

5. PUBLIC AWARENESS AND RESISTANCE TO ROCKY FLATS (1970-1989)

Introduction: As noted earlier, the Denver-area public was mostly ignorant about Rocky Flats until Edward Martell and Stuart Poet found plutonium in the off-site environment after the Mother's Day, 1969, fire and informed the public that Rocky Flats was a nuclear weapons plant that had endangered them ever since it began operations in 1952 by releasing lethal toxins. This chapter focuses on the two decades from the 1969 fire till the 1989 FBI raid and "temporary" halt to production later that year, a "temporary" halt that became permanent. These two decades were marked by heightened public awareness, new information becoming available and a very rapid growth of opposition to Rocky Flats. In this period both the EPA and the state began regulation at the plant. In 1992 the plant's mission was changed from production to cleanup..

AEC scientists map plutonium contamination: After Martell's revelations in 1970, AEC brought their own scientists to Colorado to sample the off-site environment either to refute or to confirm what Martell had reported. The visiting scientists, P. W. Krey and E. P. Hardy of AEC's Health and Safety Laboratory in New York City, more than confirmed the accuracy of Martell and Poet's work. In 1970 they produced a long report that included a map with odd-shaped "isopleths" showing relative concentrations of wind-blown plutonium released from Rocky Flats and deposited in soil on and off the plant site (see Figure 5.1).

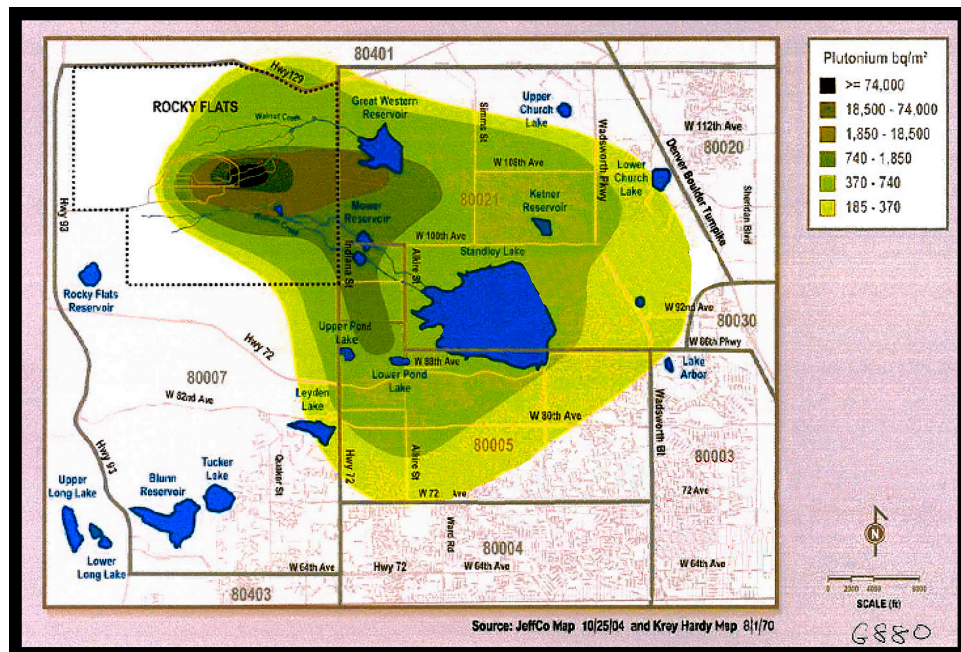


Figure 5.1: 1970 map by AEC scientists P. W. Krey and E. P. Hardy of plutonium contamination at Rocky Flats. The amoeba-like isopleths show distribution of windblown plutonium in becquerels per square meter (Bq/m²). One becquerel = one disintegration (release of radiation) per second. From Krey and Hardy, "Plutonium in Soil Around the Rocky Flats Plant," HASL 235 Report (1970). The map shows an area of about 30 square miles off the Rocky Flats site that is contaminated with plutonium released from the plant. This color adaptation of the original black-and-white map was used to delineate the area of the class of affected property owners seeking compensation for damage to their property in the Cook v. Dow & Rockwell lawsuit heard in Denver federal court. This case will be discussed later.

Krey: Plutonium deposited throughout the Denver metro area: Martell was the first of a number of independent scientists to play a major role in bringing public attention to Rocky Flats. Before telling more about him and the contributions of others, I'll mention another crucial finding of

AEC scientists Krey and Hardy. When they produced their 1970 map of plutonium contamination on and near the Rocky Flats site (Figure 5.1), they didn't just sample close to Rocky Flats. They took 25 soil samples across the Denver metro area in an effort to find out how much plutonium had been released from Rocky Flats and where it had gone. Krey published the results in *Health Physics* in 1976. His article included a map, again with isopleths showing relative concentrations of wind-blown plutonium (see Figure 5.2). Plutonium quantities decreased in samples further out from the plant site until finally deposits from Rocky Flats could not be distinguished from background. Krey's map shows that plutonium released from Rocky Flats was deposited across all of the City of Denver. The quantity of plutonium in off-site soil found by Martell and Poet after the 1969 fire and soon after by Krey and Hardy was at that time regarded as disturbing by Martell and others.

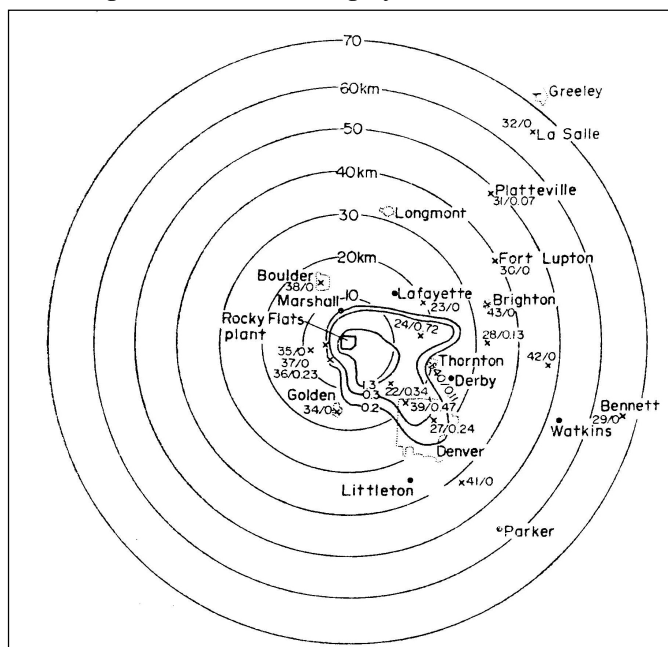


Figure 5.2: Plutonium released from Rocky Flats in soil in the Denver metro area. Each X on this map designates a soil sampling site. The first of the pair of numbers adjacent to the sampling site represents the site number. The second (following the slash) represents the Rocky Flats plutonium in millicuries per square kilometer (mCi/km^2) measured at that site (one millicurie is $1/1000^{\text{th}}$ of a curie). The outlines of the isopleths reflect the concentration contours of Rocky Flats plutonium in the soil expressed as mCi/km^2 . The concentric circles show distances from the center of the Rocky Flats plant in kilometers (1 km = 0.62 mile). P. W. Krey, "Remote plutonium contamination and total inventories from Rocky Flats," *Health Physics*, 1976, vol. 30, p. 210.

The State of Colorado sets a meaningless standard for plutonium in soil: In response to all these revelations about plutonium released from the plant into off-site areas, Colorado was the first state with a DOE nuclear weapons plant to set a standard for plutonium permitted in off-site soil. In January 1973 Colorado stated that land where plutonium contamination exceeds 0.2 disintegrations per minute per gram of soil (dpm/g) is "unfit for residential use, subdivision development, or commercial and industrial uses."¹ But this strict rule did not last. Less than two months later the state increased by tenfold the amount of plutonium to which exposure was allowed, from 0.2 dpm/g to 2.0 dpm/g . And it lifted its prohibition against residential, commercial, or industrial uses in areas where contamination did not meet the new standard; hereafter it would merely require "special

¹ R. L. Cleere, "Public notice of plutonium contamination in the area of the Dow Chemical Rocky Flats Plant," Signed R. L. Cleere, Executive Director, CDH, January 24, 1973.

techniques” for construction in these areas, such as plowing plutonium under.² Thus, the standard was completely gutted of its original provisions for public health. In 1975, Martell criticized the state standard for being at least 20 times too high and not protective of public health.³ Nonetheless, the revised standard remains in effect today, allowing residential development very near the site. To the state government, economic growth is more important than protecting public health.

Tripling the size of the Rocky Flats site to create a buffer zone: In February 1974, eleven months after establishment of the state’s 2.0 dpm/g standard for plutonium in off-site soil, the AEC more than tripled the size of the Rocky Flats site by adding 4,550 acres, mainly on the downwind, down gradient east side where the boundary was moved out to Indiana St. This meant that most land where the plutonium contamination was too high to meet the state’s 2.0 dpm/g standard was now incorporated within the Rocky Flats property on federal land where the state’s standard did not apply and could not be enforced.

The state’s misleading soil sampling practice: In enforcing its new standard for plutonium in soil in areas east of the enlarged site, CDH employed from the outset a sampling method that thwarted its ability to locate places where the plutonium concentration exceeded the standard. Rather than analyzing specific samples for their radiation content, CDH divided the area to be sampled into large sectors, then calculated the average plutonium concentration in each sector by compositing all the soil collected from twenty-five samples taken from within that sector.⁴ This approach may show average distribution in large areas, but it dilutes particular points where readings are high by averaging them with lower ones, making identification of hot spots impossible.

CDH’s soil sampling also misrepresented reality in that over time its samples were collected to increasingly greater depth. This diluted the material measured and gave the impression that the quantity of plutonium in the soil was steadily decreasing. An internal study criticized this practice and showed that plutonium concentrations in soil around Rocky Flats had changed little from 1970 until 1991.⁵ For public health assessments, CDH eventually adopted the practice of compositing samples taken from the top quarter-inch of soil within a given area, continuing in shallow surface soil the method criticized in the previous paragraph. The words of German analyst Ulrich Beck are apt: “Whoever limits pollution has also concurred in it.” Standards for “permissible” exposure “may indeed prevent the very worst from happening,” he continues, “but they are at the same time ‘blank checks’ to poison nature and humankind a bit.”⁶

Martell and the public: Rocky Flats a local hazard and a global threat: Martell’s revelations after the 1969 fire sparked public awareness and action. “Nobody knew anything about Rocky Flats until his study,” said Judy Danielson, a physical therapist. She used Martell’s work to organize people to go door-to-door in areas east of Rocky Flats asking residents if they could collect a scoop of dirt from their yards to test for radiation content. They labeled these samples with names and addresses and took them to public meetings of candidates for Congress in 1972, asking those running for office to get the samples analyzed and to explain what they’d do about Rocky Flats.⁷ This attracted media attention and helped make Rocky Flats an issue that candidates for public office could not ignore.

² “Amendment to the State of Colorado Rules and Regulations Pertaining to Radiation Control, Subpart RH 4.21.1,” Adopted Colorado State Board of Health, March 21, 1973.

³ Martell, “Basic considerations in the assessment of the cancer risks and standards for internal alpha emitters,” at the public hearings on plutonium standards, US EPA, Denver 1975, pp. 17, 20.

⁴ Jonathan Love, “Rocky Flats Soil Plutonium ²³⁹⁺²⁴⁰Survey from 1970 to 1991,” Denver: CDH, 1994.

⁵ Richard H. Jones and Yiming Zhang, “Spatial and temporal analysis of the Rocky Flats soil plutonium data,” Denver: CDH, September 19, 1994.

⁶ Beck, *Risk Society: Towards a new modernity*, trans. Mark Ritter (London: Sage, 1992), p. 64.

⁷ Ackland, *Making a Real Killing*, p. 169.

In 1974, Danielson, a Quaker, and Pam Solo, a nun from the socially active Sisters of Loretto, were hired to share a staff position at the Denver office of the American Friends Service Committee. Their focus: nuclear weapons production at Rocky Flats. Thus began what by the end of the decade had blossomed into a national and global movement of resistance to nuclear weapons. The Rocky Flats Action Group, an umbrella body that grew out of the AFSC activities, labeled Rocky Flats a “local hazard and a global threat.” The “local hazard” was the public health and environmental danger Martell had exposed, the “global threat” the possible nuclear holocaust that haunted him. Observing bomb tests in the South Pacific as an Army radiation health specialist made him, he said, “quite a pacifist. If you appreciate the effects of thermonuclear explosions, you aren’t going to be disposed toward the military and wars as the means of settling national affairs.”⁸ The Rocky Flats movement thus articulated and elaborated Martell’s twin concerns (see Figure 5.3).

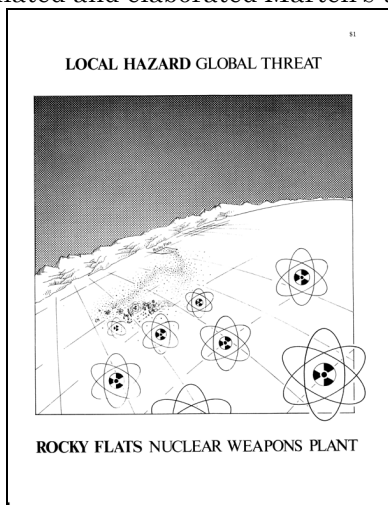


Figure 5.3: In 1977 the Rocky Flats Action Group published this 20-page booklet. It was packed with most of what was then publically known about Rocky Flats.

The Lamm-Wirth Task Force calls for shutdown of Rocky Flats: Pressure from those energized by Martell led to the creation in late 1974 of the Lamm-Wirth Task Force on Rocky Flats by newly elected Governor Dick Lamm and Congressman Tim Wirth, whose district included Rocky Flats. The Task Force Final Report issued in 1975 recommended that Rocky Flats be closed and its work be relocated.⁹ This recommendation would not be forgotten.

The Rocky Flats Monitoring Committee: One recommendation of the Lamm-Wirth Task Force was creation of a citizen oversight group. Thus, in 1976 the government created the Rocky Flats Monitoring Committee, probably the first citizen oversight group for a nuclear weapons facility anywhere. Pam Solo, the only “adversary” appointed to this body, reported that they met on a regular basis, toured the Rocky Flats buildings, saw everything, were ‘dazzled’ with technology, and were treated like VIPs. “The language and euphemisms that they used – a nuclear excursion, as though it was a trip up the Colorado River. You kind of kill off the language.” She pressed them: “The Task Force says shut it down and convert it. How are we going to move on this? They would all look at me like I had pulled their pants down.” Those meetings, she said, left her “totally numb and sick.”¹⁰ The group’s funding ended in 1981.

Martell on the danger of plutonium’s alpha radiation: Martell emphasized that plutonium alpha particles taken into the body do not distribute uniformly in an organ, as assumed by those

⁸ Ibid., p. 162.

⁹ *Lamm-Wirth Task Force on Rocky Flats: Final Report*, October 1975.

¹⁰ Pam Solo, Interviewed by Moore, Newton, MA, September 23, 1996.

“who persist in using the average whole organ dose as the measure of cancer risk” for setting exposure standards. Instead, within the body, alpha particles clump in “hotspots” where their energy is concentrated at levels 100 to 1000 times their average organ concentrations, a fact ignored by most of those who set standards. Also, in the process known as “alpha recoil,” alpha particles subdivide into a cloud of smaller particles, thereby enhancing and intensifying the potential for harm to surrounding cells, possibly inducing cancer or creating conditions for other ailments.¹¹ He noted that “plutonium in fallout from nuclear tests is now present at measurable levels in all human organs.” While the amount is small, it “will certainly contribute to the initiation and progression of malignancy in the general population,” particularly when radiation from other sources is added.¹²

Martell calls attention to the commonly ignored danger of naturally occurring radiation:

Martell estimated that 80 percent of all cancers are radiation induced, most of them “attributable to lifetime exposures to natural background radiation.”¹³ Those who ignore the adverse role of naturally occurring radiation, he noted, find it easy to allow additional exposure from human-made sources. Internal alpha emitters, from natural as well as unnatural sources, “may be the principal agent of radiation-induced cancer” as well as the major contributing factor in arteriosclerosis and resultant cardiovascular disease.¹⁴ The record from Rocky Flats and other plutonium-processing sites suggests increased incidence of coronaries among plutonium workers.¹⁵

Martell calls for independent studies of radiation health effects: In February 1995 Martell wrote to then-Energy Secretary Hazel O’Leary urging a full-scale study of plutonium health effects, especially to protect workers. Such a study, he said, must not, as in the past, be “controlled by a vested-interest establishment that has contrived to minimize or ignore adverse effects of all sources of human exposure to ionizing radiation.”¹⁶ O’Leary did not reply.

A few weeks before his July 12, 1995, death, Martell, with a sarcastic twist, told close friend chemist Niels Schonbeck that he had failed to realize that “the point was, if there’s something disturbing going on, look the other way.” He, clearly, was not one who looked the other way. Later, with sadness, he said, “I worry about all future generations, because we’re not studying radiation-induced health effects, not objectively, not thoroughly.”¹⁷

Rocky Flats and animals: Alerted by Martell’s report, some local farmers, ranchers and pet owners who lived near Rocky Flats worried that their animals may have been exposed to radiation, because some had weird abnormalities. Bini Abbott, who ran a ranch for abandoned and abused horses about a mile-and-a-half downwind of the plant, had so many horses with health problems that she began to freeze some of their body parts for later examination¹⁸ (see Figure 5.4). Loyd Mixon, a local farmer with numerous deformed animals, created quite a stir when he took “Scooter,” a pig with no hind feet and misshapen ears, to a meeting of the Lamm-Wirth Task Force in 1974¹⁹ (see Figure 5.5). As if items like these were not enough, the EPA reported in December 1974 that cattle in a pasture just east of Rocky Flats had more plutonium in their lungs than cattle grazing on the

¹¹ Martell, *Natural Radionuclides and Life* (unpublished manuscript), chap. 4.

¹² Ibid., chap. 7, pp. 7-8.

¹³ Ibid., chap. 7, p. 11.

¹⁴ Martell, “Tobacco radioactivity and cancer in smokers.” *American Scientist*, July-August 1975, vol 63, pp. 409-410.

¹⁵ Martell, interviewed by Robert Del Tredici, July 22, 1982.

¹⁶ Martell to Energy Secretary Hazel O’Leary, February 9, 1994.

¹⁷ Martell, interviewed by Niels Schonbeck for the Rocky Flats Health Advisory Panel, February 21, 1995.

¹⁸ Ackland, *Making a Real Killing*, pp. 166-167; Iversen, *Full Body Burden*, pp. 65-66.

¹⁹ Ackland, *Making a Real Killing*, pp. 183; Iversen, *Full Body Burden*, pp. 123, 138.

Nevada Test Site where the U.S. had exploded hundreds of nuclear bombs during the 1950s and 1960s²⁰ (see Figure 5.6). Animals at Rocky Flats will be discussed more fully below.



Figure 5.4. A windy day at Bini Abbott's horse ranch, about a mile-and-a-half downwind of the Rocky Flats plant, which is up the hill beyond the horses, hidden by flying dust. Photo by John Till, 1999.



Figure 5.5: Farmer Loyd Mixon, who lived downwind of Rocky Flats, and deformed pig "Scooter."

²⁰ Iverson, *Full Body Burden*, p. 113.



Figure 5.6: Cows grazing just east and downwind of the Rocky Flats plant. Photo by John Till, 1999.

More bad news: Tritium found in Great Western Reservoir: Throughout the early 1970s Rocky Flats was in the news often, and the news was not good. On April 24, 1973, Al Hazle of CDH discovered tritium in the water of Great Western Reservoir, a lake just east of the Rocky Flats boundary that was the source of Broomfield’s drinking water (for the location of Great Western Reservoir, see Figure 5.1 on p. 36). Tritium is a radioactive form of hydrogen used in thermonuclear bombs but supposedly not present at Rocky Flats. In the form of “tritiated water” it cannot be separated from the water and thus is readily internalized. Once in the body it can prove harmful, because, with a half-life of only 12.3 years, it emits radiation rapidly. CDH did not tell the public about finding tritium, but it informed the AEC. Behind the scenes for several months the AEC and Dow, without doing any analysis of the reservoir, denied that Rocky Flats was the source of the tritium. In September, the governor publicly disclosed the fact that there was tritium in the Great Western Reservoir, creating quite a stir.

After the governor’s revelation, the AEC finally conducted an investigation and announced that its own Livermore Laboratory in California had accidentally sent tritium to Rocky Flats. This made the tritium incident a full-fledged scandal. Not only were people drinking a radioactive substance but those in charge didn’t seem to know where it came from and what was happening. With all this attention, CDH said the tritium is harmless. Martell strongly disagreed. Things moved slowly. A quarter-century later, in 1998, Broomfield finally got a new source of drinking water, paid for by AEC’s successor, the Department of Energy, without DOE admitting that tritium endangered anyone’s health.²¹ Despite the denials from Rocky Flats, Edward Putzier, a health physicist at the plant, wrote in a 1982 paper that some Rocky Flats glove boxes contained “massive amounts” of tritium,²² suggesting even greater official ignorance at Rocky Flats – or denial or outright lying.

Changing of the guard at Rocky Flats: Writer Len Ackland says, “The tritium fiasco was the last straw for Dow Chemical at Rocky Flats.” The company had lost favor with the public – with all the reports about accidents, fires, spills and releases – but now even some in the workforce and in Congress were critical.²³ In 1998, I interviewed for the Rocky Flats oral history collection Jim Kelly, former president of the United Steelworkers Local 8031, the principal union at Rocky Flats. He told me about his testimony before a Congressional committee about Dow’s poor safety record not in the community but with employees, workers at the plant. He thought this hearing was a tipping point

²¹ Ackland, *Making a Real Killing*, pp. 171-173, 176; Iversen, *Full Body Burden*, pp. 96, 100-101

²² Putzier, “The Past Thirty Years at Rocky Flats,” November 1982.

²³ Ackland, *Making a Real Killing*, p. 176.

for the company.²⁴ Dow soon announced it would not seek renewal of its contract at Rocky Flats. In November 1974, AEC replaced Dow with Rockwell. Less than two months later, in January 1975, AEC itself was divided into two parts, the Nuclear Regulatory Commission, responsible for nuclear power, and the Energy Research and Development Administration (ERDA), in charge of weapons. Two years later ERDA was renamed the Department of Energy (DOE). One complaint about the AEC was that it was self-regulating. This continued with DOE.

Biology Professor Harvey Nichols hired to sample airborne plutonium, becomes major critic of Rocky Flats: In 1975 the ERDA hired British-born Dr. Harvey Nichols, a specialist in aerial transport of pollen, to study airborne particles at Rocky Flats. At the time he did not know that the plant produced the fissile plutonium cores for warheads. In 1975-76 he took snow samples across the whole of the roughly ten square-mile Rocky Flats site. All his samples were radioactively “hot,” even those from areas predominantly upwind. He estimated that about 14 million radioactive particles per acre were deposited on the site in less than two days of snowfall.

To determine what kind of radiation was being emitted, he brought particles present in the snow into contact with radiation-sensitive film. The particles etched fission tracks and “star bursts” on the film, indicating alpha radiation emitted by plutonium. This meant that tiny plutonium particles released from the tall smokestack at Rocky Flats (see Figure 5.7) and floating in the air had, in Nichols words, “been scavenged from the air by the falling snow.” He concluded that routine operations at the plant were constantly dusting the Rocky Flats site with “up to tens of billions of plutonium particles per acre.”²⁵ This constant dusting, of course, included the “buffer zone,” land that is now the Rocky Flats National Wildlife Refuge.

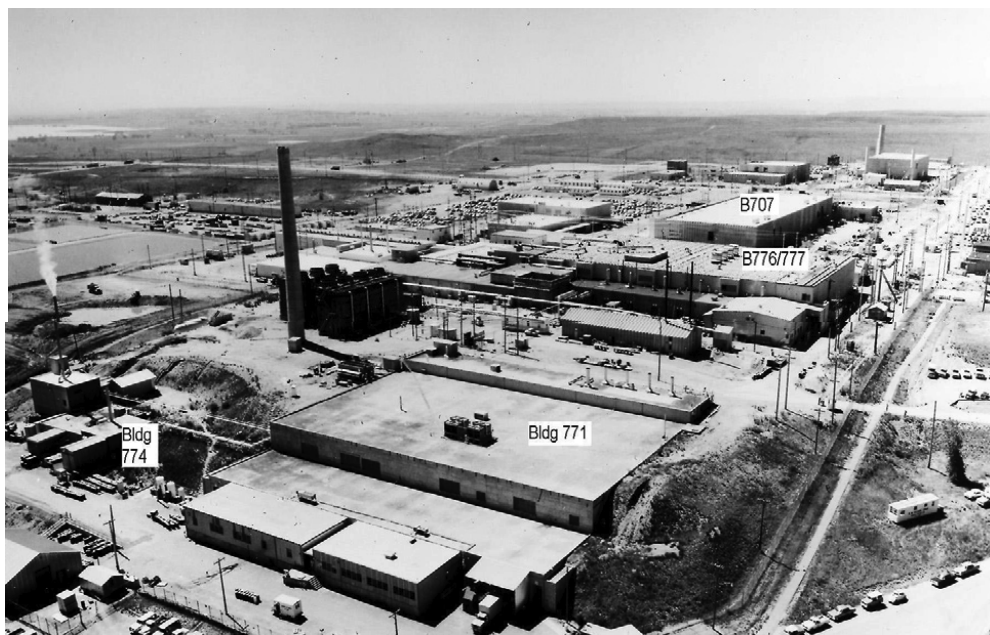


Figure 5.7: Photo from 1969 showing the 150-foot tall stack. Nichols realized that plutonium was being routinely released from this stack. In the picture one can see the three plutonium processing buildings (771, 776/777, and 707). The view is southeast. Standley Lake is visible in the upper left. Missing is the high-security barrier erected around the plutonium area in the early 1980s.

²⁴ Kelly, Maria Rogers Oral History Program, <http://oralhistory.boulderlibrary.org/interview/ohxxxx/>

²⁵ Nichols, Final Report on ERDA Contract EY-76-S-02-2736 and personal communications dated November 21, 2003, and October 15, 2009. See also Nichols, Rocky Flats: A Detective Story at <http://www.rockyflatsnuclearguardianship.org/#!/presentation-by-harvey-nichols/c1m2k>

Years later, in response to Nichols' questioning at a hearing on Rocky Flats before the Colorado State legislature, officials from Rockwell International, the company that ran the plant, admitted that plant operations routinely released plutonium particles to the environment. A 1992 report by ChemRisk contains a graphic image (see Figure 4.11, p. 35) that shows the magnitude of these routine releases during production years at the plant. Far more plutonium was actually released in day-to-day operations than in the extreme events of the 1957 fire, the 1969 fire and the leaks at the 903 drum storage area.

Nichols disagrees with government agencies about contamination of the buffer zone:

Nichols is convinced that the tiny plutonium particles released from Rocky Flats are still present in the soil of the buffer zone, now the Rocky Flats National Wildlife Refuge. But the government agencies responsible for the Superfund "cleanup" of the site did no remediation in the buffer zone, because in their view this part of the site contained little contamination. The method they used to characterize the area (locate, measure and map contamination) is called "kriging." This commonly used method estimates contaminant concentration in a given area by averaging a few surface soil samples collected within a large plot – say, 5 plutonium samples averaged from a plot of 25 or more acres. It may miss or average away hot spots. In the buffer zone it showed plutonium contamination to be either non-existent or insignificant. Nichols trusts results of his own sampling more than the kriging reports. He says most of the tiny plutonium particles released into the buffer zone soil either blew away to another location or remain – not necessarily on the surface, likely percolated down a bit, but still there.

Nichols says airborne plutonium was inadequately monitored around the perimeter of the Rocky Flats site: By the late 1970s DOE, EPA and CDH were periodically reporting to the public results of air monitoring around the perimeter of the Rocky Flats site (see Figure 5.8). Their reports routinely showed little or no plutonium leaving the site. As soon as Nichols, who is very experienced with air monitoring, saw the equipment being used at Rocky Flats, he called it laughable. To do an effective job, air monitors must have maximum intake of airborne particles, but this was not possible with the monitors at Rocky Flats. They did not pivot into the wind, did not compensate for changes in wind speed, and were roofed in a way that prevented intake of many particles.²⁶ As a result, the periodic reports of Rocky Flats air-monitoring data misrepresented reality and were more "a program to reassure the public rather than the sound, unimpeachable scientific endeavor that was actually needed."²⁷ With airborne plutonium poorly monitored at the perimeter of the site, Nichols thought multitudes of tiny particles had been distributed off the site as well as on, a fact already demonstrated by Martell as well as AEC scientists Krey and Hardy and, as will be shown shortly, by Carl Johnson, MD, Director of the Jefferson County Health Department.

Meteorologist W. Gale Biggs also found that airborne plutonium was poorly monitored: In the 1980s then-Governor Roy Romer appointed meteorologist W. Gale Biggs to assess air-monitoring of plutonium releases at Rocky Flats. Among the things he learned are these:

- The majority of emissions (60-99%) are "fugitive" emissions – that is, plutonium from the soil picked up by the wind and carried elsewhere. This is what happened with the 903 leaks.
- Plutonium particles in fugitive emissions can be either small or large.
- The average size of particles in ductwork in plant buildings is very small, 0.045 microns.
- The average size of a human hair is about 50 microns.

²⁶ Nichols, "Pollen and spores as vectors of radionuclide particles at the Rocky Flats facility, Colorado," First Progress Report for US ERDA under Contract No. E (11-1) - 2736, October 15, 1975; and "Some aspects of Organic and Inorganic Particulate Transport at Rocky Flats," Final Report for US ERDA on Contract EY-76-S-02-2736, prepared for US ERDA in 1977.

²⁷ Nichols, Assessment of the Official Air Sampling Equipment at Rocky Flats (February 18, 2012). On line at http://media.wix.com/ugd/cff93e_eef7aa6815f245e18c1357249382ed97.pdf

- Particles released from the stack (such as those Nichols found in snow) are tiny – probably smaller than 0.01 microns – because they have passed through several banks of filters.
- After emission from the stack, some small particles attach to larger airborne particles, such as pollen or organic matter, the size of which may range from about 15 to several hundred microns.
- Larger particles drop to the ground before they reach air monitors around the perimeter of the site and thus are not monitored. Some of these were deposited in the buffer zone,
- Smaller particles that reach the monitors can pass through them without being monitored.
- Thus the air monitors fail to monitor much of the emitted airborne plutonium.
- Small particles probably travel some distance before settling.
- The population was exposed to airborne plutonium before it settled.
- By means of the “alpha-recoil effect,” a process that continues indefinitely, radiation decay of plutonium generates enough energy to blast a piece of plutonium off the particle.
- Due to alpha recoil, particles decrease in size and increase in number. Most of these tiny particles can pass through the filters of the monitors and thus are not measured. They can be readily picked up by wind and more readily inhaled.²⁸
- For all the reasons cited, the amount of plutonium emitted was not measured and could not be known.
- Though the most dangerous exposure is from airborne pathways, we cannot estimate the extent of the health problem because we do not know the emissions.



Figure 5.8: Air monitor along the eastern boundary of the Rocky Flats site. Such monitors, according to Nichols were inadequate. The plant's water tower and tops of buildings are visible about 2 miles away up the hill in the center of the picture. Photo by Robert Del Tredici.

Innovation: Carl Jonson samples plutonium in dust: In 1974 Carl J. Johnson, MD, was named Director of the Health Department in Jefferson County, where Rocky Flats is located. A short time later a County Commissioner asked him whether the Commissioners should allow a residential development on land just east of Rocky Flats. The CDH had already approved the project, despite having found plutonium in surface soil there up to seven times the state standard for plutonium in soil (see pp. 37-38); they would require plowing prior to construction. In response, Johnson and two colleagues from the U.S. Geological Survey (USGS) in Littleton sampled the area, using probably for

²⁸ Biggs, Airborne Emissions and Monitoring of Plutonium from Rocky Flats (March 17, 2011). http://www.rockyflatsnuclearguardianship.org/#!/academic-information/zoom/clarf/image_17gh

the first time anywhere the innovative method of sampling only respirable or breathable dust. Samples taken at 25 locations showed plutonium concentrations, on average, 44 times greater than what had been measured at the same locations in previous whole-soil sampling by CDH. Several readings exceeded previous ones by 100 times or more, one by 285 times.²⁹ In September 1975, when the County Commissioners saw the results, they vetoed residential development on the land in question. This triggered a lawsuit against Rocky Flats by Marcus Church, owner of the land, a matter to be examined later (see pp. 51-52). When Johnson and his colleagues published their results, they explained that they sampled dust because it is only the “very small particles” of dust on the surface of soil that can be picked up by wind and made available for inhalation, the worst way to be exposed to plutonium.³⁰ Their article continues to be cited by those who do this unique type of sampling. But ERDA, Rockwell, CDH and EPA, all of which had supported Johnson and his colleagues on their original sampling, suddenly backed off and became negative about Johnson and his work. Martell, on the other hand, applauded the sampling of breathable dust as a stroke of genius and the most realistic way to sample for plutonium.³¹

Johnson proposes that the state adopt dust sampling for plutonium: In October 1975

Johnson formally proposed that, for purposes of assessing health risk of plutonium exposure in off-site areas, the state set a new standard based on plutonium in respirable dust on the surface of soil. “The coarser materials which are not inhaled and retained,” he pointed out, “have no bearing on the actual hazard to health and serve only to dilute the amount of radioactivity found by analysis, and may yield a spurious low concentration of plutonium that is misleading.”³² CDH did not welcome this proposal. To resolve the issue, the Colorado Land Use Commission brought in Karl Z. Morgan, fabled “father of health physics” and former chair of the internal dose committee of both the National Council on Radiation Protection and Measurements (NCRP) and the International Commission on Radiological Protection (ICRP) and recently retired from DOE’s Oak Ridge Lab. Morgan was asked whether for assessing the public health risk from plutonium in surface soil it was better to follow Johnson in using dust samples or CDH in collecting whole-soil samples. Morgan sided with Johnson. Colorado officials, having gotten from Morgan the advice they sought, chose to ignore it. Shortly after his visit, Morgan wrote Johnson: “The situation is much worse than I had suspected. . . . I am amazed that the State of Colorado . . . has not been out front from the beginning, collecting this type of data, pointing out the environmental hazard and doing all it could to ameliorate the problem.”³³

Johnson and the criticality question: In environmental sampling done near the Rocky Flats site Johnson found cesium-137, a radioactive material never used at the plant. For him its presence suggested the likelihood of “a significant fission reaction,” or “criticality,” of plutonium at the plant. A criticality is a run-away chain reaction of fissionable material that happens spontaneously and instantly releases a blast of neutron radiation likely to be fatal to anyone nearby. Three employees at the Los Alamos Lab in New Mexico lost their lives due to criticalities there. If there was ever a criticality at Rocky Flats, other fission byproducts, such as strontium-90 and iodine-131, should also be present. Johnson asked plant officials to sample soil for these materials and to do a review of

²⁹ Johnson, “Survey of land proposed for residential development east of Rocky Flats, for plutonium 239 contamination of respirable dust on the surface of the soil,” Report to the Jefferson County Commissioners and the Colorado State Health Department (September 12, 1975).

³⁰ Johnson, R. R. Tidball, and R. C. Severson, “Plutonium hazard in respirable dust on the surface soil.” *SCIENCE* (August 1976), vol. 193, pp. 488-490.

³¹ For an account of Johnson’s Rocky Flats work, see Moore, “Democracy and Public Health at Rocky Flats,” in Dianne Quigley et al., *Tortured Science* (Amityville, NY: Baywood, 2012), pp. 76-92; on line at http://media.wix.com/ugd/cff93e_c22798032f2e468f9af7d9ccb317169f.pdf .

³² Johnson, “Remarks to the State Board of Health concerning a proposed new interim standard for contamination of soil with plutonium” (January 21, 1976).

³³ Morgan to Johnson, January 30, 1976.

“incidents” at the plant “to determine the source of the cesium.”³⁴ When he learned that an explosion had accompanied the 1957 fire – the blast that blew doors open – he suspected it was a criticality. He saw official reports of elevated levels of strontium as well as cesium in soil at the site. But all his queries regarding criticalities were ignored.

Former Rocky Flats engineer James S. Stone, who blew the whistle to the FBI on problems at the plant, insisted that there had been several criticality events there.³⁵ Strontium as a contested issue reappeared in January 2005 when former FBI agent Jon Lipsky who had led the June 1989 FBI raid of Rocky Flats, announced at a news conference in Denver that he had seen documentation of high levels of strontium contamination at the site.³⁶ Whether there’s ever been a criticality at Rocky Flats remains a matter of controversy. The standard line is that no criticality has happened at Rocky Flats. It is well known that there was a Criticality Lab at the plant, where experiments were performed. It seems reasonable to assume that criticalities occurred on purpose at the lab and that their byproducts were released into the environment, but so far this is only speculation. In July 2015 Robert E. Rothe, who operated the Criticality Lab, confirmed that criticalities had occurred repeatedly, sometimes for extended periods. He says nothing about disposal of radioactive byproducts.³⁷

Johnson asks: Is it safe to live near Rocky Flats? Ever since 1970 when Martell alerted people to the danger of plutonium in the environment in off-site areas, some have wondered whether it is safe to live in the contaminated area. Johnson responded to this question quite directly by examining the incidence of cancer among people living in areas known to be contaminated with plutonium. He focused on Anglos in 1969-71 because cancer data was available for this period and the population near Rocky Flats was overwhelmingly Anglo. He mapped three isopleths in the metro area showing wind-blown concentration of plutonium from Rocky Flats, then looked at the incidence of cancer within each area and compared it to cancer incidence in the surrounding non-contaminated area. His isopleths were similar to those of Krey’s 1976 map (see Figure 5.2, p. 37) but were based on more samples from a smaller area. Johnson’s map shows that in the most contaminated Area I nearest Rocky Flats there was 16% more cancer than in the non-contaminated Area IV, 12% more cancer in Area II which reached into the heart of Denver, and 6% more cancer in Area III which stretched to the far side of Denver (see Figure 5.9). Overall, he “found a higher incidence of all cancer in areas contaminated with plutonium, compared to the unexposed area.”³⁸

DOE effort to refute Johnson’s cancer incidence study failed: DOE paid Kenneth S. Crump, one of its own scientists, to refute Johnson’s cancer-incidence study. When he used the same data that Johnson used, he got the same results. When he examined data from a decade later (1979 -81), he found a reduced cancer incidence in Area I nearest Rocky Flats, with the highest incidence in Area II, the urban core. He advanced the thesis that cancer incidence in both cases had nothing to do with Rocky Flats but was due to the “urban effect” measured by distance from the State Capitol building in Denver. He asserted that there was no evidence of “a relation between environmental exposure to plutonium from Rocky Flats and cancer incidence.”³⁹

³⁴ Johnson, Report to the Jefferson County Board of Health (March 31, 1977).

³⁵ Rocky Flats Oral History Program Boulder Public Library, James S. Stone, OH1302-2.

³⁶ See McKinley and Balkany, *Ambushed Grand Jury*, pp. 122, 187, 194-196.

³⁷ Rothe, Comments on the June 9, 2015, NIOSH White Paper, July 10, 2015; received by email from Jon Lipsky, July 14, 2015. NIOSH is the National Institute for Occupational Safety and Health.

³⁸ Johnson, “Cancer incidence in an area contaminated with radionuclides near a nuclear installation,” *AMBIO* (October 1981), vol. 10, 4, p. 178.

³⁹ Crump et al., 1987 “Cancer incidence patterns in the Denver Metropolitan Area in relation to the Rocky Flats Plant,” *American Journal of Epidemiology* (1987), vol. 126(1), pp. 127-135. See also Crump et al., “Statistical analyses of cancer incidence patterns in the Denver metropolitan area in

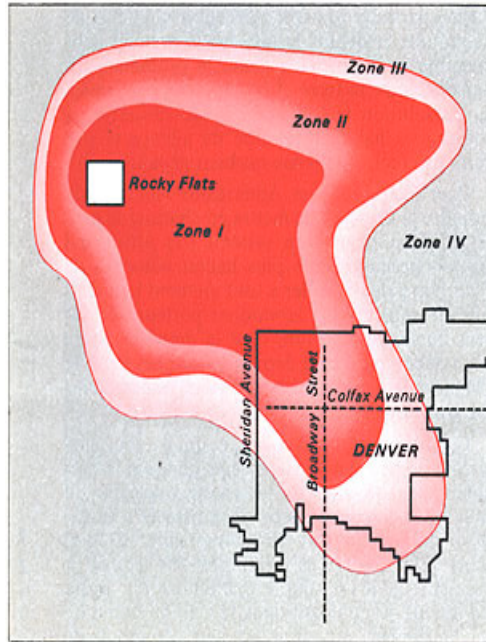


Figure 5.9: Jonson's map, as produced in color by John Craig Freeman. Areas I, II and III on the map are contaminated with plutonium released from Rocky Flats. In the non-contaminated Area IV cancer incidence is roughly equal to the rest of Colorado. See the text above for the cancer incidence in the three contaminated areas. From Johnson, "Cancer Incidence in an Area Contaminated with Radionuclides Near a Nuclear Installation," *AMBIO* (October 1981), vol. 10, no. 4, p. 177.

Johnson, in a published response, pointed out that Crump was able to claim a lower percentage of cancer for areas near Rocky Flats only by setting aside his own isopleth approach in favor of dividing the Denver region into six equal pie-shape sectors centered on and radiating out from the State Capitol building in downtown Denver. When Crump analyzed cancer incidence in each of these six sectors, he concluded that the incidence of cancer in the sector that included Rocky Flats was not appreciably different from its incidence the other sectors. But, Johnson, in a published reply, pointed out, the sector that included Rocky Flats also included the upwind non-contaminated City of Boulder (1970 population 66,870). Adding Boulder's population results in greatly undercounting the percentage of cancer incidence related to Rocky Flats (see Figure 5.10).

When Crump used Johnson's isopleth approach he got the same results as Johnson for 1969-71, while for 1979-81 Crump found, as noted, a decline of cancer incidence in the area nearest Rocky Flats. Johnson attributed this reduction to the very large in-migration into his Area I during the 1970s, significantly lessening the percentage of people in the contaminated area counted in Johnson's original study.⁴⁰ Despite this careful rebuttal, DOE and other agencies ignored what Johnson wrote and continued to tout the Crump study as definitive. And those simply eager to dismiss Johnson ignored him and cited Crump. Richard W. Clapp, one of the country's foremost epidemiologists, said he'd never heard of something called "the urban effect" having anything to do with cancer incidence anywhere. He contacted Crump and sought an explanation, but Crump was unable to give one. In Clapp's view, Crump's attempt to refute Johnson is a failure.⁴¹

relation to the Rocky Flats plant," Report for DOE contract #DE AC04-76EV01013, Subcontract 8115006, Lovelace Inhalation Toxicology Research Institute, Albuquerque, NM (August 20, 1984).

⁴⁰ Johnson, "Cancer incidence patterns in the Denver Metropolitan Area in relation to the Rocky Flats Plant," *American Journal of Epidemiology* (1987), vol. 126 (1), p. 153.

⁴¹ Clapp, Report submitted 13 November 1996 for plaintiff's counsel in *Cook vs. Dow Chemical and Rockwell International*, United States District Court, District of Colorado.

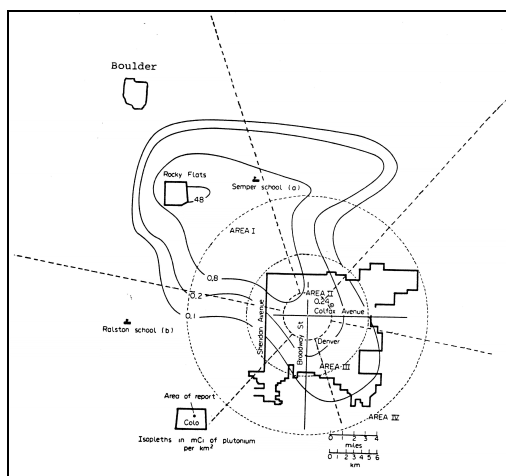


Figure 5.10: Crump divided the Denver area into six sectors radiating outward from the State Capitol Building, then analyzed data from these sectors to demonstrate the “urban effect” on cancer incidence patterns. The figure above superimposes Crump’s sectors on Johnson’s map. Note that the non-contaminated City of Boulder is included in the sector that contains Rocky Flats. Adding Boulder to the sector that includes Rocky Flats results in gross undercounting of cancer incidence attributed to Rocky Flats. This image is from an unpublished paper by Johnson, “Rocky Flats Revisited: Follow-up Studies,” April 1988, page 15.

Johnson loses his job when real estate interests gain control of County Commissioners: Johnson’s article clearly disturbed people associated with the nuclear establishment. But it also troubled those involved in development in the burgeoning suburbs moving closer to the Rocky Flats site (see Figure 5.11). After a realtor was elected as a Jefferson County Commissioner in 1981, a changed county Board of Health, appointed by the Commissioners, voted three-to-two to give Johnson the choice of being fired (and losing all accrued benefits) or of resigning immediately. He resigned.⁴² This happened five months before publication of his cancer incidence study in *AMBIO*, journal of the Royal Swedish Academy of Science. On hearing of Johnson’s dismissal, Martell called him the “only man in the Denver public health community who is concerned about public health.”⁴³

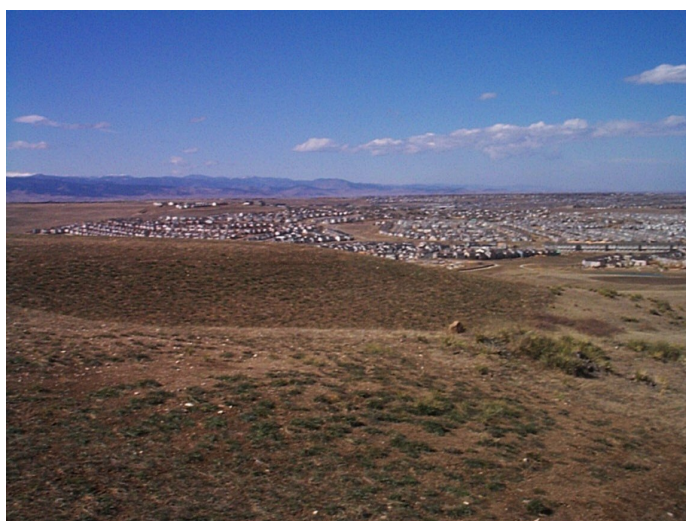


Figure 5.11: This 1999 photo by John Till shows residential development encroaching on the Rocky Flats site from the northeast.

⁴² The author was present at this meeting, which happened in Golden on May 15, 1981.

⁴³ Martell quoted in Timothy Lange, “They Fired Dr. Johnson,” *Westword*, May 28, 1981.

Federal government's Rocky Flats Advisory Notice: The question about living near Rocky Flats caught the attention of the U.S. Department of Housing and Urban Development. In March 1979 the agency required anyone seeking federal mortgage insurance on property bought within ten miles of the Rocky Flats plant to sign the “Rocky Flats Advisory Notice” (see Figure 5.12). The notice

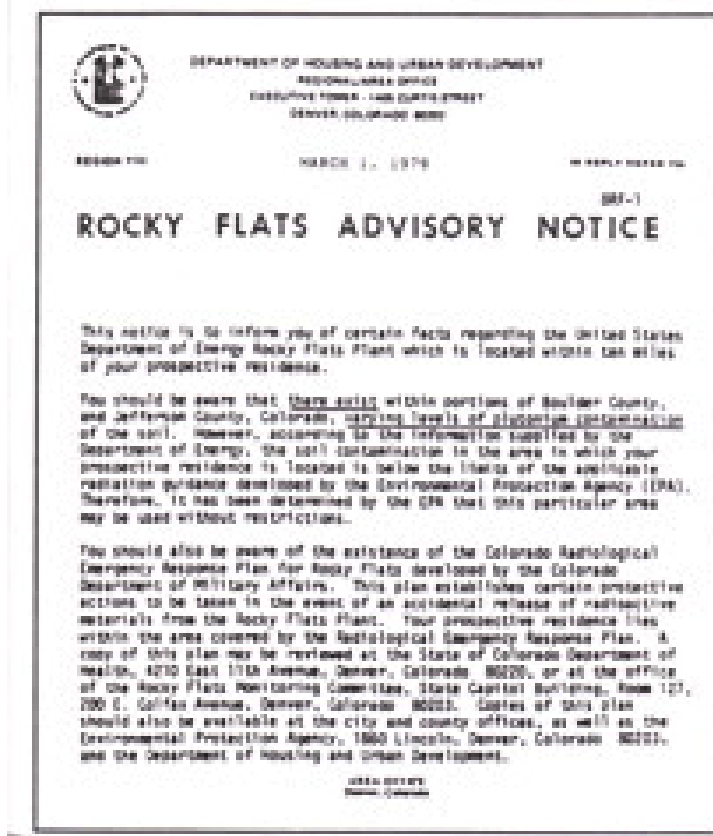


Figure 5.12: Rocky Flats Advisory Notice. My text explains that this rule had a short life.

referred to “varying amounts of plutonium contamination of the soil” and to an “Emergency Response Plan” that would be implemented in the event of “an accidental release of radioactive materials” from Rocky Flats. The notice had a very brief life. Shortly after Ronald Reagan took office in January 1981, the Advisory Notice requirement was eliminated.

The Advisory Notice also had an absurd side, in that it required signatures from people who purchased property that was not contaminated. In fact, most land encompassed within a 10-mile circle around Rocky Flats would not be contaminated. The 20-km (12-mile) concentric circle around Rocky Flats on Krey’s map (see Figure 5.2, p. 37) is not much larger than a 10-mile circle; most of the land within the 20-km circle according to Krey is well outside the contaminated area. Plutonium released from Rocky Flats was deposited not in concentric circles around Rocky Flats but in places where the wind carried it, as shown by Krey and Hardy’s as well as Johnson’s isopleths.

Church lawsuit by landowners claiming harm to their property and its bearing on

Johnson: With his sampling of dust in 1975, Johnson had stopped residential development on land east of Rocky Flats (see pp. 47-49). In response Marcus Church and other landowners filed a lawsuit against Dow and Rockwell, operators of the plant, arguing that contamination from Rocky Flats had devalued their property. They sought \$23 million for damages. Years passed before the “Church case,” as it was known, came up. Finally, in December 1984 it was settled without a trial. The

plaintiffs (landowners) were paid \$9 million, and it was mandated that the contested land could be used only for open space or an industrial park.

DOE and the contractors also gained control of all internal documents reviewed in this case and had the court lock them away, a step that “effectively seals off information about contamination from journalists, scientists, or concerned citizens”⁴⁴ – a measure repeated, as we shall see, in the case brought after the 1989 FBI raid of Rocky Flats to collect evidence of criminal activity at the plant (see chap. 6). After settlement of the Church case, referring to the long latency period for cancers caused by exposure to plutonium, Johnson told journalists, “Officials have permitted excessive plutonium exposures knowing that they will be through with their careers and retired before the evidence is apparent.”⁴⁵

Johnson and the Church case: Confirmation and exclusion: Though the settlement of the Church case confirmed Johnson’s position that housing should not be allowed on the contaminated land, in other respects the case played out in ways not favorable to him. First, in his words, there was “a court hearing staged for the judge and the press by the attorneys and witnesses for the defendants. Nothing was to be heard from the experts for the plaintiffs [including Johnson], and there was to be no cross examination of defendants’ witnesses.”⁴⁶ This is injustice as theater.

With Johnson effectively gagged, CDH head Stanley W. Ferguson, citing Crump, pointedly dismissed Johnson’s cancer incidence study, then stated the position of CDH: “There is no scientifically valid evidence of the creation or intensification of any health effects as the result of the existence and operations of the Rocky Flats Plant, or by the existence of any materials from the Rocky Flats Plant on soils outside of the plant.”⁴⁷ Also, reversing their earlier statement that plutonium on Church land exceeded the state’s standard for plutonium in soil by up to seven times, CDH now gave Church and other landowners a certificate stating that plutonium contamination on their land did not exceed the standard. By contrast, in testimony Johnson was not allowed to give, he declared that “radioactive emissions from the Rocky Flats Plant have caused an excess of cancer in the exposed areas.”⁴⁸ The media ignored Johnson and quoted Ferguson.

New rules for the game: Risk assessment and cost-benefit analysis: In the 1970s and 80s, at just the time Martell and Johnson were most active in efforts to protect public health, others were developing the tools of risk assessment and cost-benefit analysis. These tools enable U.S. decision-makers to deal with threats to public health and environmental integrity without unduly impeding harmful enterprises like the nuclear industry. Incorporation of these tools into the decision-making process is based on the assumption that scientists can understand the impact of human activities on ecological and human systems well enough to predict harm and to estimate risk. The resultant risk-based regulatory regime that now prevails in the U.S. puts a price on human health and ecological well being without really knowing what that price is. It presupposes that some level of harm is acceptable without asking those affected whether it is acceptable to them. If Peter’s health is robbed to pay Paul for making bombs, decision makers believe the benefit of what Paul does is worth the cost of slighting Peter. Abstract and abstruse formulations of risk are employed to consign Peter and others to disease, deformity, and premature death, whether soon or in the unknown long term.

⁴⁴ Iversen, *Full Body Burden*, p. 199.

⁴⁵ Johnson, Two Landmark Radiation Cases, p. 14.

⁴⁶ *Ibid.*, p. 200.

⁴⁷ Affidavit of S. W. Ferguson in the U.S. District Court for the District of Colorado, Civil Action No. 75-1162, February 15, 1985.

⁴⁸ Johnson, “The public health impact of the Rocky Flats nuclear weapons plant in the Denver Area: A case history with recommendations’ (no date).

Dose reconstruction: Substitute for a government funded health study for off-site people:

The goal of the Rocky Flats dose reconstruction study which began in 1990, was to determine the history of contaminant releases from the plant and to estimate doses that off-site people may have received in order to decide whether further study was warranted. It was funded by DOE and managed by CDH, which during the study changed its name to the Colorado Department of Public Health and Environment (CDPHE). Colorado Governor Roy Romer appointed a 12-member Health Advisory Panel to oversee the study. It included, besides prominent scientists and local people, two officials from CDH (one would chair the panel) and one each from DOE and Centers for Disease Control. A panel with one-fourth of its members from state and federal agencies would not stray far from the risk assessment orthodoxy that typically informs studies of this sort.

The nine-year study (1990-1999) estimated that total offsite plutonium releases for the production years, 1952-1989, ranged from 4.8 to 51.3 curies.⁴⁹ One curie is the quantity of any radioactive material that undergoes 37 billion disintegrations or releases of radiation per second. Thus, according to their estimate, plutonium released from Rocky Flats to the offsite environment emits between 176.6 billion and 1.9 trillion bursts of alpha radiation each second. After 24,110 years (the half-life of plutonium-239), the number of alpha bursts per second will be reduced by half. The material remains in the environment in the form of particles too small to see, but not too small to be inhaled or otherwise taken into the body, where it may harm one's health.

Periodic meetings to involve the public in the dose reconstruction study were sometimes informative, often tedious, occasionally contentious. Technical specialists and the engaged public interacted intensely in efforts to reconstruct major accidents and contaminant releases. But when it came to estimating risk, the abstractions of the "experts" left me and I suspect others with the sense of being reduced to a spectator. The study's final report session felt something like a triumphal celebration, as if those affected were expected to rejoice at learning that, though as much as 51.3 curies of plutonium may have been released offsite, risks were inconsequential and further studies were not warranted. I could imagine those alpha particles surrounding us and ticking away. It was a bit unnerving.

The CDPHE calls the dose reconstruction study a "health study," but it was no such thing. Indeed, it concluded that an actual health study was not warranted. The only situation in which a dose reconstruction study would point to the need for direct health study would be where there is an undeniable correspondence between known large releases of a particular contaminant and its known physical effects. An example is large releases of radioactive iodine from DOE's Hanford facility matched by the high incidence in the area of childhood thyroid cancer, a cancer attributed solely to the presence of iodine in a single organ.⁵⁰ Plutonium released from Rocky Flats can certainly cause cancer in exposed people, but any cancer caused by plutonium can also have other causes.

The CDPHE has generally interpreted the study as providing scientific confirmation of the absence of adverse health effects. Unknown to outsiders, some members of the Health Advisory Panel wanted additional research on plutonium in water as it affects downstream communities, a proposal vetoed by the panel's CDPHE chair. Others thought the final report should emphasize in the strongest manner possible that the Denver-area population had been subject to the risk of a major cataclysm due to careless operation of the plant. Specifically, had the 1969 fire breached the roof of the building where it raged, Denver almost certainly would have faced evacuation. Because the final report downplayed this matter, a prestigious independent scientist who was a very active

⁴⁹ Summary of Findings, Historical Public Exposures Studies on Rocky Flats (Denver: Health Advisory Panel and CDPHE., August 1999).

⁵⁰ Tim Connor, *Burdens of proof: Science and public accountability in the field of environmental epidemiology, with a focus on low dose radiation community health studies* (Columbia, SC: Energy Research Foundation, 1997).

member of the panel, David Albright, president of the Institute for Science and International Security, refused to sign the final report.⁵¹

The study concluded that the largest single plutonium release was from the 1957 fire and that the person likely to have received the highest exposure was a laborer working outdoors in the direct path of the plume of plutonium-laden smoke from that fire (see Figures 4.8 and 4.9, pp. 32 and 33). The researchers produced a dose calculator that could be used by anyone present in the Denver area at the time of the fire to estimate their dose according to their location. By the time the calculator was finished, however, the CDPHE chair had dissolved the oversight panel by the simple expedient of convening no more meetings. The calculator thus was never made available, and affected people were denied the chance to learn of the dose they may have received back in 1957.

Needed studies that never happened: Despite the conclusion that there is no need for further health studies, others have strongly disagreed. Here are notable examples:

- In 1982, Martell said that the plutonium in the soil east of Rocky Flats “involves risks that are sufficiently serious that only epidemiological studies of the next several generations of people living in that area can really find out what is going on.”⁵²
- In 1996, nurses at the University of Colorado medical center conducted a community needs assessment and concluded that community-based epidemiological studies should occur in areas affected by Rocky Flats.⁵³ For anyone who wonders, an epidemiological study is not a direct health study. Instead, it is a statistical analysis, like Carl Johnson’s cancer incidence study in which he compared the number of cancers within a specific geographical area with the plutonium contamination in that same area. He provided what is sometimes called “circumstantial evidence” of the cause of the cancers.
- In 1996, Boston University epidemiologist Richard W. Clapp performed a small epidemiological study in which he found excessive incidence of lung and bone cancers in areas near Rocky Flats. He concluded that “the most recent data are indicative of an ongoing health effect and support the need for surveillance of the incidence of cancer and other diseases on a continuing basis in the exposed communities.”⁵⁴ He, like Martell, thought only epidemiological studies repeated over several generations in the contaminated area would help us “really find out what is going on.”

The programs that Clapp, Martell and the nurses proposed have never taken place. Indeed, there has never been any direct health study or medical monitoring of people who live in areas contaminated with plutonium released from Rocky Flats. Hence, no one really knows the actual health effects of living in such areas.

The kind of public health analysis that should have happened for people in the vicinity of Rocky Flats: The Fernald Medical Monitoring Program established at DOE’s Fernald uranium processing facility near Cincinnati, Ohio, was created as a result of a class action lawsuit. From 1990 to 2008 this program provided comprehensive health monitoring for 9,782 individuals. DOE paid for monitoring and diagnosis, not for treatment. Having one’s health monitored relieved some individuals of worry, while for others it provided an early warning of problems in need of attention.⁵⁵ A program of this sort should have been set up by the federal government for all DOE nuclear weapons facilities. One of the administrators of the Fernald Program told me that soon after the program was

⁵¹ Personal communication with David Albright, Washington, DC, March 30, 2004.

⁵² Martell, Interviewed by Robert Del Tredici, 1982.

⁵³ N. J. Brown et al, *Rocky Flats community needs assessment report* (Denver: UCHSC School of Nursing, 1996), p. 46.

⁵⁴ Clapp, Report submitted 13 November 1996 for plaintiff’s counsel in *Cook vs. Dow Chemical and Rockwell International*, United States District Court, District of Colorado.

⁵⁵ See <http://www.eh.uc.edu/fmmp/> and <http://cctst.uc.edu/sites/default/files/files/Slides%20Pinney%202011-01-27.pdf>

created DOE officials decided that nothing like this would be allowed at any other DOE site. One of the original goals of *Cook v. Rockwell & Dow*, the class action lawsuit brought as a result of the FBI raid on Rocky Flats in 1989, was to see a similar health monitoring program set up for people who lived in areas known to be contaminated with plutonium released from Rocky Flats. The judge disallowed this public health aspect of the case before it went to trial and restricted the case solely to harm to property. People around Rocky Flats would have benefitted from a medical monitoring program like the one at Fernald, and we all would have had much more information about health effects from exposure to plutonium and other toxins released from Rocky Flats. It was not to be.

Kristen Iversen, author of *Full Body Burden: Growing Up in the Nuclear Shadow of Rocky Flats* (NY: Crown, 2013), now has a web site that presents accounts of people who grew up or lived near the Rocky Flats plant. Many of these stories are about health problems people believe are related to Rocky Flats. See Rocky Flats Stories at <http://www.kristeniversen.com/rocky-flats-stories>. Perhaps at some point in the future this anecdotal record can be used to get medical monitoring of the sort done at Fernald and recommended for Rocky Flats by Richard W. Clapp (see preceding).

CDPHE says cancer incidence near Rocky Flats is about the same as anywhere else in the metro area: In 1998 CDPHE dismissed Johnson's concern with a report claiming that those living near Rocky Flats have no higher incidence of cancer than people elsewhere in the metro area.⁵⁶ But, like Crump's study, this one distorts reality by mixing populations exposed to plutonium with populations not exposed. In a letter to attorney Caron Balkany, co-author of *The Ambushed Grand Jury*, German radiation specialist Bernd Franke sharply criticized this report. "It appears," he wrote, "that the study design was chosen to calm people down, for public relations purposes, rather than for any real scientific reason."⁵⁷ Rather than protecting the public, CDPHE's study approves residential development on contaminated land.

Assessing Carl Johnson: The Rocky Flats work for which Johnson was celebrated and vilified and for which he was forced from office was done in the final six years and five months of the seven years and eight months that he served as Director of Public Health for Jefferson County. Since the termination of his very brief tenure, no one remotely like him has occupied an official position related to public health vis-à-vis Rocky Flats — no county or state or federal official. Johnson stands alone as an untiring advocate for people whose health may have been harmed by Rocky Flats, inside or outside the facility. Though he made himself available to concerned individuals and groups (he met with a study group I organized in 1979), the primary arena of his work was with personnel from government agencies, especially DOE and CDH. His Rocky Flats work is densely documented in the many articles and reports he prepared as well as in his voluminous correspondence.⁵⁸

By the time Johnson died on December 29, 1988, he was a much-published, internationally respected researcher and specialist on radiation health effects. At the urging of former Interior Secretary Stewart Udall, he did the first-ever study of down-winders from the Nevada Test Site.⁵⁹ He was in considerable demand abroad as well as elsewhere in the U.S. But in Colorado he was in eclipse, dismissed by nuclear technocrats as well as by promoters of urban sprawl. The constant criticisms of his cancer incidence study by nuclear establishment figures gave unreflective boosters of urban development a rationale for ignoring his warnings.

⁵⁶ Colorado Central Cancer Registry, *Ratios of Cancer Incidence in Ten Areas Around Rocky Flats, Colorado Compared to the Remainder of Metropolitan Denver, 1980-89 with Update for Selected Areas, 1990-95* (Denver: CDPHE, 1998).

⁵⁷ Franke to Balkany, December 2, 2002.

⁵⁸ The papers of both Johnson and Martell are archived at the University of Colorado, Boulder.

⁵⁹ Johnson, "Cancer incidence in an area of radioactive fallout downwind from the Nevada Test Site." *Journal of the American Medical Association* (1984), vol. 251, pp. 230-236.

On December 18, 1988, less than two weeks before he died, Johnson published in the *New York Times* an op-ed called “Rocky Flats: Death, Inc.” He recounted his years with Jefferson County, explaining various studies he had done and how, “as a result of the buildup of enormous political pressures by vested interests,” he was forced from office. He concluded that if people are “to be properly protected, all studies of nuclear contamination and associated health effects should be conducted primarily by independent scientists who are insulated from cynical retaliation.”

The Denver Post published a tribute to the deceased Johnson headlined “Doctor warned of Rocky Flats danger” six days after the FBI raided Rocky Flats on June 6, 1989, to collect evidence of environmental crimes allegedly committed at the facility. The article came close to saying that Carl Johnson was right all along. It quotes an anonymous Rocky Flats insider who said Johnson “wasn’t as off-base as we used to say he was.” For many, the fact that the FBI was investigating Rocky Flats confirmed that Johnson knew what he was talking about.

Johnson delved into the details of radiation health effects to understand in the most thorough way possible what “proper” protection of public health would entail. He reminds us that any purportedly “safe” dose of radiation may be the one that will tip the scales against us. Our fate may be sealed 20 or 30 years before symptoms appear. He was an exemplar of caution on behalf of the unassuming public. But the rules by which he worked were not the rules by which others played the game. There is a striking difference between public health as service to the public and public health as obeisance to the nuclear industry and the economy of denial.

John (Jock) Cobb, MD, of the University of Colorado Medical School studies Rocky Flats plutonium in bodies of deceased people who were autopsied: It’s hard to imagine this happening now, but in the 1970s the EPA-asked Cobb to collect body samples of Colorado people who had died and been autopsied, then to research the collected tissue to see how much Rocky Flats plutonium was deposited in the bodies of these deceased individuals. This would show definitively to what extent people who lived downwind of Rocky Flats had taken into their bodies various quantities of plutonium released from the plant. Having the study sponsored by EPA meant that the DOE would not control the results. It is well known that plutonium deposited in the tissue of lung, liver and bone will continue to irradiate surrounding tissue, typically for the rest of one’s life. So EPA asked Cobb to study lung, liver and bone tissues. But he also wanted to study the presence of plutonium in the tissue of the gonads, because this would have a genetic effect that could be passed on to future generations. Such a study was far more complicated than analysis of lung, liver and bone. Moreover, it had never been done by anyone, and Cobb wanted to do it. He told the EPA he’d do the study only if he could add gonads research. EPA approved this. The study began in 1975.

Cobb’s team of researchers measured plutonium concentrations in body tissues collected from more than 500 persons who died and were autopsied in Colorado hospitals, several in the Denver-area, one in Pueblo. Researchers routinely sought permission from the closest of kin to take the samples. The study compared those who lived near Rocky Flats with those who lived far from the site. The bodies of all these people contained plutonium from bomb fallout, but those who lived nearer the plant had identifiably Rocky Flats plutonium in tissues of lung, liver and bone, with contents higher the closer the person lived to the plant. Cobb periodically shared study results with DOE and Rockwell officials. They found the results embarrassing, but they couldn’t stop the study, because it was funded by the EPA. So they tried to get rid of Cobb, even sought to get him dismissed from the university medical faculty. This failed, because he had tenure.⁶⁰

The study was well underway when Reagan became president in January 1981. Anyone old enough to recall will remember that his administration tried to destroy the EPA. Ann Gorsuch (later

⁶⁰ Most of the information in these several paragraphs on Cobb is drawn from the interview with John Cobb, Rocky Flats Oral History project, Maria Rogers Oral History Program, OH1180V.

married and known as Ann Buford and the mother of Supreme Court Justice Neil Gorsuch) was named head of the EPA by Reagan. She terminated the funding for Cobb's study, so it ended before it was completed. Cobb insisted that the data already gathered be made publicly available, but people at EPA resisted. When Cobb persisted, EPA personnel rewrote the report's conclusion to say that Rocky Flats harmed no one. In response Cobb appealed to members of Congress to get the report's original language restored. Finally, the report, more or less in its original language, was made available by the National Technical Information Service.⁶¹ You could get a copy only if you contacted them and paid a fee. Very few people ever saw the report or knew of its existence. Rumors were that Cobb had found nothing worth reporting. But when it appeared the report stated clearly that plutonium from Rocky Flats was present in lungs and liver of people who lived near the plant. Results of the study, if not widely available, at least were formally recorded. The report can be read at Archives of the Atomic West in Norlin Library, University of Colorado in Boulder.

Cobb's plan to study plutonium in the gonads, with an eye on the effect on future generations, did not happen: For Cobb the most important part of the study was not done. His research team had collected tissue from lung, liver and bone, but also from the gonads. "It was my hypothesis," he said in his oral history interview, "that the plutonium was being deposited in the gonads, right where it would be affecting the sperm and causing mutations in the sperm, which would then show up . . . in future generations as . . . childhood cancers, deformities, and all that sort of thing." He was familiar with studies of plutonium in gonads of rats. These studies showed that plutonium was "deposited in the basement membrane" of the gonads "right near where the sperm were being generated. . . . This would be the worst place to have plutonium in your body, and if it was there in significant amounts that would be not only endangering the present but all future generations, because it would be damaging the genes."

The research Cobb was most eager to do had never been done with humans, and, so far as I know, has not yet been done. "It takes a whole lot more finesse," he said, "to find the amount of plutonium in the gonad, which weighs only 5 or 6 grams, maybe, than it does in a lung, which is maybe a thousand grams." So the samples from the gonads "were left for last." One of his colleagues in the study was a man named Wes Erford, who undertook the task of developing a method for measuring the very tiny amounts of plutonium deposited in the gonads. His success in doing this was a major breakthrough for studying the gonads, but it happened just as funding for the study ended. Thus Cobb and his team never got to take advantage of Erford's innovation. With the end of the study, all the gonads samples, which remained unexamined, were "sent to Los Alamos by the EPA." Sending the gonads samples to DOE's Los Alamos Lab of course was done by Reagan's EPA, greatly changed from the original agency that was actually an environmental protection agency.

At Los Alamos the gonads samples sat in a freezer for 20 years. When Shawki Ibrahim of Colorado State University's nuclear research program learned about these samples he asked Los Alamos to send them to CSU. He designed a study that could gain government support. Cobb had intended to find out how much plutonium was in the gonads of individuals and to show on a map where each person lived and how much plutonium was present in that person's gonads. This information would show where genetic problems might appear in later generations, a type of research that, as pointed out earlier, had not previously been done anywhere. Ibrahim's plan, by contrast, "would have negated" what Cobb had hoped to find out. According to Cobb, Ibrahim "was going to take all the gonads [samples] and put them into one big pot and analyze the whole thing and then get a figure from that of how much [plutonium] was in each gonad on average." Ibrahim sought Cobb's blessing for this approach, but Cobb didn't give it, because only separate analysis of individual samples would provide the important results he wanted. Ibrahim's approach would totally destroy the very possibility of learning about the presence of plutonium in the gonads of specific

⁶¹ Cobb et al., "Plutonium Burdens in People Living Around the Rocky Flats Plant," March 1983, EPA-600/4-82-069, Springfield, VA: National Technical Information Service.

persons. Cobb died in 1993. In August 2014, in email exchanges with Ibrahim I learned, first, that the gonads samples were sent from Los Alamos to CSU; and second, that, though the samples were kept securely in a freezer at CSU, they were destroyed by a weekend power outage. Thus ended what could have been a pioneer study of plutonium from Rocky Flats in human gonads.

Controversy over plan to incinerate plutonium waste: In the mid 1980s the DOE and plant operator Rockwell International proposed operating a new incinerator in Building 776 to burn plutonium waste at Rocky Flats. This would dispose of some of the plant's huge backlog of nuclear waste, but it would also release even more plutonium particles into the Denver area. To prevent this, Jan Vittum, who volunteered with the American Friends Service Committee in Denver, in 1987 convened five independent scientists, whom she called "the Boulder scientists" because all but one of them lived in Boulder. The group included Martell, Nichols, Biggs, chemist Niels Schonbeck from Metro State, and engineer Joe Goldfield, who had designed the kind of filters used in the plutonium facilities at Rocky Flats. From their several disciplines, in public meetings and via their writings, they showed that incinerating plutonium at Rocky Flats would be unhealthy for people of the Denver area. By the end of 1987 it appeared that the DOE had vetoed the idea and there'd be no incineration of plutonium. But in fact the idea went underground and shifted to using the older Building 771 incinerator that had burned plutonium previously but now was illegal to operate⁶² (see Figure 5.13). A few months later, in June 1989, when the FBI and EPA raided Rocky Flats, running this 771 incinerator became one of the most prominent issues to be investigated. It will be taken up later.

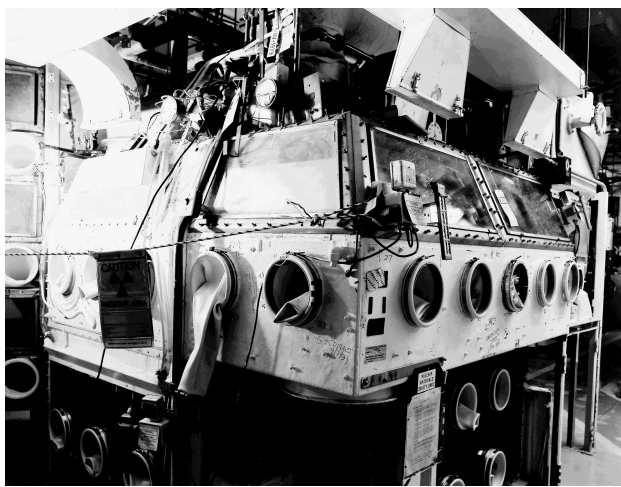


Figure 5.13: Building 771 incinerator. In the late 1980s Rockwell wanted to burn plutonium-contaminated waste in a new incinerator in Building 776. Due to strong public opposition this was not done. The FBI later alleged that the waste instead was illegally burned in the 771 incinerator.

The dawn of organized resistance to Rocky Flats, its distinctiveness and its multiple forms: Resistance to nuclear weapons was initiated by a few scientists of the Manhattan Project who thought nuclear weapons made war obsolete. They called themselves "nuclear pacifists."⁶³ Atmospheric testing of nuclear weapons attracted more resisters, because of the public health danger of radioactive particles sprinkled across the earth. Resistance to Rocky Flats is distinctive because it was the first organized opposition to a facility that actually produces nuclear weapons. Activists at Rocky Flats created a practice that has been followed elsewhere, in the U.S. and abroad.

⁶² On earlier operation of this incinerator, see Ackland, *Making a Real Killing*, p. 288, note 15.

⁶³ On this activity at Los Alamos, see Rosalie Bertell, *No Immediate Danger? Prognosis for a Radioactive Earth* (Toronto: Women's Press, 1985), pp. 140-43).

In 1974 the American Friends Service Committee (AFSC) in Denver hired Judy Danielson and Pam Solo to share a staff position focused on Rocky Flats. They were the first paid organizers and for quite a while the only ones. The small numbers of participants at the beginning grew quickly to hundreds and thousands, soon gathered into 50 to 60 groups, all seeking the truth about Rocky Flats and spreading the word about what they learned. There were all manner of groups – students, seniors, work colleagues, neighbors, religious groups, artists, musicians, dramatists, businesses, academics, poets. There were dozens of ways of opposing Rocky Flats and the nuclear enterprise – writing, speaking, debating, street theater, marches, music, poetry, art, lobbying, study groups, rallies, as well as educating the public on the nuclear fuel cycle, radiation health effects, nuclear winter, deterrence, the Non-Proliferation Treaty and more. Activities like these burgeoned.

Former school teacher Alex Mayer planted a “peace garden” across the road from the west gate main entrance to Rocky Flats. Often destroyed, he replaced it with new plantings by the next day. The Denver Catholic Worker held a vigil at the west gate every Sunday for ten years. One-day vigils at the west gate were common. Artists hung a giant “Shutdown Rocky Flats” banner from a building near the State Capitol. A street theater group could appear at any time in downtown Denver or elsewhere with a new skit deploring bombs and calling for an end to the arms race.

Taxpayers pay for pollution and Price-Anderson protects polluters: The preceding pages tell of contamination on and off the Rocky Flats site. The government hires and pays for the polluter – with money from taxpayers. The Price Anderson Act, adopted in 1957 and renewed several times since, “indemnifies the nuclear industry against nuclear accidents and exempts corporations from penalties associated with their actions, even in the case of gross corporate negligence. . . . Companies like Dow and Rockwell can pollute without penalty, and the taxpayers bear the cost.”⁶⁴

Paying for protest: Paid organizers were actually rare. Most of the groups opposing Rocky Flats went hand to mouth, working things out as they went along. An incredible array of activity was peopled by volunteers with costs covered by people who scrimped, saved and sacrificed, though they were often called “pinkos,” told to “get a job” and accused of being paid servants of the Soviets.

Legal rallies and releasing of balloons at Rocky Flats: In the spring of 1978 and 1979 legal rallies were held at Rocky Flats, the first drawing about 5,000 people, the second roughly 12,000. Famous people gave speeches – Pat Schroeder, Daniel Ellsberg, Helen Caldicott, George Wald – and pop musicians performed – Jackson Browne and Bonnie Raitt. A dramatic moment in the 1979 rally was the unleashing of more than 2,000 helium-filled balloons, each with a tag informing the finder that it was released from Rocky Flats and asking that it be mailed back to a Denver address. The idea was to find out where the wind carried plutonium released from Rocky Flats. Tags came back from as far away Illinois, Indiana, Iowa, Kansas and Nebraska (see Figure 5.14).

A symbolic blockade of the railway tracks at Rocky Flats became a real blockade and ruined the chance to make common cause with Rocky Flats workers: In the heady days of the rapidly growing movement of resistance, staff from AFSC and other groups invited people from all across the country to come to Rocky Flats for a big rally on Saturday, April 29, 1978. The rally would demand that Rocky Flats be “economically converted” from making weapons of mass destruction to making something socially useful. T-shirts made for the occasion depict a bomb being turned into a mass-transit train (see Figure 5.15). The rally would be followed by an overnight “symbolic blockade” of the railroad tracks leading in to the plant, the intent being to show that the resisters had the numbers to do a real blockade later if there was no progress on economic conversion of the plant. Police and federal marshals agreed that because the blockade was “symbolic,” no arrests would be made. The plan had been carefully vetted not only with management and security officials

⁶⁴ Iversen, *Full Body Burden*, pp 123-124. See Moore, *Citizen’s Guide*, pp. 4-5.

at the plant but also with leaders of the production workers union, so they would know that no one was trying to deprive them of a job.



Figure 5.14: Balloons being released from Rocky Flats, April 29, 1979. Photo from Joseph Daniel, *A Year of Disobedience* (Boulder: Daniel Productions, 1979), p. 84.



Figure 5.15: Rocky Flats economic conversion. The message on T-shirts in 1979 was to convert the plant from making bombs to making trains for mass transit.

All went according to plan, except that when organizers of the weekend events arrived at Rocky Flats early Sunday morning they learned that 35 individuals who'd spent the night on the tracks – Daniel Ellsberg of Pentagon Papers fame among them – were determined to remain on the tracks. Dubbing themselves the “Rocky Flats Truth Force,”⁶⁵ they turned a symbolic blockade into a

⁶⁵ Gandhi's term for nonviolence, “satyagraha,” translates as the force of truth, or truth force.

real one. The peaceful scenario of the original organizers quickly degenerated into a shouting match between people who opposed Rocky Flats in different ways. The most serious downside was that workers at the plant felt betrayed by those occupying the tracks. Ironically, an event that brought national and international attention to resistance at Rocky Flats wrecked any possibility of making common cause with Rocky Flats workers. At the Fernald and Mound nuclear weapons plants in Ohio, anti-nuclear activists were able to work closely with nuclear workers on public health and environmental issues, but the possibility of doing this at Rocky Flats was ruined.

When those on the tracks were arrested and removed, they were replaced by others. Keeping the tracks occupied became a collective commitment. The blockade continued for a year, probably the longest sustained civil disobedience action in U.S. history (see Figure 5.16). Patrick Malone's teepee



Figure 5.16: First arrest of members of the Rocky Flats Truth Force. When people were removed from the tracks, others soon took their place. Photo from Daniel, *A Year of Disobedience*, p. 55.

on the tracks at Rocky Flats became a highly visible icon inviting people passing by on nearby Highway 93 to visit or to join the occupation (see Figures 5.17 and 5.18).



Figure 5.17: The teepee on the tracks. Photo from Daniel, *A Year of Disobedience*, p. 61.



Figure 5.18: Bearded poet Allen Ginsburg and friends about to be arrested for blocking a train at Rocky Flats. Photo from Daniel, *A Year of Disobedience*, p. 60. Ginsberg's poem, "Plutonian Ode," comes from his time on the tracks. Philip Glass turned the poem into his Symphony No. 6. See http://www.philipglass.com/music/recordings/symphony_6.php.

Civil disobedience preferred by many: The message of civil disobedience: “I break a law of the land in obedience to a higher law, such as, thou shall not kill, and I willingly accept punishment for what I do.” Despite the serious loss of not being able to make common cause with workers at the plant, civil disobedience became a preferred option for many who opposed Rocky Flats.

On Nagasaki Day, Sunday, August 9, 1987, several hundred were arrested for civil disobedience, not at the west gate main entrance to Rocky Flats but at the more contaminated east gate. Plant officials forced the activists to go there by closing the west gate. The turnout was large and arrests were delayed because many resisters locked themselves to the fence. Radio broadcasts were soon telling workers not to come in to work that day. Though it was a Sunday, the plant was then operating around the clock seven days each week. This was the only time activists succeeded in shutting down the plant for a day.

Jennifer Haines, who moved from the east coast to Colorado to do something about Rocky Flats, found that solo civil disobedience was her forte. Arrested often, she spent four-and-a-half years in federal penitentiaries, where her life was made difficult because she insisted on using her given name rather than the identifying number assigned to her by the imprisoning government. She tells her impassioned story in *Bread and Water: A Spiritual Journey* (Orbis Books, 1997).

On Ash Wednesday 1983, Sister of Loretto Pat McCormick and Mennonite Mary Sprunger-Froese drove to Rocky Flats in a car that wouldn’t go into reverse. At the plant they joined the line of cars taking workers in for the day shift. Though they had no passes, at the security gate they were waved through. On the fence of the high security plutonium processing area they hung crosses and a banner on which they poured blood. They kneeled to pray, and waited – and waited. Eventually a security guard asked, “What are you doing here?” Their answer: “We’re commemorating Ash Wednesday.” “Oh,” he said, “I forgot to go to mass.” “This can be your mass,” Pat told him. She and Mary were arrested and carted away.

The civil disobedience blockade of the railroad tracks leading into the Rocky Flats plant was the subject of *A Year of Disobedience* (1979), a book of photos by Joseph Daniel. His photos were accompanied by Keith Pope’s historical narrative, Daniel Ellsberg’s statement at the subsequent trial of the disobedient ones, and Allen Ginsburg’s “Plutonian Ode.” To celebrate the 35th anniversary of the Rocky Flats Truth Force, Daniel brought out an enlarged edition, called *A Year of Disobedience and a Criticality of Conscience* (2013). The new book contains photos not included in the first one, my summary of the history of resistance to Rocky Flats, an interview with Ellsberg about the current nuclear weapons situation globally, and brief biographies of a few members of the Truth Force.

My personal activity regarding Rocky Flats began with civil disobedience of sitting on the tracks leading in to the plant in April 1979. Getting arrested and put on trial in federal court was an unexpected education. I was arrested as part of an affinity group. The judge in the case asked each of us to write a statement of what we intended to tell the jury. I wrote that I would say that it was the government, not us, who were breaking the law. The government had pledged with Article VI of the Nuclear Nonproliferation Treaty of 1968 “to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control.” According to the Constitution an agreement like this has the force of law. Since the U.S. government has ignored what the Treaty says, it is breaking the law. The judge responded that I was forbidden to say this in the court. This was an education on the injustice of the justice system.

Civil disobedience is not for everyone: Not everyone favored the more confrontational approach of civil disobedience, with the inevitable arrest, trial and possible imprisonment. In fact, the civil disobedience practiced by the Truth Force and others strengthened the political middle of the

movement. It helped legitimize other ways of opposing Rocky Flats, many of them noted above. There was something for everyone. And all these actions fed into the Nuclear Freeze movement of the early 1980s – an appeal that both the U.S. and the USSR engage in a bilateral freeze of the manufacture of nuclear weapons. On June 12, 1982, a million people gathered in New York’s Central Park to call for an end to the nuclear arms race.

“We’re not breaking the law; the government is”: One small group from among the roughly 300 who were arrested at Rocky Flats on August 9, 1987, and Ken Gordon, their pro bono lawyer, deserve to be singled out. When they were put on trial in federal court for their arrest, Gordon persuaded the judge to allow them to be tried not for trespass as charged but under Colorado’s “choice of evils” defense. Instead of being tried for having disobeyed the no-trespass law, they chose to argue that it was the government, not them, that broke the law. They were allowed to say what I was forbidden to say a few years earlier. The government’s illegal behavior was its failure to abide by its obligation under Article VI of the Nuclear Non-Proliferation Treaty to work in good faith for the total abolition of nuclear weapons. They reminded the court that according to the Constitution international treaties ratified by the government have the force of law. The judge allowed this defense, and the jury, having heard it, found the defendants not guilty as charged. This is the only time in all the many court trials of those arrested for opposing Rocky Flats that any individual or group was acquitted.

Local artist shows the magnitude of the nuclear weapons enterprise: Denver artist Barbara Donachy very effectively addressed the question of how to convey the enormity of the nuclear weapons enterprise. Her *Amber Waves of Grain*, produced in the mid-1980s, vividly depicted the size of the U.S. nuclear arsenal with roughly 31,500 miniature ceramic replicas of nose cones, one for each warhead in the U.S. arsenal at its peak size (see Figure 5.19). For each warhead, of course, Rocky Flats produced the plutonium pit. Her work was exhibited in cities across the country.

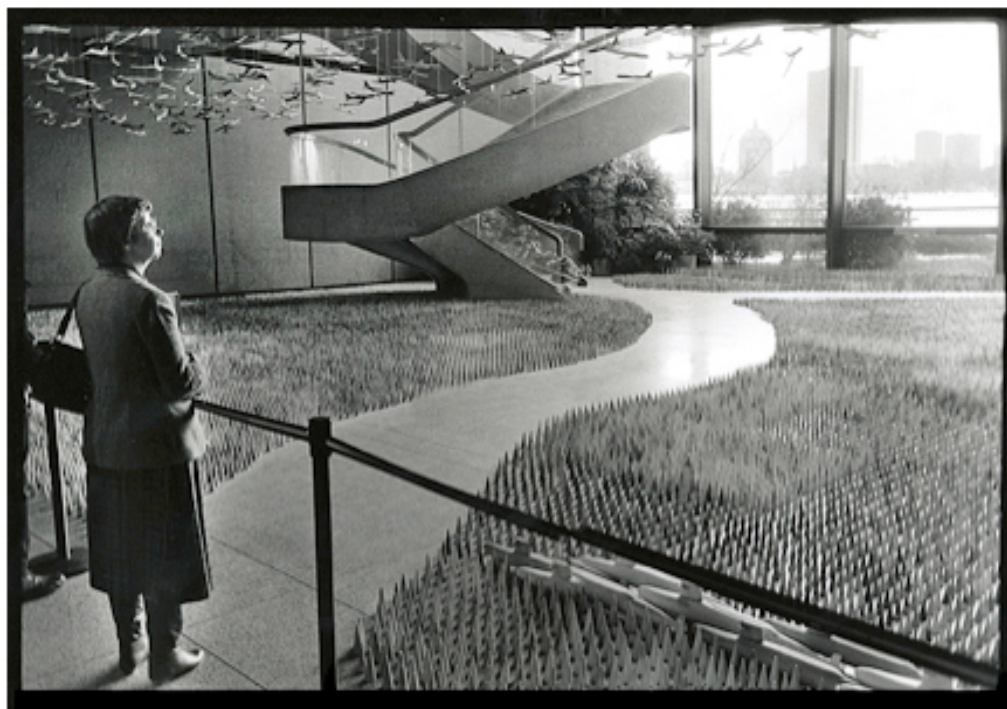


Figure 5.19: “Amber Waves of Grain,” by Denver artist Barbara Donachy, depicting with miniature ceramic nose cones all the warheads in the U.S. nuclear arsenal, a total of about 31,500. Photo of display at the Boston Science Museum, February 13, 1985. From Robert Del Tredici, *At Work in the Fields of the Bomb* (NY: Harper & Row, 1987), Plate 106.

Encirclement of Rocky Flats: A demonstration of heart and silence, with an afterthought

warning: The most beautiful demonstration at Rocky Flats itself was the October 15, 1983, encirclement of the plant by about 17,000 individuals. No speeches by famous people, no rock musicians, no politicians looking for votes, no trespass or civil disobedience, nothing but the sound of the wind and birds and, at a given moment, the playing of taps (see Figure 5.20). As beautiful as this event was, I learned later that Ed Martell, who'd blown the whistle on the public health danger of Rocky Flats, was horrified that wholly innocent people, especially children and women of child-bearing age, were invited to mingle where plutonium had been deposited in the soil.



Figure 5.20: Encirclement of Rocky Flats, October 15, 1983. Photo by Siri Jhoda Singh Khalsa.

Founding of the Rocky Mountain Peace Center: At precisely the time of the encirclement of Rocky Flats, six activists, three men and three women, created the Rocky Mountain Peace Center in Boulder (now the Rocky Mountain Peace and Justice Center). Committed to nonviolent action, from the outset the Peace Center offered civil disobedience and nonviolence training for any who sought it while also encouraging participation in the full range of activities opposing bomb production at Rocky Flats. After production ended at Rocky Flats only half-a-dozen years later, the Peace Center persisted as the key organization seeking the best possible cleanup of the highly contaminated site, a topic to be examined later. In 2010 the Rocky Mountain Peace and Justice Center initiated the Rocky Flats Nuclear Guardianship project, also to be examined later.

Dark Circle, award-winning documentary with a focus on Rocky Flats: In 1982 the film *Dark Circle*, roughly half of which is devoted to Rocky Flats, premiered in Denver, bringing much new attention locally. Directed by Judy Irving, Chris Beaver and Ruth Landy, it explores the link between the nuclear weapons industry and the nuclear power industry. The footage on Rocky Flats is both revealing and disturbing. When the film was banned from PBS, the directors alleged censorship. The film is now available to purchase or rent. I highly recommend seeing it.

Environmental regulation at Rocky Flats? The 1970 passage of the National Environmental Policy Act created the Environmental Protection Agency. Did this mean there would be environmental regulation at sites like Rocky Flats? The DOE and its predecessor agencies, AEC and ERDA, insisted that the Atomic Energy Act exempted the sites of the nuclear weapons complex from such regulation. But they also claimed that they would abide by environmental law by regulating themselves. An example of such self-regulation was the 1980 Rocky Flats Environmental Impact Statement (EIS), a document that essentially declared that there was no reason for concern with environmental contamination and associated problems at the Rocky Flats plant.⁶⁶ Despite DOE's views, in 1984 the EPA recognized serious environmental contamination at Rocky Flats when it proposed adding Rocky Flats to the Superfund National Priorities List of the country's most contaminated sites. Rocky Flats was formally added to the list in 1989.

An ugly problem: Regulation of mixed waste at Rocky Flats: Here I refer briefly to only part of the waste problem, since the reader doesn't need all the details of this long and tawdry tale.⁶⁷ Earlier we observed two points about waste at Rocky Flats, first, that in regular operations large quantities were routinely produced; second, that neither DOE nor its contractors had any plan for dealing with the waste. In a sense it was ignored until it could be ignored no longer because its quantity was so great and its existence so dangerous. A third closely related problem is that DOE was self-regulating; no other government agency had authority to deal with the waste.

Most waste at Rocky Flats was "mixed waste" – that is, it contained both radioactive and hazardous but non-radioactive materials. The 1976 Resource Conservation and Recovery Act (RCRA) gave EPA and individual states authority to regulate hazardous (non-radioactive) waste. DOE argued that RCRA did not apply at its sites, because most waste at these sites contained radioactive materials. But in 1984 a federal court in Tennessee effectively ended DOE's self-regulation of mixed waste. Authority to regulate such waste was shifted from DOE to EPA and states with laws at least as restrictive as EPA's. In November 1985, however, DOE and Rockwell refused to recognize the jurisdiction of the EPA or CDH over mixed waste at Rocky Flats. CDH threatened to deny Rockwell a permit to store mixed waste. If enforced, this would shut the plant down.

Rocky Flats authorities were so determined not to accept outside regulation that they wanted to oppose it in court. But a very revealing, harshly critical memo from a high-ranking DOE official in Washington ended their opposition. She wrote: "The [RCRA] compliance posture of the Rocky Flats facility makes it a poor candidate for testing fine points of law. . . . We have basically no RCRA groundwater monitoring wells, our permit applications are grossly deficient (some of the waste facilities there are patently 'illegal'). We have serious contamination, and we have extremely limited environmental and waste characterization data for a site of this complexity." She recommended getting an agreement with EPA and CDH, but she wanted the agreement "finessed" with vague and ambiguous language that would give DOE "credibility" and offset the possibility of "citizen suit enforcement."⁶⁸ So damning a memo was obviously not intended for the public, but it became available and was widely circulated. DOE, EPA and CDH did reach an agreement that supposedly ensured Rocky Flats' compliance with relevant law. This was less than three years before the FBI raided the plant to investigate violation of federal law, including violation of RCRA.

⁶⁶ Ackland, *Making Real Killing*, p. 200.

⁶⁷ For more detail on waste at Rocky Flats, see Moore et al., *Citizen's Guide to Rocky Flats*, pp. 29-36; on line at http://www.rockyflatsnuclearguardianship.org/citizens-guide-to-rocky-flats?lightbox=image_lcd

⁶⁸ DOE, Memorandum EH-1, "Status of Rocky Flats Agreement Negotiations," from Mary L. Walker, Asst. Secty. for Environment, Safety and Health, to S. R. Foley, Jr., Asst. Secty. for Defense, July 14, 1986.

Pondcrete: Another waste mess: From the time production began in the 1950s liquid hazardous waste containing low-levels of plutonium and other toxins was stored in five shallow outdoor pools roughly the size of swimming pools. They were called solar evaporation ponds because it was assumed the sun would evaporate the liquid and leave behind a sludge. By the 1980s DOE wanted these ponds shut down, so Rockwell workers put the sludge in large plastic-lined boxes where it was mixed with concrete that they thought would produce solid blocks called “pondcrete” that then could be shipped to the Nevada Test Site for disposal. After sending 3,000 pondcrete blocks to Nevada, the practice suddenly ended. Nevada officials found that pondcrete contained radioactive and non-radioactive materials and thus was mixed waste, regulated by RCRA. The Test Site was not licensed for such material. Then came the real problem. In theory, pondcrete was solid one-ton blocks. But in reality many of the blocks had the consistency not of cement but of mayonnaise. More than 16,500 blocks had been produced. Half or more of them, stored at Rocky Flats, began to sag and leak. A radioactive pudding ran out of the containers over the land and down into the creek beds that drain the site.⁶⁹ The pondcrete mess was left for the “cleanup.”

No more plutonium waste to Idaho: From 1954 until 1989 waste with a relatively high content of plutonium later called “transuranic” (heavier than uranium) or “TRU-waste” was shipped offsite to DOE’s Idaho National Engineering Laboratory (INEL) where it was “temporarily” buried. Shortly after the June 6, 1989, FBI raid on Rocky Flats Colorado Governor Roy Romer reached an agreement with DOE that set a limit of 1,601 cubic yards as the maximum amount of TRU-waste that could be stored onsite. This number did not seem restrictive to DOE at the time, because Rocky Flats was routinely shipping TRU-waste to INEL. But on September 1, 1989, Idaho Governor Cecil Andrus ended 35 years of TRU-waste shipments from Rocky Flats to INEL. At the Idaho border he refused to allow a train carrying Rocky Flats waste to enter the state. He said he was tired of waiting for the DOE to keep its promise to open a permanent TRU-waste disposal site somewhere. The train returned the waste to Rocky Flats and no more was sent to Idaho.⁷⁰ Chapter 10 includes further discussion of the Rocky Flats waste sent to Idaho.

Frantic efforts by government officials to find an alternative storage site for the waste proved fruitless. Romer held the line, warning DOE that if they exceeded the TRU-waste limit at Rocky Flats no more waste could be generated – which of course meant the end to production.⁷¹ DOE tried to buy time by installing a new supercompactor that would compress the waste into a smaller package, about a 50% volume reduction. The supercompactor, however, was damaged during shipment, and production permanently ended before it could be brought on line.

This account provides only a partial view of the complex waste problem in the period just before and after the FBI raid. Everything was complicated by lawsuits and intergovernmental agreements. DOE argued that some of the large volume of material stored at Rocky Flats that had been called TRU-waste should instead be regarded as “residue,” because it contained a sizeable volume of plutonium that could be extracted and used again. In a defeat for the DOE, a lawsuit won in 1990 by Sierra Club declared that this material was waste and therefore was subject to RCRA regulation.⁷² Eventually, to expedite the “cleanup,” even so-called “residues” were handled as waste and were disposed of at WIPP, the Waste Isolation Pilot Plant in New Mexico, which opened in 1999.

Criticality danger: Plutonium in the venting ducts: A scandal that wouldn’t go away was the revelation that an unknown quantity of plutonium had accumulated inside the 6,200 feet of venting ducts in the three plutonium processing buildings at Rocky Flats. This threatened a “criticality” – a spontaneous nuclear chain reaction that occurs when a “critical mass” of radioactive material like

⁶⁹ Ackland, *Making a Real Killing*, pp. 210-211.

⁷⁰ *Ibid.*, p. 213

⁷¹ Joan Lowry, “Politicos Deride Plant’s N-Waste Plan,” *Rocky Mountain News*, October 12, 1989.

⁷² Ackland, *Making a Real Killing*, p. 188, note 15.

plutonium accumulates and spontaneously fissions (see pp. 46-47). The splitting atoms release neutrons and other radioactive particles. The worst sort of problem that can happen in a plant like Rocky Flats, a criticality could result in sudden death for anyone nearby. The matter came to light in the summer of 1989 when engineer James Stone blew the whistle on the issue to the FBI. He had badgered DOE and Rockwell on this since 1983, but they had done nothing. Stone believed there had been several previous criticalities at Rocky Flats, a view that countered the official position at Rocky Flats. A 1992 study of Building 771 at the site, written for the cleanup by its nuclear workers, lists a total of 53 “criticality infractions” that happened in this one building over the years since production began.⁷³

DOE Secretary James Watkins hired a company named Sciencetech to do a criticality investigation. Had a criticality occurred at Rocky Flats, fission products such as cesium and strontium, not otherwise present at the site, would have been present. Nat Miullo of the EPA found these materials in soil on the plant site and told DOE he believed there had been a criticality. In the 1970s Carl Johnson had also said there’d been a criticality. Sciencetech found records showing that the problem of plutonium deposits in the ductwork had been recognized as early as 1953, within the first year of operations at the plant. It was due to faulty “pre-filters” or poorly fitting ones; pre-filters were small filters on gloveboxes that trapped plutonium particles and prevented them from escaping into the venting ducts. Workers, frustrated by clogged pre-filters, punched holes in them, allowing plutonium particles to escape into the ductwork to relieve pressure inside gloveboxes so they could continue work. But this of course meant plutonium deposits in the ducts. Were workers paid bonuses that gave them an economic incentive to put production ahead of safety?⁷⁴ After all its work, Sciencetech concluded that there were 62 pounds of plutonium distributed randomly in the ductwork – enough for 10 bombs – a dangerous situation.

Because of the danger posed by plutonium in the ductwork, many in the public expected the DOE to do an Environmental Impact Statement (EIS) on this issue, that is, an official study of alternatives for dealing with the problem – examining possible effects and what the best solution would be. However, DOE and EG&G on May 20, 1991, bypassed this requirement to give themselves a “categorical exclusion” for this project. Despite the fact that the effort to remove plutonium from roughly 6,200 feet of ductwork posed an obvious danger to the public, DOE decided to proceed with the work without an EIS. It thus was good that production ended. We turn now to this topic.

⁷³ “1992 Facility History for Building 771 at the Rocky Flats Plant,” Compiled for EM-30 by M. H. Chew and Associates, Inc., April 1992. On line at <https://rockyflatsambushedgrandjury.com>

⁷⁴ For a full discussion of this issue, see Moore, *Citizen’s Guide*, pp. 39-41; on line at <http://www.rockyflatsnuclearguardianship.org/#!/citizens-guide-to-rocky-flats/c1hm8>