

EA-1120; Solid Residues Treatment, Repackaging and Storage at the Rocky Flats Environmental Technology Site and Finding of No Significant Impact

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1. PURPOSE AND NEED FOR ACTION

1.1 Background

From its founding in 1952 through the cessation of production in 1989, the United States Department of Energy's (DOE) Rocky Flats Plant (now the Rocky Flats Environmental Technology Site [the Site]) produced components for nuclear weapons. Some of those components were made of plutonium. As a result of the processes used to recover and purify plutonium and manufacture the components, a variety of materials became contaminated with plutonium. If the level of contamination were low, the material was considered waste. However, if the concentration of plutonium in the material exceeded the "economic discard limit," the materials were classified as "residue" rather than "waste" and were stored for later recovery of the plutonium. While large quantities of residues were processed, others, primarily those more difficult to process, accumulated at the Site in storage.

Two important events regarding residues have occurred at the Site since production activities ceased. One event was the end of the Cold War in 1991, which made the return to production of nuclear weapons, with their Rocky Flats-made components, unnecessary. This event led to DOE's decision to permanently cease production at the Site, clean up and remove radioactive and chemical contamination at the Site, and find alternative uses for the Site.

The other important event was DOE's decision not to recover plutonium from the residues for use in weapons production. This decision, together with the requirements of Settlement Agreement and Compliance Order on Consent No. 93-04-23-01 issued by the Colorado Department of Public Health and Environment requiring that residues be treated as waste, effectively turned the residues into waste. (The materials formerly known as residues are now classified as transuranic waste [waste with more than 100 nanocuries of plutonium per gram of waste]. They are referred to as residues in this document to differentiate them from other wastes at the Site). Reclassification of residues as waste and the decision not to recover the plutonium in the residues meant that the residues must be made safe for interim storage (i.e., storage until long-term disposition of the residues is determined) at the Site and, ultimately, shipment offsite.

The Defense Nuclear Facility Safety Board's Recommendation 94-1 addressed safety issues associated with storage of residues. In response to this recommendation, DOE believes that it is necessary to treat and/or repackage, store, and ultimately remove the residues from the Site for disposition for the following reasons:

- To comply with the requirements of Settlement Agreement and Compliance Order on Consent No. 93-04-23-01. This Order compels DOE and its contractors to implement the Mixed Residue Reduction Program in a timely and adequate manner. The Program requires, among other things, the "processing of backlog mixed residues to put them in a shippable and/or disposable form as expeditiously as reasonably possible" and "removal from the Plant of the backlog mixed residues and the TRU [transuranic]-mixed wastes generated by their processing as expeditiously as reasonably possible once a final offsite disposal facility becomes available."
- To minimize the potential for accidental exposure of workers and the public to the radiation hazard presented by the residues.
- To provide a broader range of possibilities for the future use of the Site than would be possible if the residues were permanently stored or disposed of at the Site.

To facilitate the timely decontamination and decommissioning of plutonium buildings.

Nearly all of the residues are in a condition or container that does not meet the Site's interim safe storage criteria which were developed in response to the Defense Nuclear Facility Safety Board's Recommendation 94-1. The variances include relatively large quantities (over 200 grams) of plutonium in many of the drums, levels of radiation at drum surfaces and temperatures generated by radioactive decay that exceed interim safe storage criteria, the presence of liquids, respirable fines (small particles that can be inhaled), and possibly-corrosive and pyrophoric materials in the drums. In addition, most residues do not meet DOE's or the U. S. Department of Transportation's requirements for offsite shipment. Consequently, the residues need to be put in a condition and in containers in which they can be safely stored and, once their final disposition has been determined, safely transported.

The subject of this document is how best to make residues safe for storage until their final disposition can be decided and implemented. How and where that final disposition is to be made will be decided through such analyses as the Waste Isolation Pilot Project Supplemental Environmental Impact Statement, a draft of which is to be released later this year.

1.2 Purpose and Need for Action

The need for DOE to take action regarding stored residues at the Site is based on:

- The requirements of the Site's current mission to clean up the Site and convert it to other beneficial uses;
- Recommendation 94-1 of the Defense Nuclear Facilities Safety Board and the requirements of best management practices to process the residues and convert their constituent plutonium into a form suitable for safe interim storage;
- The requirements of the Settlement Agreement and Compliance Order on Consent No. 93-04-23-01 issued by the Colorado Department of Public Health and Environment to process mixed residues into a form suitable for shipment and/or disposal, and to remove from the Site all mixed residues as soon as possible;
- The requirements of best management practices that the residues be in a condition and in containers that 1) are safe for interim storage, and 2) permit shipment offsite once disposition of the residues is determined.

2. DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 General

Approximately 106,600 kilograms (kg) of residues, averaging almost 3% plutonium (for a total of approximately 3,100 kg of plutonium), are at the Site. Of this total, approximately 39,200 kg can be directly repackaged without any required treatment to meet the Site's interim safe storage criteria. This would leave a maximum of approximately 67,400 kg that could require treatment. It may not be necessary to treat this total quantity.

For the purposes of this document, treatment is considered to be any method or process designed to change the physical, chemical, or biological character or composition of the residue material to render the material safer to store, transport, or dispose. Residues have been categorized into 99 different types by "item description code," a descriptive method for grouping and tracking wastes. Because of the chemical similarity of certain groups of residues or the similarity of the manner in which they must be treated and/or repackaged to ensure safe interim storage, the entire inventory of residue types has been divided by item description code into treatment categories. These categories, and

the approximate quantity of residues in each, are: (1) ash (27,900 kg, including incinerator ash, sands, slags, and certain crucible material, graphite, firebrick, soot, and other particulates); (2) salts (16,000 kg, pyrochemical salts); (3) direct-repackage residues (39,200 kg, including dry combustibles such as paper, rags, cloth, plastics, and inorganics such as glass, insulation, certain crucible material, and metals); (4) classified shapes (6,700 kg, including classified parts, graphite shapes, tooling, and metal shapes); and (5) wet residues (16,800 kg, including sludges, grease oxides, grease fluorides, and wet combustibles containing discernable quantities of liquids such as water, acids, bases, or organic solvents) for a total of approximately 106,600 kg of residues.

The 106,600 kg of residues are stored in 55-gallon drums, 10-gallon drums, 1- and 2-liter stainless steel cans, 1- to 4-liter plastic bottles, 1- to 2-liter tin-coated steel cans in glove box lines, plastic bags and miscellaneous configurations. Residue storage locations include six of the former plutonium production buildings at the Site (Buildings 371, 707, 771, 776, 777, and 779) (see Figure 2.1), all of which are located within the Protected (security) Area. Approximately 50% by volume of the residues are categorized as "mixed" residues because they contain hazardous constituents or exhibit hazardous characteristics regulated under the Resource Conservation and Recovery Act (RCRA), as well as radioactive contaminants.

The residues exist in a variety of chemical and physical forms and packaging configurations. Some combinations of residue type and packaging could result in conditions that may compromise container integrity and worker safety. These possible conditions include combustion of drum contents as a result of low-ignition-temperature constituents, detonation of shock-sensitive compounds, radiolytic degradation of packaging materials (the interaction of radioactive materials and plastic which can produce hydrogen gas), chemical corrosion of drums or cans, and release of toxic chemicals.

2.2 Proposed Action

The proposed action is to stabilize, if necessary, and/or repackage the residues for safe interim storage at the Site while awaiting the completion and opening of a suitable repository to which they would be shipped for disposal. "Interim" storage would be in containers and under conditions appropriate for a period of approximately 20 years, but actual length of storage would be until an appropriate offsite disposal location became available.

Approximately 26,200 kg of the residues require treatment by the end of 1998 pursuant to Recommendation 94-1 of the Defense Nuclear Facilities Safety Board because they may be unstable. (Residues are unstable if they are in a condition that could result in ignition, detonation, hydrogen gas generation, container degradation or other unsafe situations.) Those materials include Ful-Flo filters (a brand of filters used to filter liquids), wet combustibles, leaded gloves, acid contaminated glovebox filters, salts, graphite fines and sand, slag and crucibles. Knowledge of the history of some residues and characterization results also indicate that, at a minimum, 39,200 kg of residue materials can be directly repackaged to meet interim safe storage criteria. The remaining residues, approximately 41,200 kg, would require further treatment and repackaging by 2002 to meet interim safe storage requirements and the terms of Recommendation 94-1 of the Defense Nuclear Facilities Safety Board.

Depending on the residue type, treatment can include: oxidation, washing, cementation, calcination, thermal desorption, drying to eliminate liquids, and chemical treatment. Treatment would convert plutonium and other unoxidized metals to oxides or other less reactive forms, immobilize respirable fines (very small radioactive particles which could be inhaled), and/or remove plutonium surface contaminants and liquids. Materials which are expected to meet the interim safe storage criteria in their current physical form or chemical composition would be directly repackaged, without treatment, into metal containers to meet interim safe storage criteria.

2.2.1 Construction

All construction activities associated with the proposed action would occur within existing buildings at the Site and

would not require additions to Site buildings or utilities. Construction materials would be staged in existing warehouses at the Site. Construction would consist of necessary modifications to the interiors of certain buildings and equipment as well as installation of some new equipment. Activities would include partial dismantling and removal of utility (electrical, water, laboratory gases, alarm) systems; dismantling and removal of equipment; construction and installation of new gloveboxes, utility systems, and processing equipment; and removal of non-structural walls. DOE expects construction activity for all but treatment of classified shape residues to start between May and August 1996 and be completed by July 1997. Construction activities for treatment of classified shapes is expected to start in June 1997 and be completed by the following October. Construction of treatment facilities would take place in Building 707 for all but wet residues, which would be treated in Building 371. Construction for ash and dry combustibles is expected to cost approximately \$29 million, while similar activities for salt residues are planned to cost approximately \$38 million. Construction activities for wet residues are expected to total approximately \$12.5 million, while those for classified shapes are estimated at \$8 million.

DOE estimates that construction activities related to solid residues treatment would generate the equivalent of approximately 1,020 drums of secondary waste. The waste would consist of retired gloveboxes and other equipment as well as construction debris. The majority of this waste is expected to be classified as low level waste (radioactive with 100 nanoCuries or less of radioactivity per gram of waste) with the remainder being transuranic waste (radioactive with more than 100 nanoCuries of radioactivity per gram of waste). A small portion, consisting chiefly of lead from gloveboxes, would be mixed waste (radioactive and hazardous, since lead is classified as a hazardous waste). DOE plans to decontaminate and possibly recycle of the lead. The low level and transuranic waste would be placed in containers (drums and crates) and stored in approved locations pending offsite disposal.

2.2.2 Operations

2.2.2.1 Ash Residues

The 27,900 kg of ash residues are stored in Buildings 371, 707, 771, 777, and 779. The ash category consists of three groups. The first group totals 23,600 kg and consists primarily of: (1) pulverized and unpulverized incinerator ash, (2) ash heels, (3) firebrick heels and fines, (4) magnesium oxide crucible materials, (5) grit, (6) soot and soot heels, (7) aluminum and magnesium oxide, and (8) plutonium fines removed from building exhaust ducts. (Ash, firebrick, or soot "heels" are undissolved waste material left over from previous processing to recover plutonium.) The second group includes primarily pulverized sands, slags, and crucible material totalling 3,350 kg. The third group consists of approximately 950 kg of graphite fines.

Full-scale treatment of ash residues would be preceded by a pilot study to determine the physical and chemical changes that occur to the ash residues as they are heated (calcined) to various temperatures. The results of the study would be used to develop the full scale treatment technology and operating parameters. The pilot study is planned to take place in Module J of Building 707. The ash residues would be moved to Building 707 from Buildings 371, 771, and 776/777. Ash would be removed from the containers inside the drums. The ash would be transferred to a pan inside a glovebox in Module J, and the pan placed in furnace J-25 or J-60. Inside the furnace, the ash would be heated in an oxidizing environment to 500—C, allowed to cool, have samples removed, reheated to 1000—C, allowed to cool, have additional sample taken, and replaced in the drum from which it had been removed. The samples would be analyzed in Building 559 to determine the success of the process. These steps would be repeated with modifications to operating parameters until satisfactory results were obtained.

Full scale treatment and preparation of ash residues for interim storage would occur in Module E or Module J of Building 707. Treatment of ash residues would result in removal of moisture and organics, conversion of plutonium and other metals that may be present to an oxide form, and immobilization of respirable fines.

Respirable ash fines would be immobilized by either cementation (mixing with cement to solidify the residue) or

repackaging. Some ash residues would require calcination (a thermal treatment which drives off or destroys organic contaminants and oxidizes metals) before immobilization. Effluent gases from calcining would be treated as necessary to reduce process emissions. A process flow diagram is shown in Figure 2.2.

The process would involve the following steps:

- The ash residues would be moved from their current locations to an appropriately-permitted input staging area in Building 707. The residues typically would be in 55-gallon drums during transport.
- Drums would be inspected, as necessary, using real time radiography (a means of examining the contents of a container using an X-ray system).
- If required for safeguard purposes, the quantity of plutonium/ameridium in each drum would be determined.
- The drums would be opened and unpacked within contamination control rooms in Building 707. The residues would be transferred to the glovebox line.
- Materials would be sorted and staged for further work in an existing glovebox.
- The ash residue would be size-reduced as necessary and packaged.
- Following size reduction, the residues requiring calcination would be heated to up to 1000—C.
- Exhaust gases from the calcination furnace would pass through a scrubber system and a granular activated carbon canister to neutralize and remove corrosive or organic constituents prior to release through the building's HEPA (high efficiency particulate air)-filtered exhaust system.
- Calcined material would be collected in containers and then non-destructively assayed (measuring the quantity of radioactive material in a container without affecting the physical or chemical properties of the material). This step would account for the plutonium inventory and assign an inventory value to each package removed from the glovebox line.
- Calcined and non-calcined ash residues would be cemented or repackaged to immobilize respirable fines.
- After the cement had cured, the residue would be staged for final packaging.
- The containers of cemented and/or repackaged residue would be removed from the glovebox line and placed inside 55-gallon drums in containers which meet interim safe storage criteria.
- The drums would be placed in a storage area.

DOE estimates that treatment and repackaging of ash residues would generate approximately 960 drums of secondary low level waste and approximately 540 drums of secondary TRU waste. This waste would be moved to an approved radioactive waste storage location on the Site for interim storage.

2.2.2.2 Salt Residue

The salt category of residues is composed of five sub-categories: (1) electro-refining salts, (2) molten salt extraction salts, (3) direct oxide reduction salts, (4) scrubbed molten salt extraction salts, and (5) cell clean-out salts. The salt matrix of electro-refining, molten salt extraction, and scrubbed molten salt extraction salts consists primarily of sodium chloride, potassium chloride, and magnesium chloride. The differences between these salts are based on their actinide and magnesium chloride concentrations. Most of the actinides (radioactive elements) have been removed from the scrubbed molten salt extraction salts. Direct oxide reduction salts have a calcium chloride and calcium oxide salt matrix which may contain elemental calcium dissolved and entrained in the matrix. It is possible that calcium metal buttons may be packaged with the direct oxide reduction salts. The cell scrapings are primarily sodium chloride, potassium chloride, and magnesium chloride salts. Reactive species (e.g., elemental metals) may be present in any of these salt categories. The salt residues are stored in Buildings 371, 707, 771, 777, and 779.

Treatment of up to approximately 16,000 kg of the salt residues would be conducted in Module A of Building 707 and would result in the removal of any water and the conversion to an oxide form of any reactive species (e.g., elemental metals) that may be present. A process flow diagram is presented in Figure 2.3.

Salts would be treated by a pyrochemical oxidation process (a high temperature [800—1000—C] oxidation process that takes place in a molten salt medium; used to ensure conversion of reactive metals to non-reactive

oxides)(oxidation is the process of combining a metal with oxygen in a heated environment in order to speed up its natural decay process and put it in a more stable form). The pyrochemical-oxidation process is similar to other pyrochemical processes done previously at the Site, specifically the molten salt extraction process. Both processes, for example, are oxidation processes, and use the same type of furnace, similar crucibles, and similar operating parameters. The pyrochemical oxidation process would involve the following steps.

- Drums containing the salts would be moved to a staging area prior to non-destructive assay.
- The drums would be opened and items removed in a contamination control cell to minimize radiological contamination risk.
- Any necessary non-destructive assay of salt residue would be conducted in the building.
- The items would be moved into the glovebox line for treatment.
- During treatment, the salt and an oxidant (a chemical added to facilitate oxidation) would be placed in a crucible (a container, usually ceramic but sometimes metal, used to hold materials being heated to high temperatures).
- The amount of plutonium in each batch would be established based on criticality safety limits and storage and disposal criteria. If the package requires subdivision, an in-line non-destructive assay system will be used to verify that the subdivided residue would not exceed the limit.
- The loaded crucible would be placed in a furnace, heated to 800· to 1000— C, and stirred for about 2 hours. The furnace would then be allowed to cool.
- During the heating, stirring, and cooling phases, argon would flow through the furnace. During the last part of the stirring phase, the argon would be replaced by a mixture of air and argon.
- The crucible and salt ensemble would be removed from the furnace, allowed to cool, and transferred to packaging.
- Each batch of stabilized salt would be packaged and removed from the glovebox.
- The packaged, stabilized salt would be analyzed to determine its plutonium content, placed in secondary packaging, and shipped to the designated Site interim storage facility.

Alternative Technology Evaluated

Open hearth oxidation was tested as an alternative to the pyrochemical-oxidation processing method. The technique involves heating residue salts in air to a temperature below the melting point of the salt residue for a time to stabilize reactive metals. Test results showed that the reactive constituents of concern were not completely stabilized. Since the technology did not achieve the desired results, it was eliminated from further consideration.

DOE estimates that treatment and repackaging of salt residues would generate approximately 920 drums of secondary low level waste and approximately 500 drums of secondary TRU waste. This waste would be moved to an approved radioactive waste storage location on the Site for interim storage.

2.2.2.3 Wet Residues

The 16,800 kg of wet residues are composed primarily of: (1) wet combustibles which are similar to dry combustibles but contain or have been exposed to discernable quantities of liquids (water, acids, bases, or organic solvents); (2) Ful-Flo filters (polypropylene material containing particulates from process liquid streams and trapped water, acids, bases, or organic solvents); (3) fluorides (plutonium fluorides, sodium fluoride pellets); (4) grease oxide (plutonium oxide mixed with lubricants); (5) grease fluoride (a mixture of plutonium fluoride and lubricants); (6) sludges; (7) HEPA filter media; and (8) unleached Raschig rings (borosilicate glass rings used to maintain subcritical conditions [conditions short of a criticality] in actinide solution storage tanks that, because of their shape and size, are not necessarily proof against a criticality).

Since this category of residues consists of a disparate assembly of materials, no single treatment technology would be suitable for all of the residues in the category. Treatment operations for wet residues would be conducted within glovebox lines in Room 3701 in Building 371. The following five sections describe the processes which would be utilized to stabilize the various groups of wet residues. The operations described below, however, would be common to

all wet residues.

- The residues would be moved from their current locations to Building 371.
- As necessary, the drum contents would be examined using real time radiography.
- If required for safeguard purposes, the plutonium/americium content of each drum would be determined.
- Drums containing residues would be opened and unpacked in contamination control rooms in Building 371. The residues would be transferred to the glovebox line.
- Residues would be sorted and staged for further work in an existing glovebox, as described in the following subsections.
- Following any required processing, the containers would be removed from the glovebox line and placed inside 55-gallon drums in containers which meet interim safe storage criteria.
- The drums would be stored in an appropriate location.

DOE estimates that treatment and repackaging of wet residues would generate approximately 2,750 drums of secondary low level waste and approximately 910 drums of secondary TRU waste. This waste would be moved to an approved radioactive waste storage location on the Site for interim storage.

Aqueous-Contaminated Combustibles, Some Ful-Flo Filters, HEPA Filter Media, Unleached Raschig Rings

Approximately 12,700 kg of aqueous-contaminated residues (residue materials that include aqueous [water-based] liquids. Such liquids are typically acidic or basic) would be treated by processing to remove free liquids, repackaged to meet interim safe storage criteria, and stored. Free liquids would be collected in the glovebox, placed in process waste lines, and transferred to Building 374 or 774 for treatment. Caustic waste treatment in Building 371 may be undertaken prior to transfer of the liquids to Building 374 or 774. Larger items would be size-reduced to facilitate washing. Washing would be done with a neutralizing solution. The pH (degree of acidity) of the wash solution would be maintained in the 10-12 range. At intervals to be determined by experience, the recycled solution would be withdrawn, assayed for plutonium content, measured for pH value, and sent to the liquid waste treatment facility in Building 374. Excess liquid would be filtered off and the remaining residues would be dried either by mixing with an absorbent material or drying at low temperatures (approximately 50— C). The resulting dried residues would be analyzed to determine if immobilization of respirable fines were necessary. If necessary, the fines would be immobilized by cementation or packaging. The final step would be to repackage the waste for interim storage and/or shipment off the Site. A process flow diagram is given in Figure 2.4.

Organic-Contaminated Combustibles and Some Ful-Flo Filters

Organic-contaminated combustibles and Ful-Flo filter residues would be processed to remove free liquids, stabilize plutonium fines, and remove oil as required, then packaged to meet interim safe storage criteria and stored. Processing to remove free liquids from approximately 2,100 kg of material would be accomplished by washing, low temperature (approximately 80—C) thermal desorption to remove volatile organic materials, stabilization of plutonium fines, and mixing with an absorbent material. Steam would be added to the low temperature thermal desorption unit to stabilize plutonium fines. Figure 2.5 is a process flow diagram for organic-contaminated combustibles.

Fluorides

Approximately 300 kg of plutonium fluoride residues require special processing to reduce worker radiation exposures which are caused by alpha-neutron interactions with the fluorine in the residue matrix. This processing would involve separation of the fluorine from the plutonium via dissolution in nitric acid followed by precipitation of the plutonium with oxalic acid. The resulting solid would be calcined, packaged to interim safe storage criteria, and stored. If the resulting solid contains more than 50 percent plutonium, it would be transferred to the Special Nuclear Material Consolidation Program for additional treatment (thermal stabilization in Building 707) and interim storage per DOE Standard 3013-94. Liquid wastes generated by this process would be transferred to Building 374 or 774 for treatment.

Grease Oxides and Grease Fluorides

Approximately 4 kg of grease or lubricants contaminated with small amounts of plutonium oxide and/or fluorides may

require drying prior to repackaging. The proposed method of drying would be the addition of an absorbent. Results may indicate that direct repackaging of material would be sufficient to meet interim safe storage criteria.

Sludges

Approximately 650 kg of miscellaneous sludges would be processed by filtering off any excess liquid and drying the remaining material by mixing with an absorbent. The resulting dried material would be analyzed to determine if respirable fines are present and if immobilization of the fines would be necessary. The final step would be to repack the residue for interim storage.

Wet Residue Alternative Technologies Evaluated

Potential alternative treatments for combustible residues are incineration in the fluidized bed incinerator at the Site (an incinerator which uses a solid heating medium to evaporate and burn off liquids) and pyrolysis (a form of thermal treatment in which the material to be treated is subjected to incomplete combustion with the consequent need to treat off-gases). However, DOE anticipates that resolution of safety concerns and questions associated with incineration or similar thermal treatment at the Site would make it highly unlikely that the necessary permitting process could be completed within a reasonable time. Also, destruction of the waste matrix (the host material of the contamination), one of the important characteristics produced by incineration and pyrolysis, is no longer required by the applicable Site storage criteria. In addition, aqueous chemical oxidation was considered. However, like incineration and pyrolysis, the matrix destruction it would have achieved is not required by the storage, shipping or disposal requirements which must be met. Therefore, these treatment options were eliminated from further consideration.

2.2.2.4 Direct Repackage Residues

Process knowledge (knowledge of the history of the waste) and characterization efforts have identified certain residues which are presently in a physical or chemical form that does not require treatment to meet interim safe storage criteria. However, while the residues themselves are in an acceptable form, their present packaging configuration does not meet the criteria. These residues would be directly repackaged, without treatment, into metal containers meeting interim safe storage criteria. After repackaging, the residue containers would be sent to an appropriate storage area pending shipment offsite.

These residues are composed primarily of two groups: dry combustibles and inorganics, which are stored in Buildings 371, 707, 771, 777, and 779. The approximately 6,600 kg of dry combustible residues consist of materials such as paper, rags, cloth, plastic, wood, surgical gloves, tape, paper coveralls, booties, personal protective equipment waste, full-face masks, v-belts, polyvinylchloride, polyethylene, polypropylene, pipes, valves, supplied-air suits, and gaskets. Inorganic residues, which total approximately 32,600 kg, consist of glass, graphite chunks or molds, coarse firebrick, insulation, crucibles, leached Raschig rings, declassified shapes (see following section) and heavy metals.

Preparation of direct repackage residues for interim storage would be conducted within glovebox lines in Module D of Building 707. The material may require size reduction and compaction to minimize the volume of the packaged residue. It is anticipated that the initial unpacking, assaying, repacking, and final packaging would be similar to that described in [Section 2.2.2.1](#) for ash residues. Figure 2.6 provides a process flow diagram.

DOE estimates that treatment and repackaging of direct repackage residues would generate approximately 1,220 drums of secondary low level waste and approximately 3,640 drums of secondary TRU waste. This waste would be moved to an approved radioactive waste storage location on the Site for interim storage.

2.2.2.5 Classified Shape Residues

Classified shape residues include materials that are classified because of their shape or configuration. They consist chiefly of pieces of graphite and metals including aluminum, beryllium, depleted uranium, stainless steel, and steel. The 6,700 kg of classified shape residues are stored in Buildings 371, 707, 771, 776, 777, and 779.

Shape alteration (including such processes as crushing, grinding, machining, and melting) to eliminate safeguards concerns would be the only treatment required for these residues and would take place in Module D of Building 707. After being unpacked and sorted, the classified shapes would be moved to a portion of the glovebox for processing. Equipment capable of reducing materials to appropriate sizes and unclassified shapes would be used for this task. Immobilization of fines may be required. After the appropriate sizes and shapes have been achieved, the residues would be repackaged for storage and/or off-site shipment. A process flow diagram for classified shape residues is given in Figure 2.7.

DOE estimates that treatment and repackaging of classified shape residues would generate approximately 180 drums of secondary low level waste and approximately 760 drums of secondary TRU waste. This waste would be moved to an approved radioactive waste storage location on the Site for interim storage.

2.3 No Action Alternative

The No Action alternative would involve long-term or permanent storage of the residues at the Site. Certain activities that are part of ongoing programs at the Site would continue under either the proposed action or the no action alternative. The Site would continue the present practice of storing residues in their current containers in Buildings 371, 707, 771, 776, 777, and 779. To assure the integrity of the drums and safe storage of the residues, the current operating and management practices for residues, such as surveillance, inspections, and maintenance would continue. Any drums that show signs of severe rusting, apparent structural defects, external corrosion, or leakage would be replaced by a container that is in good condition. If contamination were released by a drum failure, it would be cleaned up and the secondary waste (additional material contaminated by the spill) would be stored. All drums would be verified as having had HEPA-filtered drum lid vents installed. Activities associated with characterization, sampling, and gas generation testing of representative drums from each item description code would continue. Activities associated with the immediate remediation of residues with potential safety concerns would be completed.

The No Action alternative would be a safety concern to the Site and would place the Site in non-conformance with Settlement Agreement and Compliance Order on Consent No. 93-04-23-01 issued by the Colorado Department of Public Health and Environment and with the Defense Nuclear Facility Safety Board's Recommendation 94-1. In addition, it would limit future uses of portions of the Site, and substantially impede progress toward achieving the Site's mission of cleanup.

2.4 Shipment Offsite For Treatment

An alternative to treating all residues at the Site is shipping some to another location for treatment. This alternative would provide partial support to the Site's mission of cleaning up or removing contaminated materials from the Site so that the Site can be converted to other constructive uses. DOE is, in fact, reviewing the possibility of treating certain Site residues (approximately 12,500 kg of salts, 7,800 kg of sands, slags, and crucibles, and 18,000 kg of ash) at other DOE sites, such as Los Alamos, Lawrence Livermore, and Savannah River. However, several issues must be resolved before this alternative could be implemented. They including determining if offsite treatment can be accomplished at a reasonable cost and within the schedule required by the Defense Nuclear Facilities Safety Board's Recommendation 94-1, identifying adequate storage space at offsite facilities for the residues that could be treated there, certifying shipping containers, and repackaging residues for shipment. If these issues can be satisfactorily resolved, DOE may later propose to treat some Site residues at other locations. If such a proposal is made, separate National Environmental Policy Act documentation would be prepared to analyze the effects of that Proposed Action.

2.5 Shipment Offsite For Storage

Another alternative is to ship the residues to an offsite location for storage pending later decisions about treatment and disposal. As with the offsite treatment alternative, this alternative could provide support to the Site's mission of cleaning up or removing contaminated materials from the Site so that it can be converted to other constructive uses. However, this alternative also has issues that must be satisfactorily resolved before it could be implemented. As with the Shipment Offsite for Treatment alternative, the unresolved issues include identifying adequate storage space at offsite facilities for the residues, certifying shipping containers, and repackaging residues for shipment. Other issues include the fact that costs and risks would be incurred without moving toward ultimate disposal of the residues, since the residues would still have to be stored, treated, and repackaged after shipment. Consequently, DOE considers this alternative infeasible at this time, and unreasonable and has not considered it further.

3. AFFECTED ENVIRONMENT

The affected environment at the Site has two components, the natural environment and the built environment. [Section 3.1](#) describes the Site's location and its natural environmental resources. The proposed action and alternatives would take place within buildings at the Site. Those buildings comprise the built environment for this EA and are described in [Section 3.2](#). Because safety of the workers and the public is a paramount concern, [Section 3.2.8](#) discusses the safety features provided to mitigate the potential for accidents.

3.1 Natural Environment

The Site is located on 6,266 acres in rural northern Jefferson County, Colorado, 16 miles northwest of downtown Denver (see Figure 3.1). The Industrial Area occupies approximately 395 acres in the middle of the Site. The remaining 5,871 acres form a buffer zone around the active part of the Site. The buffer zone provides a distance of more than 1 mile between the developed portion of the Site and any public road or private property.

The climate at the Site is mild, sunny, and semi-arid with an average of 15 inches of precipitation annually. Winds are generally out of the west and northwest with an average velocity of 8-9 miles per hour [m/h]. Wind gusts exceeding 60 m/h occur frequently throughout the year, and gusts exceeding 100 m/h occur occasionally. Peak gusts are associated with the winter months.

The air quality is generally better at the Site than in the urbanized portion of the Denver metropolitan area. However, the greater Denver area, including the Site, is a non-attainment area for carbon monoxide and PM-10 (particulate material less than 10 micrometers in diameter), and is in interim compliance for ozone. Air emissions from the Site are within permitted limits for all pollutants for which there are standards. Radionuclide emissions from the Site are limited by Clean Air Act regulations (40 CFR Part 61, Subpart H) to those amounts that would result in no member of the public receiving a dose of more than 0.1 milliSievert (10 millirem [mrem]) per year. The actual dose from radionuclide emissions (point-specific and diffuse sources) to the public from the Site in 1993 was 1.6×10^{-3} (0.0016) mrem (EG&G 1994a). In comparison, the average annual natural background radiation received by individuals in the U.S. is 350 mrem (NCRP 1987).

The Site is located on a broad alluvial terrace at the base of the Rocky Mountains at an elevation of about 6000 ft. Underlying the Site is the Rocky Flats Alluvium, a soil composed of cobbles, coarse gravel, and sand over a largely

claystone bedrock.

Seismic activity in the area is low and the potential for landslides and subsidence is minimal. Adjacent land uses are agricultural to the west, agricultural with some industrial to the south, agricultural and very-low-density residential to the east, and agricultural/open space to the north.

Surface water drainage from the Site flows to the east. The developed area of the Site is drained by Woman and Walnut Creeks, while three other streams drain portions of the Buffer Zone. Ponds on Woman and Walnut Creeks store storm water runoff from the Site and effluent from the Site's sewage treatment plant. The contents of the ponds are analyzed to ensure they meet the standards of the Colorado Water Quality Control Commission prior to release downstream. The Site is not located within a 100-year floodplain as classified by the U.S. Army Corps of Engineers (USACOE 1992).

Scattered wetlands exist throughout the Site, including three small wetlands (combined area less than one acre) between Buildings 371 and 776/777 (ASI 1990). None of these wetlands is located in the immediate area of the proposed action (Krause 1994).

The Buffer Zone provides habitat potentially suitable for the Ute Ladies'-tresses, an orchid listed by the U.S. Fish and Wildlife Service as "threatened." However, individuals of the species were not found in any of the three consecutive annual Site-wide surveys (ESCO 1993). A small community of a Colorado plant "species of concern," the forktip threeawn, has been identified along the railroad tracks that enter the Site from the west along the west access road. This area is over a mile from the location of the proposed activities. No habitat suitable for either of these species has been documented within the area of the proposed action.

Habitat suitable for a federal Category 2 plant species (a species whose listing as "threatened" or "endangered" may be appropriate, but for which adequate data are not available), the Colorado Butterfly Weed, exists in the Buffer Zone, but no individual of the species has been found in recent surveys (ESCO 1993). The Preble's meadow jumping mouse is a Colorado "species of concern" and a federal Category 2 species which DOE treats as an endangered species. It is a resident of many of the riparian areas at the Site, including those along Woman Creek. No threatened or endangered species, other species of concern, or migratory birds were found in a survey conducted in September 1994, in the undeveloped area east and north of Building 371 (Ryon 1994). Since then, however, an active nest of a federally-designated threatened species, the bald eagle, has been found at Standley Lake east of the Site boundary. This nest is more than 2 miles from the buildings that would be involved in the project.

The Site is 6 miles from the nearest school and 10 miles from the nearest hospital. Approximately 291,000 people live within 10 miles of the Site and over 1,100,000 within 20 miles. The entire metropolitan Denver area, with a population of over 2.2 million, is within 50 mile) of the Site (EG&G 1994b). Population centers are generally to the northeast and southeast of the Site. The Boulder metropolitan area is within 10 miles north of the Site.

3.2 Built Environment

The Site's built environment is in the Industrial Area where the majority of work activities occur and where most of the Site's workers are located. The locations of buildings at the Site are shown in Figure 2.1 with the buildings that play a role in the proposed action highlighted. Solid residue processing would occur in Buildings 371 and 707. Low-level liquid waste treatment operations would be conducted in Building 374. Buildings 371, 707, 771, 776/777 and 779 are currently being used to store residues. The remainder of this section provides a description of these buildings.

3.2.1 Building 371

Building 371 is a four-level facility with approximately 186,000 ft² of floor space. Building 371 was originally

constructed to: (1) recover plutonium from residues generated by plutonium-related fabrication, assembly, and research activities throughout the Site; (2) convert the recovered plutonium into high-purity buttons; and (3) recover associated americium and convert it into americium dioxide. The building, placed in operation in 1981, is the proposed site for processing the wet combustible and other wet residues. Presently over 35,000 kg (38 tons) of residues are stored in Building 371.

In addition to being a proposed location for treating, repackaging and storing solid residues, Building 371 is currently the focal point for consolidation of special nuclear material from around the Site, and plays an important role in the program to drain and process liquid residues.

3.2.2 Building 374

Building 374 is an aqueous waste treatment facility located on the east side of Building 371. Operations began in Building 374 in 1980. Liquid wastes that meet waste transfer shipping limits are received from other Site buildings including Buildings 371, 707, 774, 776/777, and 779 primarily through a network of underground piping which has secondary containment. The waste treatment process includes carrier precipitation, evaporation of liquids, and sludge solidification. Solid wastes generated by operations in Building 374 are packaged and stored in an approved onsite storage location pending offsite disposal.

3.2.3 Building 707

Building 707 is a two-story facility with 148,480 ft² of floor space. In addition, there is a single-story portion with 18,560 ft² of floor space on the east side of the building. Building 707 was built in 1970, as a manufacturing facility for casting, fabricating, assembling, and testing finished plutonium parts. Former operations in the building include metallurgy, fabrication (machining), assembly, inspection, nondestructive testing, and support. The building was completed in 1969, and is the proposed site for treatment and repackaging the ash, salt, dry combustible, and inorganic residues. Presently less than 1000 kg (1 ton) of residues are stored in Building 707.

In addition to being proposed for a primary role in the program to treat, repackage, and store solid residues, Building 707 is the key building for thermal stabilization of plutonium fines.

3.2.4 Building 771

Building 771, built in 1951, is a two-level facility with approximately 151,000 ft² of floor space. The building is connected by a tunnel to Building 776/777 which is directly connected to Buildings 779 and 707. The tunnel between Buildings 771 and 776 is concrete-lined and has a ventilation system equipped with HEPA filters.

Building 771 housed plutonium fabrication activities initially, but was used primarily for plutonium recovery. The building also has capabilities for chemical research, plutonium metallurgy, and analytical laboratory activities. The building once housed maintenance shops and a waste packaging facility. Operations conducted in the building included chemical and physical processes for recovering and refining plutonium metal and americium oxide, plutonium chemistry research and radiological analyses of samples for isotopic content, impurities, and trace elements. Currently, less than 7000 kg (8 tons) of residues that require treatment are stored in Building 771. There are no plans to conduct solid residue processing operations in Building 771.

3.2.5 Building 774

Building 774, built in 1952, is a four-story liquid waste treatment facility with approximately 25,000 ft² of floor space, and is located directly east of Building 771. A network of process waste pipelines connects Building 774 to many other onsite buildings, including Buildings 374, 707, 771, 777, and 779. In Building 774, liquid process wastes are chemically treated by acid neutralization and precipitation.

3.2.6 Building 776/777

Building 776/777 is made up of two adjoining buildings and is considered to be a single structure. It is a two-story facility with approximately 156,200 ft² of floor space. The building is connected to Building 779 by an enclosed hallway, to Building 771 by a tunnel, and to Building 707 through Building 778. Building 776/777 was built in 1956, for six major categories of operations: weapons production support, site-return processing, waste operations, research and development, special projects, and support activities such as radiation monitoring, maintenance, and process materials support. Operations in Building 776 began in 1957. Currently, Building 776/777 is used for waste operations such as drum storage and residue drum venting.

The facility presently houses less than 34,000 kg (37 tons) of plutonium residues that require treatment. There are no plans to conduct residue treatment operations in this building.

3.2.7 Building 779

Building 779 was completed in 1965, and currently houses research and development equipment. The building consists of approximately 68,000 ft² of floor space on two floors and a small basement. It is connected by tunnels, either directly or through other buildings, to Buildings 777, 707, and 771. Building 779 currently houses less than 1000 kg (1 ton) of plutonium residues that require treatment. There are no plans to conduct residue processing operations in this building.

3.2.8 Safety Systems

Throughout all buildings that would be part of the Proposed Action, safety systems are or would be in place to protect workers, the public, and the environment. The safety systems include vital safety systems and glovebox design features. Worker safety is further assured by using personal protective equipment and meeting other applicable requirements of the Occupational Safety and Health Act as well as DOE and State of Colorado regulations. Implementation of administrative safety procedures also enhances the safe conduct of operations.

Vital safety systems reduce the potential for occurrence of, and mitigate the effects of, accidents. These systems have surveillance testing requirements and limits for operations which are specified in the Operational Safety Requirements of the building-specific Final Safety Analysis Reports. Brief descriptions of each of the systems are provided below.

Early spill control and response would be achieved by spill containment measures such as secondary containment, employee recognition of spill events and initiation of response procedures, a structured emergency response plan, and a highly trained and fully equipped Hazardous Material Team.

Residue processing activities would be performed in gloveboxes. Gloveboxes are enclosed structures made of steel and leaded glass and are accessible through gloveports. Workers would handle residues through the gloveports so that there is no direct physical contact with the residues. Gloveboxes that would be used in association with residue treatment are

equipped with an exhaust HEPA filter to minimize accumulation of residues in the exhaust ductwork and release of particulates to the atmosphere. The final stages of exhaust HEPA filters are tested regularly. The vital safety systems have surveillance testing requirements and limits for operations that are documented in the Operational Safety Requirements chapter of the building-specific Final Safety Analysis Report.

Personal protective equipment is provided to enhance worker safety. Throughout the proposed residue treatment processes, operators would be equipped with appropriate protective clothing as determined by job reviews and documented on radiation work permits. Each operator would be trained on the safety equipment required for each activity. Each person involved in activities involving residues would read and follow the requirements of the radiation work permit. The normal equipment required for operations involving residues is coveralls, external radiation dosimeters, safety glasses, and safety shoes. Many of the operations also require using two pairs of surgical gloves. Workers use alpha monitors to check for plutonium contamination as they exit glovebox gloves. If contamination is found, appropriate work restrictions are established until the cause is identified and corrected.

3.2.8.1 Ventilation

Many of the processing activities described in [Section 2](#), Description of the Proposed Action and Alternatives, would be conducted within the confines of gloveboxes. Ventilation systems maintain the gloveboxes at a negative pressure with respect to the surrounding room. If any breach were to develop (e.g., a glove develops a hole), the flow of air would be from the room to the gloveboxes, thus preventing the spread of contamination.

Air from the gloveboxes passes through multiple stages of HEPA filters prior to being exhausted to the atmosphere. Each HEPA filter stage is tested at the time of installation to provide a particulate removal efficiency of at least 99.97 percent and a minimum of one stage in each HEPA filter bank is tested regularly. Use of HEPA filters minimizes the amount of airborne radioactive particles that reach the atmosphere.

3.2.8.2 Selective Alpha Air Monitors

Selective alpha air monitors monitor and detect the presence of airborne contamination in rooms and plenums. The system provides both audio and visual alarms. The detectors are subjected to frequent operational checks, monthly performance testing and calibration for airflow, and an annual radioactive source calibration to maintain sensitivity and reliability. Monitors alarm automatically if any out-of-tolerance conditions are detected. Upon the alarm of a selective alpha air monitor, remedial actions are taken to prevent worker exposure and release of contamination to the environment.

3.2.8.3 Fire Protection

Fire protection systems provide fire detection and fire suppression in all buildings containing radioactive material. Gloveboxes and exhaust plenums are equipped with glovebox overheat detectors which sound an alarm should the temperature in the system rise above a predetermined level. Alarm indication is provided both locally and to the Rocky Flats Fire Department. Fire detection systems would sound an alarm if a fault occurred within the system. Exhaust plenums are protected by a water deluge system that sprays water before the first stage of HEPA filters in the event of an overheated plenum. The water deluge system protects the integrity of the HEPA filters. Further fire suppression capability is provided by fire hoses and fire extinguishers.

3.2.8.4 Life Safety/Disaster Warning

The life safety/disaster warning vital safety system is a public address system that provides a means for audio transmission of alarms and safety announcements over numerous speakers located in all buildings. Site workers can take appropriate responses to alarms and announcements.

3.2.8.5 Criticality Alarm

The criticality alarm vital safety system detects any criticality event through the use of numerous detectors. The system provides audio and visual alarms.

3.2.8.6 Emergency Power

Vital safety systems are powered by a normal and alternate power supply from the Public Service Company of Colorado. Emergency diesel generators provide backup power capabilities should both normal and alternate power be lost. An uninterruptible power supply system provides continuous power for more sensitive vital safety system electrical loads upon the loss of power. The fire detection panels, the life safety/disaster warning system, and the criticality alarm system each have a dedicated backup battery or uninterruptible power supply system.

4. ENVIRONMENTAL EFFECTS OF THE PROPOSED ACTION AND ALTERNATIVES

4.1 Natural Environment

Activities planned for the Proposed Action and those that would take place under the No Action Alternative would occur entirely within the Industrial Area of the Site. All of the activities, except transportation of residues between buildings, would take place inside existing buildings. Therefore, neither alternative is expected to affect water quality, flora, fauna or environmentally-sensitive resources such as wetlands or floodplains. Air quality effects are discussed under Human Health, below.

All Proposed Action buildings have been determined to be eligible for listing on the National Register of Historic Places. The Proposed Action has the potential to adversely affect the historic characteristics of the interior of the buildings through the changes planned to equipment. Consequently, prior to any alterations to the interior or exterior of any building, possible adverse impacts would be avoided through negotiations with the State Historic Preservation Officer.

None of the alternatives is expected to cause any adverse effects to the natural or built environment; therefore, the remainder of this section focuses on potential effects to human health. Such effects stem from both routine operations and accidents.

4.2 Human Health

Treating and repackaging residues would expose workers to both radiological and chemical hazards under routine operating conditions, and could expose workers and the public to the same hazards in the case of a major accident.

4.2.1 Routine Operations

Routine operation of the Solid Residue Treatment, Repackaging and Storage program could result in the potential for adverse human health impacts in two ways: direct radiation exposure of workers and airborne disbursement of radioactive and chemical contamination with the potential to affect workers and the public.

4.2.1.1 Direct Worker Exposure

During normal operations, radiation workers at the Site are routinely exposed to ionizing radiations at levels that are maintained As Low As Reasonably Achievable (ALARA). ALARA is the concept of ensuring that worker radiation exposures are justified by the benefits gained from performing the activity during which the exposure is received. Worker doses are maintained below the regulatory and contractual limits. The regulatory limits are risk based and apply to individual workers. The contractual limits for individual workers are administrative limits set significantly lower than the regulatory limits.

DOE's current regulatory limit for annual effective dose equivalent is 5.0 rem from 10 CFR 835, Occupational Radiation Protection. The current national contractual limit with DOE is 2.0 rem per year. This is DOE's Administrative Control Level (ACL) established in the Radiological Control Manual. The Site currently has a site ACL of 0.75 rem per year. Individual worker doses are maintained below this ACL. Based on the radiogenic cancer assumptions of the 1987 National Council on Radiation Protection recommendations, this ACL results in an annual probability of about 75 chances in 1,000,000 of succumbing to a work-related cancer. When combined with the annual non-radiation fatal accident rate for radiation workers of about 25 chances in 1,000,000, radiation workers receiving the site ACL, as a population, have an annual probability of one chance in 10,000 of dying from a work-related cause, which is the all-industry average.

Proposed Action

Under the Proposed Action, individual worker doses would not exceed the applicable limits and would be maintained below the ACL approved for the project. Increased work activity levels in the presence of radioactive materials would be expected to cause the total dose received by the involved workers, as well as the associated risk, to be temporarily elevated from the current level during the performance of treatment and repacking activities. This concept is illustrated in Figure 4.1. Likewise, during interim storage activities after treatment is completed, dose and risk to the workers would be expected to be less than the current level since less worker interaction would be required than is currently required to maintain the existing storage configuration.

No Action Alternative

Due to ongoing degradation of residue containers, some of which were intended only for temporary storage, the amount of surveillance and maintenance to support safe storage of residues would increase with time, resulting in greater worker exposures to radiation. This would cause an increase in the total dose received by the involved workers with respect to the doses currently being received (see Figure 4.1). Exposure pathways would be similar to those under the Proposed Action. However, individual

worker doses would not exceed the applicable limits, and would be maintained both below an approved ACL, and at ALARA levels.

4.2.1.2 Air Emissions

Proposed Action

Routine operations would also result in radioactive and chemical air emissions that could have the potential to affect both workers and the public. An analysis of expected air emissions (see Appendix A) shows that, while the various residue treatment and repackaging processes would produce certain hazardous, particulate and/or radioactive air emissions, all controlled air emissions would be expected to be well below not only health-based limits, but also below the much lower threshold levels for reporting or permitting. Those thresholds are annual emissions of 250 pounds (114 kg) of any single hazardous air pollutant from any single process, 2000 pounds (909 kg) of any single non-hazardous air pollutant from a single process, and radioactive air emissions of 0.1 mrem effective dose equivalent from any single point source. As shown in Appendix A, most emissions of hazardous (chemical) air pollutants would be only fractions of a kilogram (though an estimated 107 kg of carbon tetrachloride and 42 kg of nitric acid would be released with a 114 kg reporting and permitting threshold), while the non-hazardous air pollutant that would be emitted in greatest quantity (carbon monoxide) would produce emissions of 639 kg (with a 909 kg reporting and permitting threshold). Because they would be below health-based thresholds, emissions of air pollutants associated with the Proposed Action under routine operating conditions would not be expected to result in any adverse health effects.

Radioactive air emissions are expected to be within reporting and permitting thresholds, thereby resulting in no adverse effects to health. Environmental Protection Agency reporting requirements call for annual radioactive air emissions from a single point source greater than 0.1 mrem to be reported and permitted. Appendix A shows that all single-point, project-related radioactive air emissions would be below that level. In addition, emissions of chemical air pollutants would be expected to be less than applicable health-based standards. Consequently, the Proposed Action is not expected to have any adverse effects as a result of routine chemical or radioactive air emissions.

No Action Alternative

The No Action alternative would not be expected to result in any adverse effects from routine air emissions since all drums containing residues have HEPA-filtered vents. Chemical air emissions under the No Action alternative would also be expected to be under reporting and permitting thresholds, based on an analysis of headspace samples (Ramsey, 1995). Overall, the No Action alternative, like the Proposed Action, would not be expected to result in adverse health impacts from routine operations.

4.2.2 Accidents

An analysis of postulated accidents from treating or repackaging solid residues has been performed. A complete report of the analysis is presented in Appendix B, with the results summarized here. The accident that would produce the greatest release and dispersion of plutonium is an earthquake that causes the residue processing buildings to collapse. The size of earthquake needed to collapse the building has a very infrequent occurrence. For Building 707, it is predicted to occur only every 550 years, and for Building 371, every 13,000 years. The difference in frequency is due to the fact that Building 371 is seismically stronger than Building 707 and would take a stronger, more infrequent earthquake to cause it to fail.

Discussions of effects to collocated workers (workers outside the building affected by the accident but on the Site), the maximally-exposed individual, and the area population are quantified. The discussion presents the consequences of the predicated earthquakes in terms of the radiation dose that would be expected. Also presented is the risk of each case. Risk is the consequence of an event multiplied by its frequency of occurrence, and is stated in mrem per year for individuals and latent cancer fatalities per year for a population. It is used to compare events that occur with different frequencies and consequences, such as the earthquake that would collapse Building 707 (once in 550 years) and the earthquake that would collapse Building 371 (once in 13,000 years).

Because of their levels in the residues, radionuclides (i. e., plutonium), rather than hazardous chemicals, are the contaminants of greatest concern. The analysis determines the potential radiological dose that would be received by collocated workers and the maximally-exposed offsite individual, and estimates the number of additional latent cancer fatalities that would be expected in the population within 50 miles of the Site. The maximally-exposed offsite individual is an individual approximately 1 mile from the plutonium processing buildings, the distance to the nearest Site boundary. The dose would be predominantly from inhaled plutonium and americium.

Development of the accident scenarios uses conservative assumptions. For instance, some salt residues contain much higher concentrations of americium than is typical of residues. Americium 241 produces a much greater contribution to radiation dose than plutonium isotopes. The analysis conservatively assumes that salt residues high in americium were being processed at the time of the postulated accidents. Similarly, the highest concentration of plutonium in the other streams has been chosen for the occurrence of the postulated accidents.

Health effects were evaluated based on radiation from a contaminated plume created by collapse of the buildings and from inhalation and internal exposure. The inhalation pathway includes both inhalation during the time that the plume passes over and inhalation of particles that were deposited and later resuspended.

4.2.2.1 Workers

Proposed Action

For the seismic collapse of any of the buildings, the source of greatest danger to the worker population would be from the building collapse, not releases of radiation or chemicals. The radiological health effects to the workers at the facilities where the bounding accidents are postulated to occur, though not quantified, may be severe. Some workers who survived the building collapse would receive doses of radiation that could be fatal or would result in cancer that could be fatal or cause genetic damage.

No Action Alternative

Health effects to workers from an earthquake-generated building collapse under the No Action Alternative would be expected to be similar to those described for the Proposed Action.

4.2.2.2 Collocated Workers

Proposed Action

An earthquake of sufficient size to collapse Building 707 would not collapse the seismically-stronger Building 371. As a result, adverse health effects would be less. The incremental dose from the Proposed Action (the additional dose over that which would be received from the same accident under the No Action alternative) to a collocated worker from a collapse of Building 707 is estimated at 240 rem. This is a small (about 4%) increase over the 6,800 rem dose that would be received by the collocated worker in the same accident under the No Action alternative (see below). The incremental risk of this event to a collocated worker is 0.43 rem per year (rem/y).

An earthquake that caused the collapse of Building 371 would also cause the collapse of Building 707. The collocated worker incremental dose from the collapse of both buildings is estimated at 290 rem. The incremental risk of both buildings collapsing is 0.022 rem/y. The incremental risk of this event is lower than that for collapse of Building 707 because, though the consequence is slightly greater, the frequency of occurrence is much lower.

Release of chemicals, in the form of hazardous air pollutants, by an earthquake collapsing Building 371 could have adverse health effects to collocated workers, but those effects would be attributable to chemicals that would be in the

building under the No Action alternative as well; they would not be attributable to chemicals associated with the Proposed Action. The Proposed Action would not contribute materially to adverse health effects from air emissions from the bounding accident.

No Action Alternative

Under the No Action alternative, collapse of Building 707 would be expected to result in a dose to a collocated worker of 6,800 rem. Such a dose would be fatal. The risk for collocated workers of Building 707 collapsing under the No Action alternative is 12 rem/y.

Collapse of Buildings 371 and 707 under the No Action alternative is estimated to produce a combined dose to a collocated worker of 20,000 rem. Such a dose would be fatal. The incremental risk of both buildings collapsing is 1.5 rem/y.

Collapse of Building 371 would release chemical pollutants sufficient to result in adverse health impacts to collocated workers.

4.2.2.3 Maximally-Exposed Offsite Individual

Proposed Action

Collapse of Building 707 is estimated to result in an incremental dose of 2.1 rem to the maximally-exposed offsite individual. The incremental risk of this single collapse is 0.0038 rem/yr. Collapse of both Building 707 and Building 371 would produce a dose of 2.6 rem to the maximally-exposed offsite individual. The incremental risk to the maximally-exposed offsite individual of both buildings collapsing is 0.0002 rem/yr. Both doses are below the standards set to protect against adverse health effects.

Collapse of Buildings 371 and 707 under the Proposed Action would not be expected to result in release of sufficient chemical pollutants to cause adverse health effects.

No Action Alternative

The maximally-exposed individual would be expected to receive an incremental dose of 6.7 rem from collapse of Building 707 under the No Action alternative. The incremental risk of this event is 0.012 rem/y. Collapse of both buildings would result in an incremental dose of 20 rem and an incremental risk of 0.0015 rem/y. Neither of the doses exceed the standards set to protect against adverse health effects.

The No Action alternative would not be expected to result in a chemical release sufficient to result in adverse health effects from the hypothesized earthquake.

4.2.2.4 Area Population

Proposed Action

Under the Proposed Action, it is expected that there would be an additional 2.3 latent cancer fatalities among the 2.2 million people in the greater Denver metropolitan area from the collapse of either one or both residue processing buildings compared to the No Action alternative. The respective risks would be 0.0036 and 0.00018 additional latent cancer fatalities per year.

No Action

Under the No Action alternative, the area population would be expected to have 0.78 additional latent cancer fatalities per year as a result of the collapse of Building 707, and 2.3 additional latent cancer fatalities per year as a result of the collapse of both Building 371 and Building 707. The risks from these events would be 0.0014 and 0.00017 additional latent cancer fatalities per year, respectively.

4.3 Summary of Effects

No effects would be expected to the natural environment from the Proposed Action or the No Action Alternative. The potential for unacceptable adverse impacts to potentially-historic structures would be avoided through consultation with the State Historic Preservation Officer.

Worker exposures and the probability of accidents are initially somewhat greater under the Proposed Action than under the No Action Alternative because workers are working with the residues, increasing both worker exposures and the probability of accidents. However, as residue processing is completed, risks associated with the Proposed Action would drop substantially below both what they were at the beginning of processing as well as those of the No Action alternative. All worker radiation exposures would be kept within the applicable administrative control limit.

The hypothesized bounding accidents, with frequencies of occurrence of 550 and 13,000 years respectively, would be expected to result in worker and collocated worker fatalities under both the Proposed Action and the No Action alternative. Deaths would be caused by both physical effects (e.g., falling buildings) and radiologic effects. No adverse health effects would be expected from the bounding accidents to the maximally-exposed offsite individual. The bounding accident would be expected to result in a small number (approximately 2) of latent cancer fatalities among the 2.2 million people in the greater Denver metropolitan area over those which result from the same accident under the No Action alternative.

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U. S. DEPARTMENT OF ENERGY FINDING OF NO SIGNIFICANT IMPACT

SOLID RESIDUES TREATMENT, REPACKAGING AND STORAGE AT THE ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

SUMMARY: The Department of Energy (DOE) has prepared an environmental assessment (EA)(DOE/EA-1120) for treatment, repackaging and interim storage of solid residues at the Rocky Flats Environmental Technology Site (the Site) north of Golden, Colorado. The EA describes and analyzes the environmental effects of the proposed action, and considers the alternatives of taking no action, shipping the residues offsite for treatment, and shipping the residues offsite for storage. The EA was the subject of a public comment period from March 6 to April 5, 1996.

PROPOSED ACTION: The Proposed Action consists of treating and/or repackaging possibly unstable residues, and storing them at the Site until their disposition is decided. Until that time, residues need to be placed in a condition, and in containers, that are safe for interim storage

Residues are wastes contaminated with radioactive materials, chiefly plutonium and americium, in sufficient quantity that they were held pending processing to recover the plutonium. Approximately 106,600 kilograms (kg) of residues are at the Site. Of those, approximately 39,200 kg require only repackaging, leaving up to 67,400 kg that could require treatment as well as repackaging. Residues have been classified according to common characteristics and treatment requirements. The classifications requiring treatment are ash, salt, wet, and classified shape residues. All but wet residues would be treated in Building 707; wet residues would be treated in Building 371. Residues not requiring treatment would only be repackaged.

Ash residues needing treatment would be calcined, cemented if necessary, and repackaged. Salt residues needing treatment would be subject to a pyrochemical oxidation process to convert reactive metals to non-reactive oxides that are safer to store. Wet residues needing treatment would be put through one of five processes, depending on their nature. Those residues containing water-based liquids would be treated to remove free liquids and repackaged. Organic-contaminated combustibles and certain filter residues would be processed to remove free liquids, stabilize plutonium fines if necessary, remove oil if needed, and repackaged. Fluorides would be chemically converted to oxides and repackaged. Grease oxides and fluorides would be dried as necessary and repackaged. Sludges would be treated to remove free liquids, dried and repackaged. Classified shape residues would have their shape and size altered by crushing, machining or grinding, and then be repackaged.

ALTERNATIVES CONSIDERED: DOE considered the No Action alternative which would have continued the present practice of storing residues in their current containers in the buildings where they are now stored. Surveillance, inspection and maintenance activities would continue and all immediate safety concerns would be addressed. The No Action alternative was rejected by DOE because it would place the Site in non-conformance with Settlement Agreement and Compliance Order on Consent No. 93-04-23-01 issued by the Colorado Department of Public Health and Environment and with the Defense Nuclear Facility Safety Board's Recommendation 94-1. In addition, it would limit future uses of portions of the Site, and substantially impede progress toward achieving the Site's mission of

cleanup.

DOE also considered shipping some residues offsite for treatment and continues to review this possibility. However, several issues must be resolved before this alternative could be implemented. They include determining if offsite treatment can be accomplished at a reasonable cost and within the schedule required by the Defense Nuclear Facilities Safety Board's Recommendation 94-1, identifying adequate storage space at offsite facilities for the residues that could be treated there, certifying shipping containers, and repackaging residues for shipment. If these issues can be satisfactorily resolved, DOE may later proposed to treat some Site residues at other locations. If such a proposal is made, separate National Environmental Policy Act analyses would be performed on that Proposed Action.

A third alternative considered by DOE was shipment of residues to an offsite location for storage pending later decisions about treatment and disposal. This alternative also has issues that must be satisfactorily resolved before it could be implemented. As with the Shipment Offsite for Treatment alternative, the unresolved issues include identifying adequate storage space at offsite facilities for the residues, certifying shipping containers, and repackaging residues for shipment. Other issues include the fact that costs and risks would be incurred without moving toward ultimate disposal of the residues, since the residues would still have to be stored, treated, and repackaged after treatment. DOE rejected this alternative for these reasons.

ENVIRONMENTAL EFFECTS: All of the activities associated with the proposed action, except some of the transfer of residues between buildings, would take place inside existing buildings. As a result, no effects would be expected to flora, fauna, air or water quality. All buildings associated with the Proposed Action have been determined to be eligible for listing on the National Register of Historic Places. The Proposed Action has the potential to adversely affect the historic characteristics of the interior of the buildings through changes planned to equipment. Consequently, prior to any alterations to the buildings, possible adverse impacts would be avoided through negotiations with the State Historic Preservation Officer. The program would be expected to generate approximately 13,400 drums of low level or transuranic waste which would be stored on the Site pending disposal.

Under routine operating conditions, exposures of workers and the public to radiological and chemical hazards from both direct exposure and air emissions would be kept within applicable standards of regulatory agencies, DOE, and the Site. The Proposed Action would increase worker exposures in the short term but reduce them in the long term compared to both current exposure levels and the No Action alternative.

The bounding accident (earthquakes of sufficient magnitude to collapse Building 707 [expected once in 550 years] and Building 371 [expected once in 13,000 years, since Building 371 is stronger]) have equal probability of occurrence under the Proposed Action and the No Action alternative. Such an accident would be expected to result in worker fatalities (from falling debris as much as release of contamination) but no adverse health effects to the maximally-exposed offsite individual. Additional annual latent cancer fatalities among the Denver metropolitan area population of 2.2 million from collapse of both buildings are estimated at 2.3 under the No Action alternative and an additional 1.9 (for a total of 4.2) under the Proposed Action.

**FOR FURTHER INFORMATION
ABOUT THIS ACTION, CONTACT:**

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DETERMINATION: Based on the information and analyses in the EA, DOE has determined that the proposed treatment, repackaging and storage of solid residues at the Rocky Flats Environmental Technology Site does not constitute a major Federal action significantly affecting the quality of the human environment within the meaning of

the National Environmental Policy Act of 1969, as amended. Therefore, an environmental impact statement is not required and DOE is issuing this Finding Of No Significant Impact for the Proposed Action.

Signed at Golden Colorado, this _____ day of April, 1996.

Mark N. Silverman, Manager
Rocky Flats Field Office
U. S. Department of Energy

RESPONSE TO COMMENTS ON DRAFT SOLID RESIDUES TREATMENT, REPACKAGING, AND STORAGE ENVIRONMENTAL ASSESSMENT

Rocky Mountain Peace Center

1. **Comment:** Poor public notice was provided that an EA was being performed.

Response: DOE acknowledges poor communication with Rocky Flats stakeholders regarding the fact that the Solid Residues Environmental Assessment (EA) was in preparation. In response to this situation, DOE will provide the Citizen's Advisory Board (CAB) with a list of upcoming EAs, and will notify CAB periodically of scheduled EAs in the future.

2. **Comment:** The EA document nowhere explains how to make public comments - to whom, where, etc.

Response: Copies of the EA were preceded by a Community Advisory or notice of availability which described how, when, and where to make comments. Future Rocky Flats Field Office (RFFO) draft EAs will include a page with information about making comments.

3. **Comment:** No public meeting or even information session is scheduled to hear from interested parties.

Response: DOE has had numerous meetings with the CAB regarding its plans for processing residues and will continue to do so. DOE believes that the combination of these earlier information sessions, together with the public comment period and the information provided in the EA, is sufficient to fully inform stakeholders and the public of its treatment and storage plans for residues. Opportunities for public involvement will be provided in the future as DOE develops plans for residue disposition alternatives. See responses to comments 8 and 9.

4. **Comment:** Though a request was made that the comment period be extended for at least 42 additional days it was extended for only 12.

Response: The original 18-day public comment period was extended to 30 days. DOE is attempting to provide adequate opportunity for public comment while meeting the commitments made in response to the Defense Nuclear Facilities Safety Board Recommendation 94-1 and the Settlement Agreement and Compliance Order on Consent No. 93-04-23-01 of the Colorado Department of Public Health and Environment. RFFO has typically allowed 30-day comment periods; what was initially a shorter comment period for this EA was an exception. The exception was made because DOE was concerned that schedule requirements associated with safety would be negatively affected by having the usual 30-day comment period.

5. **Comment:** This comment period falls in the middle of two other major comment situations, namely for the Rocky Flats Cleanup Agreement and the PEIS [Programmatic Environmental Impact Statement] on Storage and Disposition of Weapons-Usable Fissile Materials. Timing for this one could not be worse.

Response: DOE is working on numerous fronts to accomplish work at the Site and throughout the Nuclear Weapons Complex with the result that several documents may be out for review at any one time. While DOE attempts to sequence release of EAs and other public documents for review to avoid overburdening stakeholders, issuance of this EA at the same time as the EISs that are out for public review was unavoidable.

6. **Comment:** One person told me that when he requested a copy of the EA document from [DOE's Rocky Flats Field Office manager] Mark Silverman's office, he was told it was not available, that he should go to a reading room. We may be forgiven if we get the impression DOE isn't interested in getting public comment on this EA.

Response: DOE has published the EA for the expressed purpose of obtaining public comment on the proposed action and the alternatives. A Community Advisory was sent out to a list of over 50 elected officials and stakeholders, the EA was sent to reading rooms, and a notice of availability was sent to over 60 other local stakeholders known to be interested. In addition, the EA has been made available to all others who requested it with a total of over 60 copies sent out. DOE has made, and will continue to make, copies of public documents easily and readily available to all interested persons in as timely a manner as feasible.

7. **Comment:** Earlier I requested that a coordinated calendar of NEPA [National Environmental Policy Act]-process and other public comment activities for Rocky Flats be created and that the information be made available to interested parties well in advance. Such a calendar should make a point of avoiding the kinds of overlaps and conflicts created on this EA.

Response: See responses to comments 1 and 5.

8. **Comment:** NEPA requires an EIS for a major federal action likely to have a significant impact on the environment. A project involving 3 metric tons of plutonium and costing \$87.5 million for initial construction independent of operating costs certainly fits this definition. DOE should proceed with actions required to stabilize unstable residues, but conduct an EIS for the residue project in the larger sense alluded to in the EA document.

Response: NEPA provides that one way of determining whether an EIS is necessary is to prepare an EA. DOE believes that the result of the analyses in the EA is that the environmental effects of the proposed action would not be significant and that, therefore, an EIS on the proposed action (treatment, repackaging and storage of solid residues) is not necessary. In addition, while a project's cost may indicate that it is a "major federal action", it is not necessarily an indication of having a "significant impact on the environment".

If, by "the residue project in the larger sense alluded to in the EA document" the commentator means disposition of the residues after the proposed action, the Waste Isolation Pilot Project Plant (WIPP) Supplemental EIS, a draft of which is due in late summer of this year, will provide the seminal opportunity for public comment on disposition of residues. Disposition of residues is outside the scope of this EA.

9. **Comment:** Safeguards and security concerns are not dealt with in this document, nor are they covered in the Stabilization and Disposition PEIS, nor are they covered in the WIPP EIS. Given that 3 MT [metric tons] of Pu [plutonium] is involved, this is a significant oversight. Things said at the April 2 meeting [between RFFO and the Rocky Mountain Peace Center] gave me the impression Rocky Flats folks are playing a waiting game regarding this issue, not a very happy way of dealing with the proliferation-related risks involved. If these concerns are not dealt with in any of the above analyses, where will they be dealt with? Should there be a PEIS on residues? Would this be the best way to guarantee that safeguard and security concerns for residues complex-wide get dealt with?

Response: This Environmental Assessment has been revised to better clarify the proposed action is to place residues in compliance with the Department's Criteria for Interim Storage of Plutonium Bearing Materials. Essentially, these Criteria would ensure that residues are in a condition that allows for safe storage for at least 20 years. A copy of the Criteria is available in the DOE reading rooms, or can be obtained by calling Dennis Connors of Kaiser-Hill Community Relations at 966-8164.

The draft EA contained numerous references to making the materials compliant with the WIPP Waste Acceptance Criteria (WAC). The final EA has deleted all references to WIPP as an ultimate disposal site for wastes and residues

from the proposed action. Although it is quite possible that WIPP will ultimately serve as the disposal site for Rocky Flats residues, this EA now leaves the door open for other disposition alternatives. The final EA states clearly that the intent is to place residues in a condition allowing for safe interim (up to 20 years) storage irrespective of the disposition method selected in the future.

Attached (following page) is a letter from Leanne Smith, RFFO Assistant Manager for Mission Advocacy, to Hank Dalton, EM-66 Nuclear Materials Stabilization Group at DOE Headquarters, urging Mr. Dalton to create a residue disposition decision program which allows for public input. RFFO will keep the CAB and the Rocky Mountain Peace Center apprised of Mr. Dalton's response to the letter and DOE's future plans for complex-wide residue disposition decision process. As mentioned in the comment, a programmatic environmental impact statement is one way in which a complex-wide disposition strategy for residues could be developed.

The proposed action of this EA will not preclude any disposition alternatives that would be considered under a complex-wide disposition strategy. As the strategy is developed, activities covered in this EA would be evaluated to ensure they support and are consistent with the long term disposition. The EA would be revised as needed to conform to the disposition strategy.

The proposed action would place ash residues in a cemented waste form which could complicate, although not preclude, certain disposition alternatives. Cementation would eliminate the possibility of dispersion of ash particles in an accident, protecting workers and the public from exposure as a result of inhalation of airborne ash. While cementation may complicate some disposition alternatives, it is justified by the risk reduction gained from eliminating the possibility of dispersion.

Safeguard and security (*i. e.*, non-proliferation) considerations would be important in development of a complex-wide disposition strategy. However, placing residues in a non-proliferable form is not an underlying factor for the proposed action of this EA. Safety concerns identified by the Plutonium Vulnerability Assessment, the Defense Nuclear Facilities Safety Board Recommendation 94-1, and the 1993 Residue Consent Order drive proposal for treatment and/or repackaging of residues. During treatment, repackaging, and storage at the Site, residues would be subject to all DOE safeguard and security orders and rules.

10. Comment: Ambiguity reins (*sic*) regarding residues. The EA nowhere tracks what has happened on the definition of residues at Rocky Flats (where they are now called TRU [transuranic] waste), to say nothing of elsewhere in the DOE complex (where other definitions prevail). This confusion of terms in more than semantic, since it may one day effect decisions on which material can or cannot go to a DOE disposal facility such as WIPP.

Response: The changes in definition referred to are explained in the third paragraph of [section 1.1](#), page 1, of the EA.

11. Comment: The EA assumes WIPP will open and will have the capacity to take all the Rocky Flats residues. The essence of bad planning is exclusion of alternatives because of assumptions that themselves can only be speculative. What happens if WIPP doesn't open? Does anyone at DOE ever ask this question? What is the answer to it in terms of alternatives?

Response: The EA has been modified in [section 1](#) to refocus on the central question of the document: how best to make solid residues safe for interim storage until their disposition is determined. Disposition of Rocky Flats's solid residues after they are made safe for storage at the Site is beyond the scope of the EA, but will be dealt with in the WIPP Supplemental EIS, and possibly other disposition decision processes, as mentioned above.

12. Comment: What variances are required from DOT [Department of Transportation] for transport of residues to WIPP? What is the status of this? What effects does it have on actions with residues at Rocky Flats or at WIPP?

Response: See response to comment 11. Interim safe storage criteria have been designed both to ensure safe storage for at least 20 years and to minimize the amount of additional treatment or repackaging that would have to be done later. If WIPP waste acceptance criteria change significantly or if certain expected variances to DOT shipping regulations are not granted, subsequent treatment or repackaging may be required.

13. Comment: Ditto for the WIPP WAC [waste acceptance criteria]. What are the existing criteria? The proposed changes? What is the status of this and its effect on operations at Rocky Flats.

Response: See responses to Comments 11 and 12. Residues are proposed for treatment to meet interim safe storage criteria, not DOT requirements or WIPP WAC *per se*, though the criteria have much in common with the requirements and the WIPP WAC. Changes to the latter two sets of requirements would have little if any effect on residue operations at the Site because such operations are guided by the interim safe storage criteria, not WIPP waste acceptance criteria.

14. Comment: From an earlier version of a quite incomplete residue section of SISMP [Site Integrated Stabilization Management Plan] I learned that minimal processing will occur to prepare residues for 20-year storage. Why isn't this processing described in detail in the EA? I assume the processing will have to meet DOT and WIPP standards, but wonder if affected people in New Mexico have had the opportunity to be fully appraised and to comment on what is considered for their state.

Response: The processing described in the EA is the same as that described in the SISMP for placing residues in a condition for safe storage. The narrative and flow charts in the EA provide the necessary details for understanding the proposed action and its environmental effects. The processing will not be "minimal" but will be to that level necessary for safe storage until final disposition of the residues is decided and implemented, a period estimated not to exceed approximately 20 years. If interim storage turns out to exceed 20 years, additional processing or repackaging of some of the residues may be necessary at that time.

The people of New Mexico will have a chance to comment on the WIPP Supplemental EIS, a draft of which is projected to be ready for public review by September 1996. The analysis in the Supplemental EIS will include a site-by-site description of the waste destined for disposal at WIPP. This includes identification of residue-generated waste from Rocky Flats, with analyses of the transportation risk from moving wastes (including residues) to WIPP and the cumulative environmental effects of burying waste at WIPP (including an analysis of the maximum expected quantity of radioactive materials).

15. Comment: Related to the immediately foregoing item, doesn't this minimal processing plan ensure the necessity of further Pu [plutonium] processing if WIPP doesn't open within 20 years? Again is the EA really looking at alternatives?

Response: With regard to the possibility of additional residues processing in the future, see responses to comments 12 and 13. With regard to the EA looking at alternatives, [section 1](#) of the EA has been rewritten to emphasize that the scope of the EA is limited to how to best stabilize solid residues and prepare them for safe storage until their disposition is determined. [Section 2](#) of the EA looked at four alternatives (including the proposed action): processing, repackaging and storing the residues at the Site until disposition, taking no action, shipping the residues offsite for treatment, and shipping the residues offsite for storage. In addition, in describing the proposed action, certain alternative stabilization technologies were described and analyzed. Alternatives related to disposition of the residues after they have been made safe for storage are beyond the scope of the EA.

16. Comment: The EA document doesn't show that [vitrification] was ever considered, much less that it was rejected for some good reason.

Response: Vitrification was not considered in the EA because DOE considers vitrification of materials such as those containing residues to be a technology that is not sufficiently developed to assist in the residue processing program within the required schedule. The primary need driving the solid residue stabilization program is to make the residues safe for interim storage in a manner that meets the schedule commitments made in response to the Defense Nuclear Facilities Safety Board Recommendation 94-1 and the Settlement Agreement and Compliance Order on Consent No. 93-04-23-01 of the Colorado Department of Public Health and Environment. These commitments do not permit development or modification of new technologies; existing technologies must be used where ever possible.

17. Comment: On page 2-15 the document states that some Pu now in residues will be transferred to the SNM [special nuclear material] Consolidation Program. How much material is this? What effect will the transfer have on the

inventories for various categories of Pu?

Response: One class of residues, 316 kg plutonium content of fluoride-contaminated oxides, will be transferred to the consolidation program after treatment. This is because the stabilization process for fluorides will eliminate the fluoride contamination and turn the material into greater than 50% plutonium oxide. Material with greater than 50% plutonium is considered to be surplus plutonium, subject to the guidance of the Storage & Disposition of Weapons Usable Fissile Material PEIS and to the Site's SNM Consolidation program.

18. Comment: A major concern with this project is the proliferation aspect of disposing of 3 MT [metric tons] of not-completely-stable Pu at WIPP.

Response: See responses to comments 9 and 11.

19. Comment: We feel that the assessment provided by the EA is insufficient in light of the importance of the decision and the quantity of material to be processed, the possible near and long term impacts of the proposed action on the health of workers, the public and the surrounding environment, as well as potential impacts on other programs within the Department of Energy (DOE). Therefore, we request that DOE perform an Environmental Impact Statement on the treatment, packing and storage of all residues, except any high risk residues that present an immediate danger.

Response: See response to comment 8. The DOE considers all residues to be in urgent need of treatment and/or repackaging to meet the interim safe storage criteria. Several other groups have voiced a similar concern. The Defense Nuclear Facilities Safety Board, for example, noted in its Recommendation 94-1 on residues:

- "Imminent hazards could arise in two to three years unless certain problems are corrected."
- "What is clear is that the materials require treatment on an accelerated basis to convert them to forms more suitable for safe interim storage."
- "The Board is especially concerned about thousands of containers at the Rocky Flats Plant holding miscellaneous plutonium-bearing materials classed as "residues", some of which are chemically unstable."
- "The Board recommends that a program be formulated to convert within two to three years the materials to forms or conditions suitable for safe interim storage."
- "The Board recommends that preparations be expedited to process the containers of possible unstable residues at the Rocky Flats Plant and to convert constituent plutonium to a form suitable for safe interim storage."

The Plutonium Working Group, which wrote assessments for DOE's Plutonium Vulnerability Assessment, addressed the dangers posed by the residues, noting in pages 26 through 29 of their Plutonium Working Group Report, that:

- "Building 771 has 55 gallons drums of unleached ion exchange resin containing nitric acid and plutonium, an explosion hazard."
- "Buildings 371 and 771 have a total of 774 packages of wet combustibles that are a fire hazard, including Ful-Flo filters with organics and rags and paper soaked with plutonium solutions."
- "Building 771 has 13 packages of grease contaminated with plutonium oxide and fluoride that pose fire and radiation hazards."
- "Buildings 776 and 371 have 5942 pyrochemical salt packages that are corrosive and chemically reactive."
- "Over 8000 drums containing waste and plutonium scraps are stored throughout all buildings. These materials increase the general radiation levels and the amount of radioactive material for release in the event of a fire or explosion."

- "There are 2.9 metric tons of plutonium in 20,532 packages of scrap/residues distributed throughout all of the buildings. Being corrosive, residues can cause container failures. Over 5000 fifty-five gallon drums at Rocky Flats contain plutonium residues mixed with over 100 metric tons of other materials. The absence of standard DOE packaging criteria has resulted in 47 different packaging configurations for residues. Scrap residues include pyrochemical salts, wet combustibles including rags, filters and paper soaked with solutions containing plutonium. The likelihood and consequences of failures involving such large amounts and varieties of materials are unpredictable."

Thus, other groups have agreed with DOE's assessment that prompt action should be taken to stabilize and/or repackage residues to meet interim safe storage criteria. All residues at the Site should be considered in need of such treatment and repackaging. While some residues are in configurations more dangerous than others, it would not be prudent to ignore any residue category and assume the materials meet interim safe storage criteria without either stabilization or repackaging.

20. Comment: It is regrettable that the Department of Energy issued the Residue EA with very little public notice, no public process (information sessions or comment sessions), and only an eighteen-day comment period. While the process followed by the Department may have been legally adequate, it does not meet the spirit of meaningful public involvement to which the Department is committed.

Response: see response to comments 1, 3, and 4.

21. Comment: A forty-five day extension [in the public comment period] as requested by the Rocky Mountain Peace Center would have allowed for some public process and would have allowed time for development of meaningful comment from a larger group of stakeholders.

Response: See response to comment 4.

22. Comment: WIPP is almost ten years behind schedule and may never open. Reliance on WIPP is not a wise idea. DOE RFFO has been told this many times before.

Response: See response to comment 11.

23. Comment: As described in the EA approximately 5,580 drums of additional low-level waste and 5,590 drums of TRU waste will be generated. In addition at least 14,000 to 16,000 (perhaps as much as 20,000-30,000 - conversation with Paul Golan 4/1/96) drums of residues will be created as a result of processing and repackaging. These residues will be classified as TRU waste, and in addition to 5,590 drums of secondary TRU waste generated through the proposed actions, are earmarked for disposal at WIPP. The EA does not adequately describe how and where this additional waste will be stored.

Response: Wastes generated by processing of residues will be stored on the Site until their final disposition is determined. The exact location(s) for such storage have not been identified, but the Radioactive Waste Storage Environmental Assessment (DOE/EA-1146) of April 1996, analyzes nine buildings at the Site that could be converted to radioactive waste storage. Waste from residue treatment would be stored primarily in the buildings of origin.

Interim storage of residues at the Site will be integrated with interim storage of SNM (plutonium pits, metal and oxide, and highly enriched uranium). One of the alternatives in the Site's Site Wide Environmental Impact Statement, a draft of which is scheduled to be released for public comment later this year, is to build an interim storage vault for plutonium. Moving plutonium to a new vault may open substantial storage capacity for residues in Building 371. Building 371 is currently the most robust and seismically safe of all buildings at the Site for storage of radioactive wastes.

24. Comment: If WIPP does not open as planned, the EA does not describe the impact on the site. What is the impact on combustible residues if WIPP does not open? If WIPP does open there is no guarantee when, or if all of the waste at Rocky Flats will go there. The proposed actions assume a variance in DOT [Department of Transportation]

regulations that would allow 1400 grams of plutonium to be shipped in each TRU-PACT II container. This has not yet been granted. If it is not granted, reliance on WIPP will result in a much larger number of drums of residue/TRU waste.

Response: See responses to comments 11, 12 and 13.

25.Comment: Alternatives to the proposed actions are not analyzed in the EA. Wet chemical oxidation and vitrification are both possible technologies that could be utilized in treating residues. Neither technology is analyzed in this EA. It is likely that there are other technologies that escaped analysis.

Response: See response to comment 15.

26.Comment: Hazards to workers are not adequately analyzed in the EA. What would be the hazard to workers under normal operating scenarios? The Administrative Control Level [ACL] for the site is .75 rem per year. Reference is made to a project ACL. Is this expected to be higher than the site ACL?

Response: It is anticipated that worker exposures would not exceed the ACL of 0.75 rem annually for residue stabilization activities. Residue stabilization activities do involve the potential for significant cumulative radiation exposure. Depending upon how quickly the stabilization activities are carried out and how many workers carry out the activities, the potential exists for workers to be exposed to radiation in excess of the ACL. However, if establishing a higher ACL appears appropriate, it would be done by balancing the risk reduction benefit with the radiation exposure cost.

27.Comment: What type of container will be used to store residues? Will drums be new or used? No description or analysis exists in the EA. Used drums may be problematic as they may have an operational life shorter than 20 years.

Response: Basically, two types of containers will be used to store residues: pipe component and/or 55-gallon drums. The pipe components would all be new containers and most of the 55-gallon drums would be new drums. Recycling of used drums will be considered if the condition of the drums is satisfactory. The interim safe storage criteria have two basic standards - one for the material, ensuring the material is stabilized, and one for the container, ensuring the container is in good shape. All containers used for the interim safe storage of treated residues would meet the interim safe storage criteria.

28.Comment: Unfortunately residues escape consideration under both the WMPEIS [Waste Management PEIS] and the S&D [Storage and Disposition] PEIS for Surplus Fissile Material. As noted above the residues could have a significant impact on WIPP. There should be an analysis of residue plans at Rocky Flats as they relate to other TRU waste plans throughout the complex and the cumulative impact on WIPP. Residues at Rocky Flats contain 3.1 metric tons of plutonium. Currently they do not meet the spent fuel standard that is being employed in the S&D PEIS. Residues are a potential proliferation threat. It would be wise to consider residues in the context of the S&D PEIS, and to consider immobilization of residues at Rocky Flats, either through vitrification or ceramification.

Response: Regarding relationship between residues and other EISs, see response to comment 11. Regarding alternative treatment technologies, see response to comment 15.

29.Comment: The scope of this project is large. It encompasses the processing of 106,600 kg of residues containing 3.1 metric tons of plutonium. Construction costs for the project (not including operational costs) are projected to be \$87.5 million. A variety of processes will be employed to treat the residues. It is not clear in this EA that these processes are inherently safe, or that they are the best to employ.

Response: No alternative, including the no action alternative, is "inherently safe". DOE believes that the analyses in [section 4](#) of the EA, as described more fully in Appendix B, show that the processes to stabilize residues are reasonably safe as measured by common industrial and nuclear industry practices and experience.

30.Comment: How 3.1 metric tons of plutonium, the debris, and hazardous constituents with which it is commingled are treated, packaged and stored is an extremely important decision. As shown above, many important questions

remain unanswered in the EA. The magnitude of these decisions dictates the wisdom of performing an Environmental Impact Statement on the treatment, packaging and storage of residues. Therefore, we request that DOE immediately outline which "high risk" residues require immediate treatment. It would make sense to treat these residues on the basis of the EA. In a meeting with site officials on 4/2/96 it was indicated that this would be a small portion of the residues. How to treat, package, and store the rest of the solid residues needs to be the subject of an Environmental Impact Statement.

Response: See responses to comments 8 and 20. During the April 2 meeting, DOE described those residues which should be treated before 1998 and those which could wait until 1998-2002. DOE believes that all residues must be treated and or repackaged to meet interim safe storage criteria and maximize safety. The SISMP (Site Integrated Stabilization Management Plan) describes the schedule for stabilizing each type of residue.