospital at 915 North Grand Boulevard, Green



Larry Williams/Post-Dispatch

Former Dow Chemical Co. plant in Madison, where uranium metal was heated and reshaped in experiments in the late 1950s. The plant is now operated by Spectrulite Consortium Inc.

died of the cancer that had spread through his spine and intestines.

Now his account is prompting federal officials to take a new look into whether the former Dow plant may be contaminated.

The Madison plant is one of four "forgotten" sites the Post-Dispatch has discovered in the St. Louis area — sites where radioactive material was processed or stored in virtual secrecy after World War II.

There are dozens of such sites across the country that the federal government lost track of in the

postwar years.

Department of Energy officials say there is no reason to believe that any of the four St. Louis-area sites poses a serious health threat. In at least one case — the former Tyson Valley powder plant in far west St. Louis County — there appears to be no threat at all.

But the agency plans to conduct tests within the next several months at the old Dow plant and at another Illinois site, the old General Casting plant in Granite City. The tests would determine whether buildings or equipment in those two places are contaminated by radioactivity.

The fourth local site would be hard to test. It was a large building — torn down eight years ago — at the former small-arms plant complex in north St. Louis.

Across the nation, federal and military investigators have spent millions of dollars over the last 14 years searching for and testing such "forgotten" sites.

Investigators admit they may not be able to identify all the factories, businesses and warehouses once involved in the country's top-secret production of nuclear arms.

What follows is a discussion of the four area sites that were lost in the shuffle:

The Old Dow Plant

Tom Green had worked from 1946 until about 1958 for several small trucking companies that hauled materials for Mallinckrodt Chemical Works in north St. Louis. The company processed uranium for the federal government under contract to the Atomic Energy Commission.

About a year ago, Post-Dispatch reporters examining the notes taken by Drey noticed the references to Dow.

They were able to confirm through documents and interviews with former Mallinckrodt employees that experimental uranium extrusion work had been performed at Dow during the late 1950s.

But the Department of Energy had lost track of the experimental work.

"We found nothing regarding it. We can't find anything in (our) records," was the first response from Andrew Wallo, an Energy Department spokesman.

After an extensive search, the agency found two

See WASTE, Page 14

Hematite: No Records Or Markings On Burial Pits

By Carolyn Bower,
Louis J. Rose
and Theresa Tighe
Of the Post-Dispatch Staff
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HEMATITE, an unincorporated rural area of Jefferson County, is home to the nation's oldest commercial uranium-fuel production plant.

On the plant grounds are 40 earthen pits containing radioactively contaminated material, possibly including a pickup truck. No one, not even the plant's operator, knows the precise location of each pit. Nor does anyone know exactly what is buried there.

Because the plant is about a quarter-mile from Joachim Creek, some critics have said they fear that either the buried waste or plant operations could contaminate the creek. But officials of the Nuclear Regulatory Commission say they have no reason to believe that.

Despite its pioneer role, the Hematite plant has received little publicity over its 32-year history. It lies on a 155-acre tract off Route P, about 35 miles south of St. Louis.

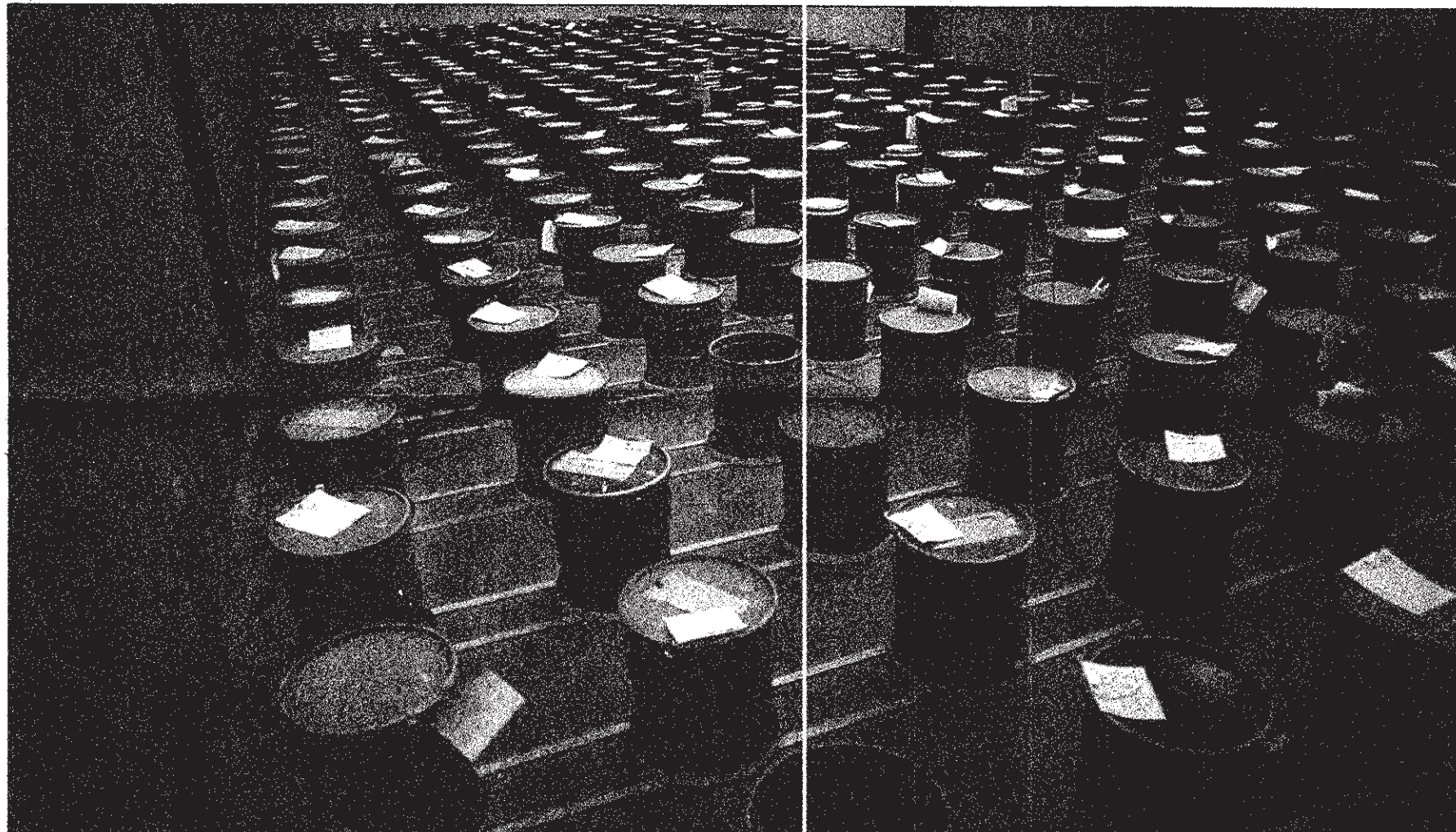
Combustion Engineering Inc., with headquarters in Stamford, Conn., owns and operates the plant. It produces uranium dioxide in powder and pellet form for use as fuel in nuclear reactors.

Combustion Engineering is the fifth operator of the plant since it was built in 1956 by Mallinckrodt Chemical Works.

Burial pits for radioactive waste were first dug at the plant in the late 1950s, according to the NRC.

Each of the 40 pits is said to measure about 20 feet by 40 feet by 12 feet deep. The pits were not lined, capped or specifically prepared to prevent leakage. The buried waste was covered by fill. One federal report said the coverings ranged from 2 to 5 feet in thickness.

Most of the pits are outside a fence that surrounds the plant. But no one knows for sure exactly where. Nor are there records detailing what and how much was buried.



Larry Williams/Post-Dispatch

Said James A. Rode, plant manager for the last 14 years and an employee there since the plant opened: "I can tell you approximately where they are located, because I was here at the times the pits were used. . . . But without markings, you can't exactly identify (their) locations."

According to a 1983 report prepared for the Nuclear Regulatory Commission, some 60 pounds of highly fissionable uranium-235 were scattered throughout materials buried in the pits. There are no other records breaking down the volumes of what was buried there.

For the most part, the burials were made in the late 1950s and early 1960s. They complied with federal

See HEMATITE, Page 14



Larry Williams/Post-Dispatch

ABOVE: Containers of scrap material and residues at the uranium fuel production plant at Hematite, Mo. The containers are separated to avoid setting off a radioactive chain reaction that would release radiation.

LEFT: James A. Rode, plant manager, standing on waste burial grounds outside the plant.

LEGACY OF THE BOMB

ST. LOUIS' NUCLEAR WASTE

Waste

From page one

brief documents that mentioned the extrusion work at Dow.

"We hope to be conducting a radiological survey there later this year," Wallo said. "You could get some contamination in the equipment or the building somewhere depending on the equipment and procedures they used."

Wallo said he doubted there would be enough contamination to pose any serious health threat.

Dow operated the plant in Madison from 1954 to about 1969, employing about 850 workers at one point. The plant has been used primarily for the fabrication of aluminum and magnesium metals.

The plant's current operator is Spectralite Consortium Inc., which took over the facility in late 1986. About 450 people now work there, producing rolled and extruded aluminum and magnesium products.

A Spectralite spokesman said: "We are aware of the interest being displayed in the incident in the past. But we are not commenting."

Officials at Dow's corporate headquarters in Midland, Mich., could find no reference to the extrusion work done at the Madison plant.

Neither could Mallinckrodt. Raymond F. Bentele, president and chief executive at Mallinckrodt, said the company long ago had turned over to the government any records of work it performed for the old Atomic Energy Commission.

In the extrusion process, heated metal is reshaped by forcing it through a specially designed opening.

Uranium bars that ultimately would be used in nuclear reactors were extruded from cylindrical ingots of uranium metal. Each ingot weighed about 3,300 pounds and measured 18 inches in height and diameter.

The tests at Dow were intended to help Mallinckrodt perfect large-scale extrusion procedures for use at the Atomic Energy Commission's uranium processing plant near Weldon Spring.

Wallo said that contamination could have occurred during the heating and extrusion process if uranium oxide flaked off the metal and was carried as dust or small specks in the air.

"There is potential for there to be residual radioactive material above our guidelines, but we certainly don't expect any significant hazard or risk," he said.

The old Atomic Energy Commission generally required careful control of uranium metal for security reasons as well as safety, Wallo said. Also, he said, some degree of cleanup or decontamination normally was required once a job was completed.

Environmentalist Drey takes a more pessimistic view. She said she was concerned that uranium-oxide dust might have settled into cracks in floors, ceilings or concrete walls and still be present.

Robert Alvarez, a frequent DOE critic, said he would not place much confidence in the effectiveness of decontamination efforts at Dow or anywhere else during the late 1950s.

"I am unaware that there were any real standards for decontamination at all at that time," Alvarez said. He is an environmental research professional who is now on the staff of a Senate committee investigating the Energy Department's nuclear programs.

Granite City Plant

On his deathbed, Green also told Drey that uranium metals may have

Sites Where Radioactive Material Was Processed Or Stored



Tom Borgman/Post-Dispatch

Tom Green
1978 photo

been taken for X-ray to the former Dow plant in Madison.

But Energy Department researchers, while checking that statement, found this work actually had been done in Granite City at the old General Castings plant.

From 1958 to about 1966, records show, uranium products from Mallinckrodt had been taken to the General Castings building to be examined for defects with equipment similar to a large X-ray machine.

Now the structure, isolated and no longer in use, is part of the Granite City Steel complex.

Wallo said the Energy Department hopes to test the building within the next few months.

Small Arms Plant

In 1979, St. Louis officials bought and later razed a massive concrete building to make way for an industrial park. They had no way of knowing that tons of radioactive uranium material had been stored at the building after World War II.

Now, eight years after the demolition, no one seems sure where all the rubble from the 725-foot-long structure was hauled and buried. Nor does anyone know whether the building became contaminated by the products stored there.

The building — known as the "proof house" — was part of the Small Arms Plant complex off Goodfellow Boulevard in north St. Louis. It was used during World War II to test-fire machine-gun ammunition manufactured at the complex.

After the war, from 1947 to about 1950, the building was virtually stripped bare and later used by the old Atomic Energy Commission to store uranium products destined for government facilities producing nuclear fuel and weapons.

Workers using flashlights and often groping in the dark in the gutted firing ranges stacked metal and fiberboard containers of

uranium products into thick-walled concrete corridors that ran through the building.

Sources interviewed by reporters said that most items stored in the proof house were finished products from Mallinckrodt awaiting shipment to government facilities at Oak Ridge, Tenn., and other locations.

Federal officials can find no documents relating to the storage.

Wallo of the Department of Energy said parts of the huge building could have become contaminated. But, he said, it is doubtful this ever would have posed any serious health risk.

Alvarez, the critic of the Energy Department, argued that the Energy Department lacks the documentation needed to draw valid conclusions about the site.

"If they weren't monitoring it, they can only guess," said Alvarez.

Mallinckrodt officials say they have no records about what was stored at the proof house; all such records were turned over to the government in 1966.

Harold Thayer, retired Mallinckrodt board chairman, said he knew of no way to accurately gauge the volume of material that may have been stored in the cavernous building.

"There were tons of it," he said. He said the building was used for temporary storage of such materials as uranium tetrafluoride and uranium dioxide — commonly referred to then as green salt and brown oxide.

Others recalled seeing wooden crates containing uranium metal stored at the proof house, as well as empty 55-gallon drums. The materials were trucked from Mallinckrodt to the proof house and later shipped out by rail.

Thayer said Mallinckrodt had used the building at the government's request. He said he did not know whether efforts had been made to decontaminate the structure, or whether decontamination had even been needed.

Asked if there could have been contamination problems, Thayer said: "I don't see how, unless somebody broke a container and spilled it or dropped it. It was all sealed products, as far as I know."

During the Korean War, the government decided to reactivate a number of buildings at the Small Arms complex, including the proof house. A St. Louis firm, Alport Construction, got a contract in 1954 to rehab the structure to put in more sophisticated ammunition-testing equipment.

In 1979, the city's Planned Industrial Expansion Authority bought a 44½-acre tract at the former Small Arms complex, including the proof house. The

purchase was part of an unsuccessful attempt to persuade General Motors Corp. to use the property and keep open its nearby assembly plant.

One year later, the agency contracted with Spirtas Wrecking Co. to demolish about 50 structures at the site, including the proof house.

Arnold Spirtas, president of the company, said that his company no longer had records relating to the demolition or which landfills or dumps were used to dispose of the rubble.

Spirtas said he could not recall details, but he said his company had fully complied with terms of the demolition contract.

One former employee of a nearby business told reporters he had watched some of the demolition work and believed that part of the rubble from the proof house had been buried on site.

However, Thomas J. Mullen, of the city's Economic Development Corp., said he had spent a lot of time at the site and he was sure all of the rubble from the building had been hauled off.

Mullen said he did not know where the wrecking firm took the debris.

Tyson Valley Powder Plant

This is the case of the disappearing waste.

More than 60 tons of radioactive material were stored after World War II in concrete bunkers at what is now Washington University's Tyson Research Center in far west St. Louis County. It was moved somewhere — presumably to a plant near Pittsburgh — but no shipping records can be found.

Federal records that had gone unnoticed for decades show that the old Atomic Energy Commission used at least two bunkers at Tyson for storage in the late 1940s.

The site, about 20 miles west of St. Louis on Interstate 44, was then part of the Tyson Valley Powder Plant, where explosives and ammunition were stored during World War II. The government turned the 1,963-acre tract over to the university in 1963 for use in wildlife and environmental research.

Documents found last year in AEC files said the radioactive material was stored in 250 wooden barrels and metal drums — including 14 containers without tops. The residue was described as "68,103 pounds of C-Special and 53,252 pounds of C-4."

C-Special and C-4 were code names for slag residue from the production of uranium metal.

The AEC stored the material at Tyson from at least May 1947 through March 1948, when memos were being exchanged to negotiate shipment of the residue to a plant at Cannonsburg, Pa.

Federal officials say they are not sure where the material was taken. University officials did not learn about the storage of radioactive residue at Tyson until reporters brought it to their attention last year.

With the university's cooperation, reporters visited the site in June and took radiological readings in and around 16 of the old concrete storage bunkers. None of the readings showed radiation exceeding normal background levels.

University radiation specialists later tested all remaining structures at the site, including 50 concrete bunkers.

No elevated readings were found, university officials said.

Gerry Everding, a Post-Dispatch special correspondent, contributed information for this story.

Waste Drums Stored Secretly

THE federal government secretly stored more than 25,000 drums of radioactive residues at the U.S. Army Depot in Granite City for a five-year period during the 1960s.

Some of the drums were so badly rusted that they leaked or allowed water to collect in them. Others ruptured and spilled their contents while being transferred to rail cars and trucks for shipment.

The drums contained more than 6 million pounds of thorium-bearing residues and rare-earth residues. They were placed at the depot under a program to guarantee the nation supplies of "strategic materials."

In the early 1960s, government officials, concerned about the deteriorating drums, got permission from the Atomic Energy Commission to dump them in a quarry near Weldon Spring.

More than 3,400 drums were pitched into the quarry before the General Services Administration made a deal to sell all 6 million pounds of the residue to a New York-based firm. The company, seeking to recover metals, even sent workers back to the quarry to haul out the discarded drums.

The last of the residue was shipped from the area in May 1966.

At the direction of the Nuclear Regulatory Commission, a radiological survey was made about six years ago at the 930-acre Granite City complex, which is used by some 55 federal agencies.

The survey report said that no radioactive contamination was found.

Hematite

From page one

regulations then in effect. Such burials no longer are allowed by the NRC.

The report in 1983 on the radiological survey conducted for the NRC said in part:

"Apparently, the bulk of buried material consisted of paper, plastic and wood items. Some metal items, such as pipes and buckets, have been buried, although no major metallic objects, except possibly a pickup truck, were disposed of."

"... The overall conclusions are that relatively small quantities of uranium have been buried and that the buried material is essentially stable at this time. The burial pits have little or no effect on the population or the surrounding environment."

In 1985, a former worker at the Hematite plant told the Nuclear Regulatory Commission he feared that leakage from the burial grounds might be contaminating nearby Joachim Creek.

Metal barrels used in the burial of radioactive wastes during the 1950s and 1960s were not always sealed, said the complainant, whose name was kept secret by the agency. He also alleged that water had been observed on occasion in the burial trenches.

But after interviews and a review of documents relating to the pits, the NRC concluded that there was no evidence to support allegation.

Over the years, the plant at times processed a material that was 90 percent uranium-235.

But for the last 14 years, Rode said, the plant has processed material that was no more than 5

percent uranium-235. This has helped reduce risks of accidents and contamination.

"We don't think of ourselves as posing any more risk to the public than any other chemical plant, and probably less, because our industry is heavily regulated and inspected," Rode said.

Nuclear Regulatory Commission records show that the plant was authorized for one year in the early 1970s to possess up to 10 kilograms of plutonium in the form of sealed fuel rods or assembled fuel elements.

That's roughly enough to trigger an atomic bomb of the type that was dropped on Nagasaki at the end of World War II. Plutonium is one of the most toxic and carcinogenic substances known.

But in a recent interview, Rode said: "We have never had or processed plutonium here at the Hematite plant."

"It would have been a cause for concern" if plutonium had been brought to Hematite, Rode added.



Post-Dispatch map

"I am very happy it was never done... That is a horse of a different color... You have to have a facility that is designed for it."

A seven-part Post-Dispatch series

Sunday: Mallinckrodt purifies uranium to help win World War II.

Monday: Uranium workers brush aside early health warnings. Years later, health studies look at cancer rates among employees.

Tuesday: Unknown to area residents, radioactive waste is dumped in North County.

Wednesday: How the Weldon Spring plant became the area's most contaminated site.

Thursday: St. Charles County residents wage war against federal officials.

Today: Four "forgotten sites." Waste is buried in 40 pits at Hematite in Jefferson County.

Sunday: Options for cleaning up radioactive waste in the St. Louis area.

LEGACY OF THE BOMB



ST. LOUIS' NUCLEAR WASTE

Looking Ahead

Waste War Looms As Cities Grapple Over Sites, Funds

By Carolyn Bower, Louis J. Rose and Theresa Tighe
Of the Post-Dispatch Staff
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LAST IN A SERIES

St. Louis is by no means alone in trying to figure out what to do about radioactive waste. The problem is national in scope. It pits cities, counties and states against one another in a scramble for limited federal cleanup money.

Especially stiff competition is coming right now from operating weapons plants in Fernald, Ohio; Rocky Flats, Colo.; Hanford, Wash.; and near Aiken, S.C. Safety problems at those plants are receiving intense public scrutiny.

Cost estimates for cleaning up all present and former installations connected with the nuclear-weapons industry range from \$130 billion to \$200 billion. The cleanup price tag for the St. Louis area's portion now stands at \$700 million.

"Everyone wants his site cleaned up," says Mike Kosakowski, a re-



Tire tracks can be seen on this sign warning that the Berkeley ball fields are closed. They were closed because of radioactivity.

Larry Williams/Post-Dispatch

gional official of the Environmental Protection Agency.

"There is not enough money in the bank. There is not enough engineering talent to address all the sites."

Cleanup issues are at the forefront here 47 years after radioactive waste began piling up from the processing of uranium and other materials for the atomic bomb and the Cold War nuclear-arms race.

Over that time, virtually no progress has been made toward permanently containing radioactive materials.

To some, the problem borders on the unsolvable. Said environmental

activist Kay Drey: "There's no good place to safely dispose of it. We may never know what to do with what we have."

Even the federal government ad-

See WASTE, Page 16

Cleanup Pledge By Bush

By Robert L. Koenig
Post-Dispatch Washington Bureau
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WASHINGTON — President George Bush, responding to a quick lesson about radioactive waste in St. Louis, has told U.S. Sen. Christopher S. Bond and U.S. Rep. Jack Buechner that he would try to restore some federal money for the area's cleanup efforts.

Both Buechner, R-Kirkwood, and a spokesman for Bond, R-Mo., said Bush had taken an active interest in the problem after he got a glimpse from the presidential limousine of a waste site near Lambert Field on Friday. Bush was being driven to a speaking engagement at Washington University.

"The president said, 'My God, I didn't know that site was so close to the airport,'" Buechner said in a telephone interview.

"When I brought up the problems with the funding levels in his budget proposal, Bush said he would ask in a supplemental (budget request) to reinstate the money for the airport site and the Latty Avenue site" in Hazelwood.

Bush's recent budget proposal — like the budget that former President Ronald Reagan submitted in January — does not include \$1.5 million that had been planned for environmental studies of radioactive contamination at the airport site and other spots in St. Louis and St. Louis County, a spokesman for the federal Department of

See CLEANUP, Page 16

LEGACY OF THE BOMB



ST. LOUIS' NUCLEAR WASTE

Waste

From page fifteen
mits that the most up-to-date earthen storage containers would be effective for no more than 1,000 years and possibly for as few as 200 years. Critics doubt the containers would last much longer than 50 years.

Most of the nuclear waste in this area will remain radioactive for at least 4.5 billion years.

Some people view the health risks of low-level nuclear waste as less than acute. They say that to spend \$700 million or more on cleanups in the area would be a misuse of money. And they contend that society's resources could be better used on more pressing matters — perhaps educating people about the dangers of alcohol or drugs or lowering the infant mortality rate.

Said Dr. Henry Royal, director of nuclear medicine for the Mallinckrodt Institute of Radiology: "My fear is that society will spend more money than it should spend dealing with low-level radioactive waste."

But most scientists, citing health hazards, say the government must do what it can to contain the waste.

Even the Energy Department, which constantly downplays the health threats, insists that the material must be cleaned up.

Andrew Avel, an Energy Department manager at Oak Ridge, Tenn., said that although radioactive sites such as the closed-down Berkeley ball fields are not now much of a hazard, they could be if someone grew food or built houses there.

"We don't know what will be out there in 200 to 300 years," Avel said.

So, the Energy Department is trying to clean up the old Mallinckrodt plant in north St. Louis and various North County sites at a cost exceeding \$250 million.

And it already has embarked on a 12-year, \$400 million cleanup at the old uranium plant near Weldon Spring in St. Charles County.

The Energy Department won't touch the highly radioactive West Lake landfill in North County or 40 waste-burial pits at Hematite in Jefferson County. Those sites come under the purview of the Nuclear Regulatory Commission.

Here is a rundown of the agency's cleanup activities in the metropolitan area:

At Impasse With The City

The Energy Department has proposed building an earthen bunker to store 925,000 cubic yards of waste on some 80 acres of land now owned by the city of St. Louis.

To make this possible, the Energy Department wants the city to deed back the 21.7-acre site where the government first buried the first nuclear waste from Mallinckrodt. The government gave the land to the city in 1973.

The Energy Department also wants the city to deed over another 60 acres of adjoining land.

Buried in the bunker would be:

■ About 250,000 cubic yards of contaminated material from the original airport site, off McDonnell Boulevard, north of Lambert Field.

■ About 211,000 cubic yards of contaminated material from Latty Avenue, including two large mounds covered with green plastic on the property of Futura Coatings Inc.

■ About 337,000 cubic yards of contaminated material that seeped, blew and leached from the airport storage site and Latty Avenue into nearby ditches, ballfields and Coldwater Creek.

■ About 127,000 cubic yards of contaminated material from the Mallinckrodt property in downtown St. Louis.

But so far, the St. Louis Board of Aldermen has refused to go along with the plan.

Mary Ross, chairman of an aldermanic committee on radioactive waste, says a history of federal secrecy and doubletalk are why the aldermen want to retain control over the site.

"If we trusted the Department of Energy, we probably would have signed a deed a long time ago," Ross said.

Energy Department officials have threatened to pull out of the cleanup effort unless the city agrees to turn over land for a bunker.

In that event, they say, the city might wind up liable for damage claims or cleanup costs.

In Search Of A Rural Site

Alderman Ross and her colleagues



Steve McCracken (left), deputy manager of the Weldon Spring cleanup, and Rod Nelson, manager of the cleanup, working in a trailer at the abandoned Weldon Spring plant.



Alderman Mary Ross distrusts Energy Department.

are not alone in opposing the Energy Department plan.

Other local governments — including St. Louis County and several North County municipalities — have called for moving the radioactive waste out of the heavily populated area.

Their solution would be a site in rural Missouri. It is unrealistic to expect other states to accept Missouri's waste, any more than Missouri would accept theirs.

Said Drey, the activist: "The radioactive waste should not be located in the center of our state's largest metropolitan area. I think all of Missouri's radioactive waste should be consolidated in one place, and that should be in Callaway County where we already have a nuclear power plant."

Two years ago, two state legislators from Callaway County responded to that idea by suggesting that the waste be put at Weldon Spring or in University City, where Drey lives.

Drey and others who want the waste taken away got a boost from Rep. Jack Buechner, R-Kirkwood. Buechner said Friday that he would file legislation requiring the Energy Department to examine possible sites outside the metropolitan area before requiring the city to turn over the airport land.

If a rural site could be agreed upon, the federal government probably would require the state of Missouri to share the cleanup cost.

There at least is precedent for this kind of solution. Local officials in South Salt Lake, a suburb of Salt Lake City, Utah, won a prolonged battle to have radioactive material moved 85 miles to a remote site in the state. Utah paid 10 percent and the federal government 90 percent of the cost of the two-year cleanup, which was completed last June.

Cleanup Near Weldon Spring

A truce prevails in St. Charles County as the cleanup gets under way at the old uranium processing plant on Missouri Highway 94 near Weldon Spring.

Department of Energy officials have suggested storing the waste in an earthen storage container covering anywhere from 45 to 58 acres on the site.

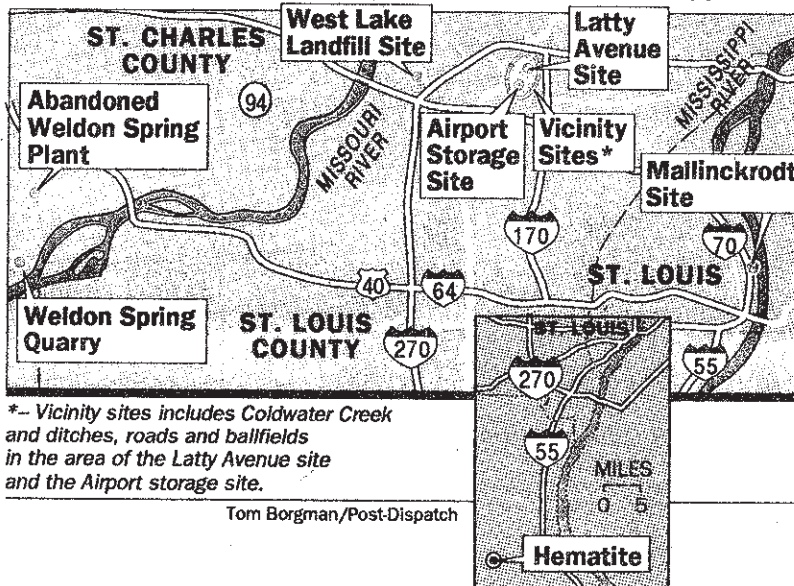
Although most residents welcome the cleanup, they want assurances that the Department of Energy will do it correctly. One of their greatest fears is that radioactive dust from the demolition of 68 buildings at the plant

Volume Of Waste		In thousands of cubic yards				
Site	Volume	250	500	750	1,000	1,250
Airport Storage site	250					
Latty Avenue site	211					
Vicinity sites*	337					
West Lake landfill site	170					
Mallinckrodt site	127					
Weldon Spring site		1,300				
Total		2,335				
Cost Of Cleanup		In millions of dollars				
Site	Cost	\$200	\$300	\$400	\$500	\$600
Airport Storage site	\$53					
Latty Avenue site	\$77					
Vicinity sites*	\$71					
West Lake landfill site	\$25					
Mallinckrodt site	\$46					
Weldon Spring site		\$400				
Total		\$975				

Source: U.S. Department of Energy

Tom Borgman/Post-Dispatch

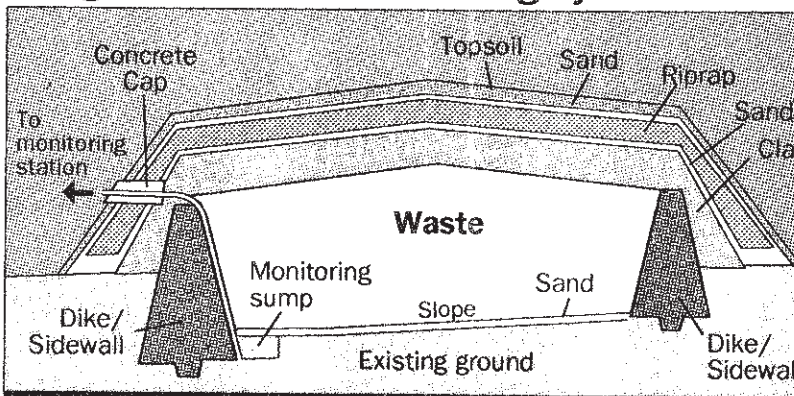
Radioactive Waste Sites In The St. Louis Area



* - Vicinity sites includes Coldwater Creek and ditches, roads and ballfields in the area of the Latty Avenue site and the Airport storage site.

Tom Borgman/Post-Dispatch

Design For Leachate Monitoring System



Source: Bechtel National

may endanger the health of 2,300 students and employees at Francis Howell High School.

The school is a half-mile downwind from the old plant. Federal officials say the work will pose no threat.

In a building moved here from Ohio at a cost of \$1.5 million, federal employees, construction workers and scientists plan how to proceed. Men in moon suits conduct tests to determine the extent of the contamination.

About four miles to the south is a nine-acre quarry filled with black water and about 10,000 truckloads of radioactive debris.

The quarry is less than one-fourth mile from the well field that supplies much of St. Charles County with drinking water.

Pending the outcome of geological

and hydrological tests, federal officials are leaning toward moving waste from the quarry to the earthen storage container at the old plant site.

The cleanup of the plant and the quarry originally were expected to be completed at the end of the year 2010.

But Rodney Nelson, manager of the cleanup, said proposed cuts in the project's annual budget could double both the \$400 million cost and the 12-year timetable.

That would make the cleanup of all waste in the St. Louis area — waste that began so innocently with the effort to develop the Atomic Bomb — a project of more than \$1 billion.

Gerry Everding, a Post-Dispatch special correspondent, contributed information for this story.

Readers May Direct Queries To Experts

Officials in various fields will answer questions Post-Dispatch readers may have about issues raised in "Legacy Of The Bomb: St. Louis' Nuclear Waste."

For more information about health studies financed by the Department of Energy, write Dr. Shirley Fry, Oak Ridge Associated Universities, P.O. Box 117, Oak Ridge, Tenn., 37830.

Dr. Alice Stewart of Birmingham, England, also is trying to do studies that would include the Mallinckrodt workers. For information, write Dr. Jonathan Berger, Three Mile Island Health Fund, 622 Locust Street, Philadelphia, Pa., 19103.

Former uranium workers interested in obtaining their exposure records from the Department of Energy can write Jane Greenwalt, Department of Energy, P.O. Box 2001, Oak Ridge, Tenn., 37831-8501.

Officials with the Missouri Department of Health will respond to questions about health. The department also maintains a cancer registry. Write Mark Roebuck at the Department of Health, P.O. Box 570, Jefferson City, 65102.

Details on the contamination in the Weldon Spring area will be provided by Martin Janowski, Community Relations Manager — Weldon Spring Cleanup, Route 2, Missouri Highway 94 South, St. Charles, 63303.

Environmental activist Kay Drey of University City also has information concerning the nuclear waste in the St. Louis area. She can be reached at 515 West Point Avenue, University City, 63130.

In St. Charles County, people who live near the abandoned uranium processing plant and want their wells tested can write Daryl Roberts or Gale Carlson, Bureau of Environmental Epidemiology, Missouri Department of Health, P.O. Box 570, Jefferson City, 65102.

St. Louis County residents with health concerns can write Dr. Wayne Black, St. Louis County Department of Health, 121 South Meramec Avenue, Clayton, 63105.

Uranium Plant Off-Limits To U.S., Ohio Inspectors

The uranium-processing plant in Fernald, Ohio, is so contaminated by radiation that state and federal agencies have barred their inspectors from the plant.

The U.S. Environmental Protection Agency and its Ohio counterpart took the action last week after two federal inspectors became contaminated by uranium in December while attending meetings there.

Uranium analysis showed the contamination. The inspectors suspect they either inhaled or swallowed uranium dust while in the plant.

The Fernald plant, 18 miles northwest of Cincinnati, has become a prime example of what can happen when waste from a nuclear processing plant poisons its environment.

It is expected to cost about \$5 billion to clean up the mess at Fernald.

That's more than five times what federal officials estimate it could cost to clean up all the radioactive waste in the St. Louis area.

Some people fear that the cleanups at Fernald and nuclear weapons plants across the country will divert cleanup money needed in St. Louis, St. Louis County and St. Charles County.

The Fernald plant was opened in 1952 by the Atomic Energy Commission, with help from chemists and engineers at Mallinckrodt Chemical Works in St. Louis. Mallinckrodt's employees pioneered many advances in uranium processing.

In 1966, when the federal government closed its plant near Weldon Spring in St. Charles County, the ura-

nium processing that had been done there was shifted to Fernald.

Since then, the Fernald plant has been the nation's sole source of uranium fuel for plutonium production and has been spewing nuclear pollution into the environment.

Ohio officials say that in the 37 years it has been in operation, the plant has released 298,000 pounds of uranium wastes into the air and 167,000 pounds of wastes into the Greater Miami River.

Another 12.7 million pounds of waste were put into pits, which may be leaking. And the plant's concrete storage tanks are cracked and leaking.

Leaking radioactivity has contaminated the Great Miami Aquifer, which supplies drinking water to about 2 million people in the Cincinnati area. The plant sits on the aquifer. Some privately-owned drinking-water wells nearby have been closed because of radioactivity.

Recent tests have turned up genetic deformities in small animals living around six waste pits and an incinerator at Fernald.

Two weeks ago, the U.S. Environmental Protection Agency asked for more tests to determine whether the contaminated water or tainted soil might be causing the mutations and, if so, whether people in the neighborhood might be at risk.

In December, a federal study recommended that Fernald be closed by 1994 to allow cleanup to begin. The cleanup is expected to take at least a decade.

Cleanup

From page fifteen

Energy said. The budget proposal for the fiscal year that begins Oct. 1 also would cut the amount for the Weldon Spring cleanup in St. Charles County to \$9.4 million, from the \$15.9 million that had been requested by the Energy Department. The manager of the Weldon Spring cleanup has said such cuts in the project's annual budget could double both the \$400 million total cost and the 12-year timetable.

Warren Erdman, Bond's top aide in Washington, said Saturday that Bush had asked, "What's hot in St. Louis?" as the presidential party was driving near the airport.

"You're driving past what's hot here," Bond replied, according to Erdman. "We have some big concerns about our nuclear waste problem."

Bond told Erdman that Bush "showed great concern about St. Louis' nuclear waste problems, and said he wanted to work with Missouri's congressional delegation to help get the (cleanup) job done."

Erdman said Bond planned to work on the Senate Budget Committee to "make sure the cleanup money is in the final budget" for the work at Weldon Spring as well as for the study of other radioactive waste sites in the St. Louis area.

Steve Hilton, a spokesman for Sen. John C. Danforth, R-Mo., said Friday that Danforth wanted to make sure that the cleanup of the radioactive waste sites in the St. Louis area "should be done as quickly, as efficaciously and as safely as possible." He said Danforth would support full funding of the cleanup efforts.

But some members of Missouri's delegation in Congress said Friday that the impasse between the Energy Department and St. Louis officials about ownership of the property north of Lambert that Bush glimpsed was the biggest barrier to cleanup efforts.

In the last few weeks, the Energy Department has been using what one area congressman called "high-pressure tactics" in an effort to persuade St. Louis officials to deed over about 80 acres of land near Lambert for a bunker to store the radioactive waste from that site, the Latty Avenue site and from Mallinckrodt Inc. property in St. Louis.

One of the Energy Department's tactics is to warn that if the Lambert

and Latty Avenue sites are put on the federal National Priority List, or Superfund, the city would be liable to share part of the cleanup cost for those sites.

If the city deeds over the land, it would not be liable, officials said.

Thomas A. Villa, president of the St. Louis Board of Aldermen, said that officials from the Energy Department made that warning explicit during a recent meeting with city officials in St. Louis.

"The financial liability would certainly be devastating" for the city, Villa said at an Airport Commission meeting Thursday. Villa said he would back efforts to convey the 80-acre site to the federal government so the city could avoid the potential costs.

But Alderman Mary Ross, D-5th Ward, chairman of the Board of Aldermen's radioactive waste committee, continues to block that step. She says the board wants the city to keep control over the property because it does not trust the Department of Energy to keep its promises.

The Board of Aldermen will not meet again until April 17; no decision on the property deed is likely until at least then.

Meanwhile, Energy Department officials have told congressmen and others that they are pushing for the airport and Latty sites to be added to the Superfund list.

A regional official for the federal Environmental Protection Agency, which administers the Superfund, confirmed recently that the airport and Latty sites were being considered for the new Superfund list. But an EPA spokesman in Washington declined to give the status of the proposal.

The Weldon Spring site has been on the national priority list since 1987.

Meanwhile, Buechner said Friday that he planned to introduce legislation soon — possibly with the support of other members of Missouri's delegation — designed to give St. Louis officials "a little more breathing room" in making a decision on the property transfer at the airport site.

Buechner said his measure would require the Energy Department to complete the environmental review process at the St. Louis sites and also look at other sites for the bunker — either in Missouri or outside of the state — before the city could be required to turn over the airport land to the federal government.