Review and Comments on CEARP Phase I. An Inventory of Hazardous Chemical and Radioactive Waste Sites at the Rocky Flats Nuclear Weapons Facility

Prepared for Colorado Representative Sam Williams' Ad Hoc Committee on Rocky Flats by Jan Pilcher, September, 1987

DOCUMENT

Comrehensive Environmental Assessment and Response Program, Phase I, Installation Assessment Rocky Flats Plant, produced by the Albuquerque Operations Office, Environment, Safety, and Health Division, Environmental Programs Branch, April 1986

REVIEW

This document is an inventory of inactive and active chemical and radioactive hazardous waste sites on the Rocky Flats Plant Initiated in mid-1984 by the DOE, the study was necessitated by current environmental legislation which the plant must comply with This includes CERCLA --Comprehensive Environemental Response, Compensation, and Liability Act (Superfund)-- and RCRA--Resource Conservation and Recovery Act

The entire cleanup program, which will consist of five phases, is designed to identify, assess and correct existing or potential environmental problems The upcoming phases will provide more more information on the assessment, prioritize the sites for cleanup, develop plans and technologies for the cleanup, then actually implement the cleanup, and verify and document the remedial actions

This inventory was developed by a review of records and literature from the Rocky Flats Plant and also from interviews with 30 plant employees, many of whom have worked at the plant since the 1950's, to find out about undocumented leaks, spills and past management practices that could have resulted in environmental problems A three person team from Los Alamos interviewed employees September 17-22, 1984, with names, positions and dates of employees' performance omitted for anonymity and employee protection.

The inventory of more than 80 sites reveals that five sites are contaminated enough that they qualify for the Superfund National Priorities List, exceeding the threshold value of 28 5 in the risk evaluation system developed by the DOE (called an HRS). These sites include the two major water drainages on the plant, Walnut Creek (score 53) and Woman Creek (score 40), the solar evaporation ponds(score 46), the present landfill (score 34), and VOCs--volatile organic compounds-- in the ground water(score 40) Another extremely contaminated site that fell just below the 28 5 score was the 903 Drum Storage Area (score 26)

Another 31 sites have been recommended for futher evaluation under Phase I and 14 sites for Phase II confirmation, one site is in Phase IV remedial action and 21 sites are into Phase V compliance and verification

Some of the areas identified in Phase I that still need evaluation include the underlying aquifer, to determine the extent and movement of VOCs in the groundwater, inactive disposal sites and other contaminated sites to determine the potential for release of hazardous substances to the environment, the jurisdiction of radioactive/hazardous chemical mixed waste management between the DOE, EPA, and State of Colorado, the feasibility of separating RCRA-regulated wastes from by-product and candidate mixed wastes (an important issue since most waste at the

plant is mixed and it would be expensive to segregate it), methods of disposal for non-combustible, radioactive and PCB-contaminated materials, emissions of VOCs to the atmosphere, and monitoring programs to detect hazardous substances in ground and surface water.

Several points are of interest in the introductory description of the Rocky Flats plant One is that the plant is located near a large urbanized area, making accidental releases of hazardous substances a sensitive issue to the immediate population Population pressures are reflected in the statistics cited in 1980 the population within 50 miles of the plant was 1.8 million, which is projected to increase to 3 5 million by year 2000 The population within 5 miles of the plant is now 9,500, projected to increase to 20,000 by 2000 The most populated area, a sector southeast of the plant towards Denver (between 10 and 50 miles of the plant) had a 1980 population of about 555,000 people, projected to increase to 1,500,000 by the year 2000

A second interesting point involves the hydrology and geology of the area Rocky Flats is on a thin gravelly alluvium that is very permeable Water flows from west to east at the plant and the groundwater surfaces at seeps and springs in the natural streams that cross the area From the plant, Walnut Creek flows into the Great Western Reservoir, which provides drinking water for Broomfield, and Standley Lake, which provides water for Northglenn, Thornton, and Westminster Recently detected VOCs in the shallow aquifer at Rocky Flats have caused additional adverse public reaction A point only glossed over in the water quality control section (p IV-7) is that plutonium has been found in the groundwater in "low concentrations" Groundwater is estimated to take one year to move from the west to east of the plant site The geology of the area also creates the potential for landslides to damage retention ponds and diversion ditches on site, according to the report

Interviews also revealed that most of the buildings (Table V-1) may have radioactive contamination underneath them and in some cases, radioactive contamination may exist in the buildings' footing drains But because the buildings are in use, no action will be taken until a building is removed Phase II will study for potential releases of contamination through various pathways, however

In general, the inventory in Phase I (detailed in Section V, Findings and Planned Future Actions), reveals a history of overflows, pipe and storage drum leaks, and sloppy management practices for the storage and disposal of hazardous chemical and radioactive leaks Solutions included burial with several feet of dirt, gravelling over, paving over, and incineration

To cite several examples

Radioactive Sites(2) in 800 Area Used to dispose of 320 tons of plutonium contaminated soil (at 7 disintegrations per minute per gram-dpm/g- of alpha activity, as compared to the Colorado standard of 2 dpm/g) from the Building 776 fire in 1969 and to dispose of 60 yards of plutonium contaminated soil (at 250 dpm/g of alpha activity, 125 times the state standard) This contaminated area was covered with approximately 3 feet of soil and fill as a way of managing the waste

903 Lip Area During the removal of leaking drums from the 903 drum storage area, winds redistributed plutonium in an estimated quantity of 1 Curie (16 grams) beyond the asphalt pad to the fence In 1978, about 4 7 million pounds of contaminated soil with 0 56 Curies of plutonium was removed and shipped offsite -Cleanup is still ongoing, now in Phase IV

Present Landfill, Original Plant Site, Outside the Security Fenced Area An estimated 9 million pounds of waste is disposed annually at this onsite landfill It received about 2,200 pounds of sanitary sewage sludge between 1968 and 1970 suspect for heavy metals and radioactivity. Leachate from this landfill contained both tritium and and long-lived alphas, such as plutonium. Leachate was collected in a small pond and spray irrigated north and east of the landfill from about 1968 to 1974 and thereafter to the south and west. Qualifies for Superfund National Priorities list.

Trench T-1,900 Area This burial trench used from 1952 to 1962 contains 125 drums with depleted uranium chips and lathe coolant. Covered with 2 feet of soil, two drums were uncovered accidentally in 1982 when weeds were being cut One drum contained 4 3 picocuries per gram of plutonium and 1.2 microcuries per gram of uranium

Solar Evaporation Ponds, 900 Area These ponds, built beginning in the 1950's to hold process wastes, were originally clay lined, later lined with planking and asphalt to hold effluent. On hot days the asphalt cement would slide, crack, and leak, and attempts were made to patch leaks with Mastick, burlap, asphalt and Phillips Petromat. Cracks contiued to develop because of weather conditions, and leachate, including sanitary sewage sludge and radioactive liquid wastes, contaminated shallow groundwater. A groundwater interceptor system was later installed Pollutants found in this system include cadmium, lead, nickel, selenium, thallium, chloroform and trichloroethylene The ponds, with some of the highest values for contamination (HRS score of 46) of both chemical and radioactive substences, is one of the highest priorities for cleanup because the steep hillsides surrounding the plant slump when saturated with water These ponds are located next to the North Walnut Creek drainage, so that slumping could occur, causing damage to the ponds and releasing contaminated liquids

903 Drum Storage Area Contained about 5,240 drums of spent machine cutting oil, of which about 3,540 contained plutonium Many of these corroded and leaked over the years (storage began in 1954, although that is not mentioned in this particular report) Between 1967 and 1968 all the drums were removed and all contaminated materials were shipped off the plant. Efforts were undertaken to scrape the plutonium contaminated material into an area (about 3 3 acres) and top it with an asphalt cover in 1969 The DOE estimates 11.4 curies of plutonium (about 182 4 grams, as compared to the current "maximum credible release" of 100 grams) leaked into the soil before the drums were removed An estimated 8 6 Curies remained on site and 1 7 Curies are estimated to be under the asphalt pad The calculated HRS score of 26 for this site is just below the threshhold qualifying for the Superfund list

Waste Storage Tanks There are a number of examples of overflows of these tanks over the years, including six concrete process waste tanks in the 700 area , used from the late 1950's to 1970, which frequently overflowed, with one overflow in the late 1950 s flowing down the road toward Walnut Creek. The tanks contained a solution of plutonium, uranium, acids and caustics

In another instance, an underground cement holding tank in the 700 Area overflowed in the early 1980's, releasing abaout 50 to 100 gallons high in nitrates with plutonium and uranium Although the area was later paved over, the plant was not sure how material was cleaned up prior to the paving Underground concrete storage tanks in the 100 Area, near Building 441, that contained nitrates and possibly radionuclides may have leaked They were part of the original process waste system and have not been removed An on site storage tank inventory is taking place to document where storage tanks, no longer in use but possibly still leaking and posing potential risks, are located.

Uranium Incineration Pits. Several sites on the plant were used for burning oil containing depleted uranium in the 1950's In one case, Building 334 is constructed over Oil Burn Pit Number 1, used in 1956 The residual by-products from this incineration were covered over with soil Oil Burn Pit Number 2 in the 900 Area, was used in 1957 and 1961-1965 to burn approximately 1,083 drums of oil containing uranium. Residues from the operations and some flattened drums were covered with backfill The pit was cleaned up and removed in the 1970's. according to the report. Another ash pit, outside the security-fenced area on the original plant site, was located along the west access road on the plant's original west boundary. Prior to the early 1960's the small incinerator burned office material and also depleted uranium chips The ashes were put into pits or pushed over the side of the hill next to the incinerator into the Woman Creek drainage. In the early 1960's the incinerator was demolished and the ash pits were covered with fill The types and amounts of hazardous subsances that may remain at this site are unknown

Spills of fuel oil tanks, the disposal of lithium metal, burial of unknown chemicals, numerous leaks and spills of caustics and acids (one of 1,500 gallons of sulfuric acid in 1970 that escaped Building 443, one of several hundred gallons of acid north of Building 444, one of about 1,000 gallons of concentrated sodium hydroxide in 1978 in the 400 Area), and multiple solvent spills are also documented in the report Interviewees recalled a spill of 100 to 200 gallons of trichloroethylene prior to 1970 by Building 776, although they could not recall any mitigation measures

Groundwater Contamination. Tests done in wells on the plant site for the first time in 1985 for VOCs revealed their presence in the groundwater. trichloroethylene in 6,400 parts per billion(ppb), tetrachloroethylene 16,000 ppb, 1,1-dichloroethylene 1,300 ppb, and 1,1,1-trichloroethane 4,800 ppb. Earlier in the report it is mentioned that low levels of plutonium have been found in the groundwater, although it is never mentioned where or in what levels.

Offsite Water Contamination. Great Western Reservoir, which provides part of the water supply for Broomfield, is 1 5 miles east of the eastern edge of the plant and is fed from the north and south forks of Walnut Creek, which run through the plant site Plutonium is estimated to be in the lake's sediments in 244 mCi and americium in 73 mCi, based on a single core sample from a 1981 study

Standley Lake, 2 miles southeast of the plant boundary, is fed by Woman Creek and supplies part of the water supply for Westminster, Northglenn and Thornton Based again on a single core sample from a 1981 study, plutonium was found at about 61 mCi and Americium at 18 mCi

COMMENTS On CEARP Phase I

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Citizens Against Rocky Flats Contamination
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In general, details in this document are inadequate for a thorough assessment of the levels of contamination at various sites, and will depend on further data being generated As examples, the study does not cite at which well the highest levels of TCE were found, it does not cite where or in what amounts plutonium was found in groundwater In numerous cases, the document states that a cleanup of a site "should have taken place," but does not document when, by whom, or what was done The EPA and CDH, as well as concerned citizens, must follow up on each of these cases to make sure the proper documentation is supplied.

* The DOE irresponsibly uses proposed EPA guidelines that have never been accepted as a standard to assure the public that offsite plutonium contamination of the soil is safe (Section V.A.5 on Contamination of the Land's Surface) The DOE should have used the Colorado State interim standard which is considerably lower. In fact there is enough controversy over the standards that Dr. Edward Martell, a nuclear chemist at the National Center for Atmospheric Research, with Dr Lappenbush, formerly of the EPA, have proposed standards 10 times lower than the state standards

Information in the Meteorology section is misleading in stating that wind drainage flows from the Rocky Flats Plant turn and move toward the north and northeast. Resuspension of soil contaminated with plutonium occurs when the wind is strong and exceeds 20-30 knots/hr, blowing almost directly into the heart of Metropolitan Denver, east and southeast, as non-DOE studies have documented

There is no mention of a criticality event in the 1957 fire, when plutonium, which had built up in the filters over a four year period, may have gone critical and spread fission products downwind This could account for high levels of cesium--up to 31 times background levels--found by Dr Carl Johnson in soil studies around the plant, and for the fact that levels were found at levels ten times higher near the plant than a few miles away Cesium, created only as a by product of nuclear fission, could have been produced during a single criticality at the plant during the fire Another possible source might be nuclear fuel rods stored at the plant which may have burned in one of the fires, producing cesium Cesium is not mentioned in the CEARP Phase I document.

The burning of depleted uranium in oil at the plant was frequently done in the early years of the plant's operation with serious potential health consequences Depleted uranium means the U-235 has been removed, but not other radioactive isotopes Uranium oxide and uranium dust, attached to smoke particles and carried by the wind, were very likely inhaled by populations downwind Uranium is an extremely effective carcinogenic agent, even though it is a lower alpha emitter than plutonium, with the potential for causing cancers and genetic damage, the latter is serious because it tends to concentrate in higher levels in the germ cells of the gonads ← D. Cobb

Plutonium and americium inventories in Standley Lake and Great Western Reservoir were based on single core samples, and should be much more thoroughly documented The document says that "based on current data, existing conditions do not pose an environmental risk," citing a 1976

EPA document Microorganisms and fish, which may be heavily contaminated, should also be studied

Plutonium contamination on site in some areas may be much higher than this document suggests, as much as 100 times higher according to Dr. Edward Martell In the 903 drum storage area, Dr Martell estimates that if 500 drums corroded and spilled their contents, each with 6 grams of plutonium, an estimated 21 kilograms of plutonium leaked (16 grams of plutonium equals one Curie, so potentially 1000 Curies could have been released) The CEARP document, produced by the DOE, estimates 11.4 Curies was released Levels of radioactivity were documented by ERDA at 50,000 picoCuries per gram just off the asphalt pad laid down as part of a containment effort by the plant in 1969, Dr Martell estimated that contamination under the 3 3 acres of asphalt may be as high as a few million times nearby fallout levels (which measure 05 picoCuries/gram locally) Much of the plutonium released into the soil in the years before the area was paved over blew downwind toward the Denver Metropolitan area.

Perhaps the most serious health issue for populated areas downwind of the plant is the offsite soil contamination by plutonium, which is not mentioned in this study.

CONCLUSIONS

The CEARP Phase I document is required reading for anyone who wishes to seriously monitor the Rocky Flats Plant Although details are inadequate for an in depth assessment, this is the first major DOE document to confirm to the general public that the extent and levels of contamination from hazardous chemical and radioactive waste are very serious.

It will be extremely important for the public to monitor the follow up to this document, CEARP Phases II through Y, and cleanup plans as they are submitted by the plant to the EPA and CDH, to make sure that the work is actually done and that the holes in data, such as the promised radiometric and tank surveys and groundwater assessment, are adequately filled in The public must have input on violations of deadlines and inadequate or unworkable cleanup plans The public should press for the release of documents now unavailable to them because of the Unclassified but Controlled Nuclear Data status assigned by the DOE.

This clean up will cost hundreds of millions of dollars, so it will also be important to press for the addition of Rocky Flats, along with other federal facilities, to the Superfund National Priorities List. At this point it is still proposed but not accepted on the list

Cleanup monies currently will come from the DOE's operating budget for environmental cleanup. That budget is essentially a political decision made in Congressional Appropriations committees, and depends to some extent on strong community pressure and lobbying from state and Congressional representatives, as recent appropriations to nuclear weapons facilities in Savannah River, South Carolina, and Fernald, Ohio have proven

We must also urge the State Health Department and the EPA to provide adequate personnel and resources for oversight of this cleanup I suggest that the legislative committee request a specific accounting of how many full-time employees at the CDH and EPA are currently assigned to the Rocky Flats cleanup effort, and if those agencies feel the level of staffing is adequate

Lastly, it will be important to press not just for containment of contamination on the plant, but a thorough cleanup, especially of plutonium contaminated areas, as plutonium, with a half-life of 24,000 years, lasts forever and can affect the health of all future generations