

02-RF-01052

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02-RF-01052

Ron Bostic  
 Director, Nuclear Regulatory Division  
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TRANSMITTAL OF THE FACILITY SAFETY ANALYSIS, BUILDING 881 AND RELATED FACILITIES, REVISION 0; REQUEST FOR APPROVAL ON THE RE-CATEGORIZATION TO *RADIOLOGICAL* - DPS-013-02

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TURNER, K.	X	X
CORRES.CONTROL	X	X
ADMIN RECORDS	X	X
TRAFFIC		
PAT#130		

- Refs:
- (a) *Hazard Baseline Documentation*, DOE-EM-STD-5502-94, U.S. Department of Energy, Washington, D.C., August 1994.
  - (b) *Integration of Environment, Safety, and Health into Facility Disposition Activities*, DOE-STD-1120-98, Volume 2 of 2, Appendices, U.S. Department of Energy, Washington, D.C., May 1998.
  - (c) *Approval of Building 881 Facility Safety Analysis Annual Update Revision 2 and Page Change PGC-881-02.1502-ARH*, Mazurowski to Parker letter, SP:NRD:RB:02-00850, June 3, 2002.
  - (d) *Safety Analysis, Building 881 and Related Facilities*, Revision 2, Site SAR, Volume I, Appendix H, May 2002.
  - (e) *Building 881 Holdup Measurement Summary*, HMT-02-282, Holdup Measurement Team, Rocky Flats Environmental Technology Site, July 26, 2002.
  - (f) *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*, DOE-STD-1027-92, DOE Standard, U.S. Department of Energy, Washington, D.C., December 1992.
  - (g) *Building 881 Criticality Incredibility and Interface with the Nuclear Criticality Safety Program*, Criticality Safety Evaluation #NMSL: 02-0058, Evaluation: BLK-179, Revision 0, August 1, 2002.

This letter transmits the enclosed *Building 881 Facility Safety Analysis (FSA)*, Revision 0, for information. This Building 881 FSA provides a new final hazard classification of *Radiological* for Buildings 881, 881F and 887, based on current radiological material inventories and the hazards associated with the facilities and their current dismantlement, decontamination and demolition (DD&D) mission. The facility hazard category for related Buildings 830, 881G, 881H, 885, and 890 remains *Industrial*. The re-categorization of the facility, as described below and in the FSA, is based on guidance provided in DOE-STD-5502-04 (Reference [a]) and DOE-STD-1120-98, Volume 2, Appendix G (Reference [b]). Further, the Building 881 FSA, Revision 0, satisfies the requirements for an annual update of a Site Authorization Basis (AB) document. Kaiser-Hill requests DOE, RFFO approval on the reclassification of the facility to *Radiological* from its present *Nuclear Hazard Category 3*. Upon approval by DOE, RFFO, the Building 881 FSA will replace the recently-approved (Reference [c]) *Safety Analysis, Building 881 and Related Facilities*, Revision 2 (Reference [d]) and will be included as a section of the Site SAR, Volume II. Until receipt of approval from DOE, RFFO, however, the existing Reference (d) shall remain in effect.

CLASSIFICATION:	
UCNI	
UNCLASSIFIED	X X
CONFIDENTIAL	
SECRET	

AUTHORIZED CLASSIFIER

SIGNATURE:

Date: 8/21/02 J/NO  
 IN REPLY TO RFP CC NO.

ACTION ITEM STATUS:  
 PARTIAL OPEN  
 CLOSED

LTR APPROVALS:

RIG. & TYPIST INITIALS:  
 ARH:wjd

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Ron Bostic  
DPS-013-02  
Page 2

Reference (d) established the final hazard classification for the facility as *Nuclear Hazard Category 3* based on a conservative estimate of plutonium inventories in the building ductwork and in low-level/low-level mixed (LL/LLM) waste containers stored in the building. K-H RISS Project Management has recently completed aggressive facility hazard reduction measures including decontamination of said ventilation ducts and removal of all LL/LLM waste stored in Building 881. Field assay measurements taken after completion of the duct decontamination indicate that no plutonium in excess of the instrument lower limit of detection (LLD) exists in the ducts. Therefore, a conservative plutonium estimate of no more than three point six (3.6) grams of plutonium is used for the facility's proposed *Radiological* hazard categorization. The *Building 881 Holdup Measurement Summary* (Reference [e]) indicates that no original measurement spectra, re-measurement spectra, or long-count spectra show any gamma-ray activity from plutonium.

The total facility plutonium inventory, including the estimated 3.6 grams of Pu in the ducts and in LL/LLM waste containers remaining in Building 881, is less than the 8.4 gram *Nuclear Hazard Category 3* threshold specified in DOE-STD-1027-94 (Reference [f]). Building inventories of other isotopes (e.g., Uranium-235) are an even smaller fraction of their respective *Nuclear Hazard Category 3* thresholds as summarized in the enclosed FSA, Table 1. Using guidance provided in Reference (f), the sum-of-ratios computed using the *Nuclear Hazard Category 3* thresholds is 0.43, or less than one, and Building 881 therefore should be classified as a *Radiological* facility. K-H has assessed feasible "hidden room" locations in Building 881 for unknown radiological/hazardous materials and no such rooms or materials have been located. Should such rooms or materials be located in the future, work shall immediately stop to ensure personnel and facility safety and the condition shall be managed via the Discovery Issues Management process as required by Section 5 of the enclosed FSA.

Due to the aggressive facility hazard reduction activities described above, operational criticality safety controls are no longer applicable to the facility. The facility has exited the facility-specific Criticality Safety Program as described in the *Building 881 Criticality Safety Evaluation (CSE)* (Reference [g]). The facility does participate in Site-Level implementation of all Site SAR, Volume I, Chapter 6 "Safety Management Programs" (SMPs), including the Criticality Safety SMP, however. To protect the enclosed Building 881 FSA's assumptions and proposed re-categorization to *Radiological*, controls are placed on the facility to prevent introduction of additional LL/LLM waste into Building 881. Authorized facility activities include continued control of existing facility contamination, and operations in support of final facility DD&D.

If you have any questions, please contact myself or Tim Humiston at extension 2700.

  
D. P. Snyder

Deputy Project Manager, RISS Safety  
Remediation, Industrial D&D, and Site Services  
Kaiser-Hill Company, LLC

ARH:wjd

Orig. and 1 cc - Ron Bostic

Enclosure:  
As Stated



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**ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE**

**SAFETY ANALYSIS REPORT**

**VOLUME II**

**FACILITY SAFETY ANALYSIS**

**for the**

**BUILDING 881  
and Related Facilities**

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KAISER • HILL  
COMPANY

Revision Number: 0  
Date: August 2002

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

# FACILITY SAFETY ANALYSIS

## BUILDING 881 And Related Facilities

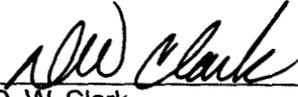
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By: Carlo Lami  
Date: 8/21/02 U/VU

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## CHANGE SUMMARY

AB Revision Number	Description
0	<p>Original Issue. Nuclear Hazard Category 3 Facility Safety Analysis (FSA) was issued as a section of the Site SAR, Volume II.</p>
1	<p>Added incorporation of DOE, RFFO technical direction contained in DOE, RFFO Ltr. AME:ABD:MER:00-00828, <i>Technical Safety Requirements Revision Building 881</i>, dated December 16, 1999. Stated technical direction was to change Specified Credited Controls (Table 9) to include a Required Action to establish a fire watch and suspend activities in affected radioactive material storage areas when either automatic fire suppression capability or fire suppression flow alarm transmittal capability to the Fire Department are not maintained.</p> <p>Added incorporation of DOE, RFFO technical direction contained in DOE, RFFO Ltr. AME:TCD:JKN:00-00013, <i>Approval of Exemption Request RFPD-DOE-C420.1-EX-054, Automatic Sprinkler Protection in the Tunnel Area of Building 881</i>, dated November 22, 1999. Stated technical direction was to change Specified Credited Controls (Table 9) to add a requirement for weekly surveillance for combustibles in the Tunnel Area (Rooms 12 and 15) and for immediate removal of combustibles, if found.</p> <p>Nuclear Hazard Category 3 FSA was issued as a section of the Site SAR, Volume II.</p>
2	<p>Added discussion of Reactive Chemical Treatment Units in Room 267, as evaluated in USQD-881-00.0962-KHT, dated March 8, 2000.</p> <p>Added incorporation of DOE, RFFO technical direction contained in DOE, RFFO Ltr. AME:NRD:MER:00-01-01790, <i>Disapproval of the Site Safety Analysis Report Revision 2</i>, dated March 22, 2000. Stated technical direction was to include in the Safety Analysis a direct commitment to compliance with the Safety Management Plan as described in Chapter 6 of the Site SAR, Volume 1.</p> <p>Added discussion of Safety Management Plan applicability and reformatted Credited Controls in the form of the Administrative Controls Template.</p>

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Revised Accident Analysis to reflect collocated worker at 100 meters and dose conversion factor based on ICRP-68. These changes are per DOE Memorandum AME:NRD:MP:00-02784 dated June 12, 2000.

Included plan to obtain isotopic field measurement data for duct holdup (Section 3.1.2) Nuclear Safety) per Technical Direction provided in DOE Memorandum AME:NRD:RGB:00-03674 dated November 28, 2000.

Added clarification regarding the referenced value of 1 mg/ft<sup>2</sup> used to qualitatively and conservatively bound the 313g Pu (rounded up from previous 312.5 g Pu) estimated as radioactive material holdup in the Building 881 ducts. The clarification resulted in changes to Section 2.2.3, Facility Inventory and Source Term Development, Table 1, Section 4.3.1, Assumptions, Assumption # 9.

Nuclear Hazard Category 3 SA was issued as Appendix H of the Site SAR Volume I.

0

Reclassifies Building 881 as a *radiological* facility based on reduced Material At Risk (MAR) in the facility via: 1) decontamination of ventilation ducts (verified via radiological measurements), and 2) removal of all stored LL/LLM waste from the facility. Radiological and chemical material remaining in the facility is in the form of fixed or removable contamination in or on the walls, floors, ceilings, ducts, etc. Contamination does not exceed high contamination area (HCA) levels.

Removes Building 881 from a facility-specific Criticality Safety Program (via Building 881 CSE, Rev 0 [RFETS, 2002d]).

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## EXECUTIVE SUMMARY

This Facility Safety Analysis (FSA) provides final hazard classification and authorization basis documentation for Building 881 and related facilities based on current radioactive material inventories and the hazards associated with the facility and its current dismantlement, decontamination, and demolition (DD&D) mission. This FSA meets the requirements for an auditable safety analysis as referenced in Department of Energy (DOE) Environmental Management limited standard, DOE-EM-STD-5502, *Hazard Baseline Documentation* (DOE, 1994a). This standard was retired by DOE Sunset Review in October 2001. This standard has been replaced by DOE-STD-1120-98. In accordance with the new standard, "Sites that have previously implemented DOE-EM-STD-5502-94 facility designations may continue to use them for their intended purposes." (DOE, 1998).

Upon concurrence by DOE, RFFO, this Building 881 FSA will replace the current authorization basis document (RFETS, 2002). Until receipt of concurrence from DOE, RFFO, however, the existing authorization basis shall remain in effect. Further, this FSA satisfies the requirements for an annual update of a Rocky Flats Environmental Technology Site (RFETS or Site) authorization basis document.

Building 881 is in the process of removing functions and materials in preparation for final facility DD&D. It was formerly used primarily for laboratory operations, data processing, and administrative functions. The laboratory operations used various chemicals, generally in small quantities. Radioactive sources were also calibrated. The facilities' chemical inventory has been removed.

Buildings 830, 881G, 881H, 885, and 890 are classified as *industrial* facilities because they do not contain chemicals or radioactive materials above the RQs listed in 40 CFR 302. Building 881's ventilation ducts have been decontaminated and all low level/low level mixed (LL/LLM) waste previously stored and repackaged in the facility has been removed. Radiological and chemical contaminants of concern remaining in the facility during DD&D are in the form of fixed or removable contamination in or on the walls, floors, ceilings, ducts, etc. After duct decontamination, the facility was re-scanned to confirm that Material at Risk (MAR) is below Nuclear Hazard Category 3 thresholds. Additionally, fixed and removable contamination remaining does not exceed high contamination area (HCA) levels. Buildings 881 is therefore classified as a *radiological* facility. Buildings 881F and 887 are classified as *radiological* facilities because they historically processed and contained LL/LLM waste materials.

Controls are placed on the facility's radiological and hazardous material inventory to prevent the introduction of additional nuclear materials into the facility maintains the *radiological* hazard classification. A *radiological* hazard classification requires compliance with applicable OSHA standards, preparation of a site-specific Health and Safety Plan (HASP), and preparation of an auditable safety analysis. This FSA serves as the auditable safety analysis for Building 881 and related facilities.

The principal receptors at risk during facility DD&D operations have been determined to be the immediate and collocated workers. Major risks to these workers are standard industrial hazards that are addressed by DOE-prescribed occupational safety and health standards addressed in the DD&D HASP. Authorized facility activities addressed in this FSA include control of existing contamination to protect worker health and safety, and operations in support of ongoing DD&D, as well as final demolition of the facility.

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## **Building 881 and Related Facilities Facility Safety Analysis, Revision 0**

The facility safety analysis (FSA) for Building 881 and Related Facilities was originally issued in June 1998 as a part of the Site Safety Analysis Report, Volume II. The facility was classified as a Nuclear Hazard Category 3 facility. The credible small and large fire scenarios, and natural phenomena-earthquake and internal event-material handling spill scenarios were analyzed. The analysis identified no risk dominant accident scenarios associated with exposure to the public. The facility mission description included preparation for decommissioning of the facility.

## **Building 881 and Related Facilities Facility Safety Analysis, Revision 1**

The *Building 881 and Related Facilities Facility Safety Analysis, Revision 1*, (RFETS 1999a) incorporated DOE, RFFO Technical Direction contained in Memorandums AME:ABD:MER:00-00828 (DOE, 1999b) and AME:TCD:JKN:00-00013 (DOE, 1999a):

- Reference DOE, 1999b technical direction required a change to Specified Credited Controls to include a Required Action to establish a fire watch and suspend activities in affected radioactive material storage areas when either automatic fire suppression capability or fire suppression flow alarm transmittal capability to the Fire Department are not maintained.
- Reference DOE, 1999a technical direction required a change Specified Credited Controls to add a requirement for weekly surveillance for combustibles in the Tunnel Area (Rooms 12 and 15) and for immediate removal of combustibles, if found.

This revision categorized the facility as a Nuclear Hazard Category 3 facility because the total inventory of radioactive materials in the abandoned scrubber, ductwork, and waste storage containers exceeded the limits defined by DOE-STD-1027-92 (DOE, 1992).

## **Building 881 and Related Facilities Safety Analysis, Revision 2**

The *Building 881 and Related Facilities Safety Analysis, Revision 2* (RFETS, 2002a) incorporated DOE, RFFO Technical Direction contained in DOE Memorandum AME:NRD:MER:00-01-01790 (DOE, 2000a). The technical direction required inclusion in the Safety Analysis a direct commitment to compliance with the Safety Management Plans as described in Chapter 6 of the Site SAR, Volume 1. Addition authorization basis (AB) document changes in Revision 2 included:

- Addition of Safety Management Plan applicability discussion and reformatted Credited Controls in the form of the Administrative Controls Template.
- Revision of the Accident Analysis to reflect collocated worker at 100 meters and dose conversion factor based on ICRP-68 in accordance with DOE Memorandum AME:NRD:MP:00-02784 (DOE, 2000b).
- Inclusion of a plan to obtain isotopic field measurement data for duct holdup per Technical Direction provided in DOE Memorandum AME:NRD:RGB:00-03674 (DOE, 2000b).
- Additional clarification regarding the referenced value of 1 mg/ft<sup>2</sup> used to qualitatively and conservatively bound the 313 g Pu estimated as radioactive material holdup in the Building 881 ducts. The clarification resulted in changes to Section 2.2.3, Facility Inventory and Source Term Development, Table 1, Section 4.3.1, Assumptions, Assumption # 9.
- PGC-881-02.1502-ARH provided clarification of the facility's mission to include duct opening decontamination, and duct section removal, if required.
- Incorporation of Technical Direction provided by DOE Memorandum SP:NRD:RB:02-00850 (DOE, 2002) that approved the Building 881 and Related Facilities Safety Analysis, Revision 2, and Page Change PGC-881-02.1502-ARH, Revision 0.

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## **Building 881 and Related Facilities Facility Safety Analysis, Revision 0**

Based on the reduction in Material-At-Risk (MAR) associated with Building 881 and its related facilities due to duct decontamination and waste container removal from storage, the Hazard Classification for Buildings 881 and 881F is revised to that of *radiological* in accordance with DOE-STD-1027-92 (DOE, 1992). Buildings 830, 881G, 881H, 885, and 890 remain classified as industrial facilities. Included in the FSA are a rationale for this re-classification (Section 4) and identification of controls necessary to maintain the new classification (Section 5). Synopses of pertinent Fire Hazard Analyses (FHAs) and Emergency Preparedness Hazards Assessments (EPHAs) are included in Section 4.

Upon approval of the new facility classification by DOE, RFFO, this FSA replaces the *Building 881 and Related Facilities Safety Analysis Report, Revision 2* (part of the Site SAR, Volume I, Appendix H [RFETS, 2002a]). This FSA will thereafter become a section of the Site SAR, Volume II and be designated as Revision 0.

## 2. FACILITY DESCRIPTION AND OPERATIONS

Building 881 and the activities associated with its mission are described in this section. Interfaces with other buildings and operations on site are discussed. Also provided is the inventory of hazardous material and source terms identified as a result of the hazards assessment. Because of the relatively low hazards associated with this facility, it has no safety class systems that are depended upon to mitigate the consequences of an accident. The structural, operational and system descriptions provided in this FSA are for descriptive purposes only.

### 2.1 FACILITY MISSION

The original activities in Building 881 included chemical processing of uranium and plutonium followed by processing and machining of stainless steel and enriched uranium. Beryllium was handled throughout the facility. All production of uranium and beryllium components in the building has been terminated. Since that time, many organizations have had activities in the building, ranging from laboratory services and development support to administrative support. The laboratories provided general analytical and standards calibration services, including atomic absorption, x-ray spectroscopy, emission spectroscopy, plasma spectroscopy, infrared analysis, ion chromatography, gas chromatography, asbestos sample analysis, and radiochemistry. Development operations included waste technology development and some development/testing of mechanical systems for weapons systems. Administrative operations provided computer center operations support and development of computer systems. Reactive chemical treatment was provided in Room 267 and decontamination and decommissioning (D&D) training was provided in Room 296.

In addition to the remaining administrative activities, current activities in the building are associated with preparations for DD&D of the facility. Such preparatory activities currently include: (a) identifying and radiological surveying to determine proper disposal of components, equipment, and miscellaneous items; (b) cleanup and decontamination, if necessary; of beryllium and radiological process equipment and general areas; (c) asbestos abatement; (d) removal of cabinets, shelves, furniture, and other miscellaneous furnishings from rooms and areas; (e) dismantling of radiological and chemical waste treatment and processing equipment (e.g., piping, tanks, enclosures, treatment equipment); (f) removal of lab hoods, equipment, and ventilation ducting; and (g) proper packaging of DD&D-generated radiological and hazardous wastes and miscellaneous items. All such activities will culminate in the demolition (via mechanical and/or explosive techniques, or combination thereof) of the facility. All explosive DD&D activities are subject to the requirements of the Site SAR (RFETS, 2001a). Final facility DD&D will be performed via a Subcontractor (K-H, 2002). Because of these ongoing DD&D activities, some of the data used in this FSA may change over time; this document provides a hazard assessment of the hazardous materials present or currently estimated to be in the facility.

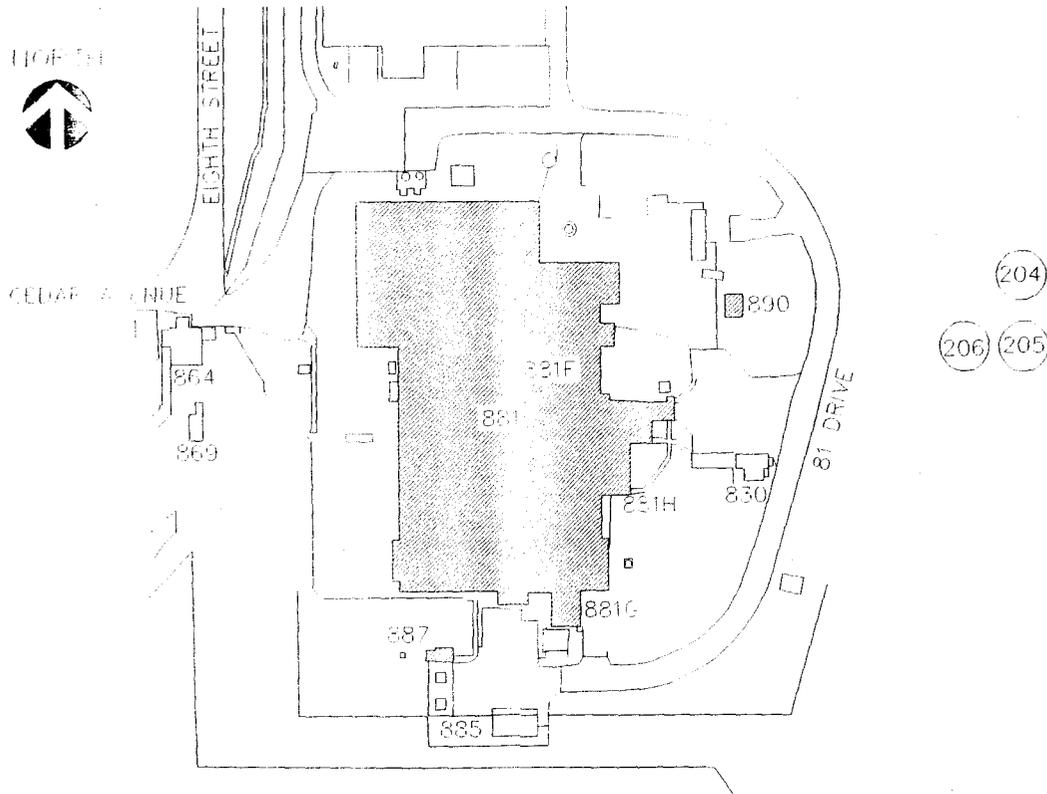
### 2.2 FACILITY DESCRIPTION

#### Building 881

Building 881 is a two-story and basement building built into a hillside and is mostly below grade. The building was originally constructed in 1953 and contains approximately 255,000 square feet of floor space. Mezzanine structures are installed on the first and second floor; the second floor mezzanine is also considered the third level. The facility's location is shown in Figure 1.

The roof of the building is at ground level at the north end of the building. The Building 881 hillside slopes downward to the south; at the south end of the building the first floor is approximately at ground level and the south exterior walls of both stories are exposed. The terrain is graded to the east of the building to allow roadway access to the second floor loading dock on the central east portion of the building and access to a first floor on the south.

The exterior walls of the building are concrete with steel frame construction, and the interior walls are concrete, concrete block, gypsum board, or transite. The floors are concrete, and are exposed in many areas, but are also covered with vinyl asbestos tile, short-pile carpet, or stainless steel. The ceilings are primarily suspended acoustical tiles with integral lighting. Some rooms have metal pan or exposed concrete ceilings. The roof is built-up roofing with foamglass insulation over concrete and metal deck.



**Figure 1. Location of Building 881 and Support Facilities**

The first floor contains an abandoned exhaust plenum previously used for waste storage. The first floor mezzanine contains offices, records storage, and an instrument laboratory. The second floor contained analytical laboratories with interspersed offices. The second floor also contains the men's locker rooms, a lunch/break room, and an abandoned exhaust plenum. The second floor includes the primary accessway to the building, the shipping dock on the central east and an additional access at the east and south. The south inlet air plenum and the north inlet air plenum are at the third floor level on each end of the building. The basement level is primarily used for building utility and support services.

Building 881 is supported by other buildings that are discussed in this report. The locations of these support buildings relative to Building 881 are shown in Figure 1.

**Building 830**

Building 830 is a metal-on-metal-frame building on a concrete slab located east of Building 881. The building is approximately 20 feet by 40 feet and is empty. It was previously used for the storage of maintenance materials and equipment.

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### **Building 881F**

Building 881F, the filter plenum for Building 881, is an integral part of Building 881. Building 881F is a metal-siding-on-metal-frame building located on the roof of Building 881. It houses four, 150-horsepower (hp) exhaust blowers located around a central high efficiency particulate air (HEPA) filter exhaust plenum. This building began operations in 1991 and replaces the function of the two exhaust plenums in the northeast corner of the first and second floors of Building 881. Process equipment includes exhaust fans, filters, ducting, and a fire-protection system. Building 881F receives exhaust from the Building 881 ducting systems. The air first passes through metal demisters, then through two stages of HEPA filter banks. The glycol-water system has been drained. The air then passes through the four exhaust fans and exits vertically to the atmosphere through the four associated exhaust stacks.

### **Building 881G**

Building 881G is a cinder block with metal roofing building on the first-floor level of Building 881 immediately south of the Building 881 exterior wall. Building 881G previously housed 400-kilowatt (kW) and 1,400 kW diesel generators that have been removed from the facility. Both were fueled from a 4,000-gallon above ground storage tank. A 4,000-gallon underground tank to the east of Building 881G is abandoned in place and has been filled with foam. Fuel has been removed from the aforementioned tanks.

### **Building 881H**

Building 881H is a prefabricated metal building located on the east side of Building 881. This building houses the primary electrical interface between Building 881 and the Site Power Distribution System, including various disconnect switches, switchgear, breakers, and distribution panels. The building will soon have only temporary power and will be "cold and dark".

### **Building 885**

Building 885 is a single-room, single-story, prefabricated metal building constructed on a concrete slab south of Building 881. The enclosed main structure measures approximately 20 feet by 24 feet, and there are semi-enclosed carport-type wings on each end. The east wing is 20 feet by 12 feet, and the west wing is 20 feet by 8 feet. There is no automatic fire detection and suppression system. The electrical power systems have been disconnected. The building is not occupied.

### **Building 887**

Building 887 is a waste collection and transfer building which had provided the interface between process waste streams from Building 881 and the Site Process Waste Systems. Building 887, an underground concrete structure approximately 25 feet by 50 feet housing seven 2,500-gallon tanks, is located south of Building 881. The tanks are mounted to the concrete floor, approximately 15 feet below grade. There are hatches for access to the tanks, and ventilation is provided by several round ducts. The building houses the appropriate piping, sample points, and pumps previously used to accomplish transfer of process waste from Building 881 to the Site Process Waste System. The tanks and lines have been drained, characterized, and are awaiting facility demolition. The building also houses the pumps for sanitary wastes.

## **Building 890**

The Building 890 cooling tower pump house and cooling tower support pad are located to the east of Building 881, immediately west of 81 Drive. The cooling tower (CT) and the associated pumps have been removed, and cooling is now provided by an exterior tower (CT-3). CT-3 has been drained and disconnected. The pad has been covered with earth and vegetation. The building is a concrete structure approximately 20 feet by 20 feet, built into the hillside.

### **2.2.1 Facility Systems**

This section discusses the utility systems in Building 881 and the associated buildings. If a building is not discussed with a particular utility, this building is not serviced by the utility.

#### **Heating, Ventilation, and Air Conditioning (HVAC) System**

The Building 881 HVAC serves both human comfort and hazardous material confinement functions. The system is a once-through system with intake plenums on the north and south sides of the building at the third level. Air entering the inlet plenums is heated using plant steam or cooled using evaporative coolers. The inlets have filters to remove airborne particulates from the outside air. The conditioned air is routed throughout the building via ducts and ceiling plenums.

Most of the air is exhausted via four belt-driven 150-hp fans through the Building 881F HEPA filter plenum. Appropriate differential pressure can be maintained with only two exhaust fans. Rooms 131, 137A, 127, 145, and 147 have dedicated air conditioning systems.

Some of the room air is exhausted via chemical hoods to ensure that hazardous fumes or vapors are appropriately diverted from occupied rooms. There are 90 chemical hoods in the building, 61 of which are located in the analytical laboratory areas. Nine of the hoods handle acid fumes and are equipped with caustic scrubbers that are planned to be removed by Fiscal Year (FY) 2003. Sixteen non-Resource Conservation and Recovery Act (RCRA) hoods have been removed. Some hoods are connected to one of two booster fans (no longer powered) located in the basement to ensure that an appropriate hood face velocity is maintained. Hoods are designed to maintain constant velocity laminar flow regardless of window position and some are equipped with integral chemical storage cabinets in the bottom, through which the hood air is appropriately drawn. Hoods are certified and routinely inspected for appropriate operation. There are also three process gloveboxes in the building; similar measures are taken to ensure confinement integrity of the gloveboxes.

Buildings 830, 881F, 881G, 881H, 885, 887, and 890 do not have air conditioning systems. Ventilation for these buildings is provided by roof vents. Where water systems are exposed to the environment/outdoors, as in Building 881F and the four cooling towers around Building 881 (discussed below), 40/60 percent solutions of ethylene glycol were used to prevent freezing. The glycol-water mix has been drained from the system.

#### **Sanitary Sewer**

Sanitary sewer lines throughout Building 881 are routed to Building 887, where sewage is pumped to the plant treatment system. Overflow and blowdown from all cooling towers is handled by the Sanitary Sewer System; all cooling towers have been drained and the system is now out of service. All drains are blocked.

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## **Process Waste System**

Liquid wastes from various systems and five analytical lab sinks were transferred through the building to Building 887 via stainless steel lines. Process wastes from the Building 887 tanks were pumped to Building 374 via a stainless steel and polyvinyl chloride (PVC) line. Wastes are appropriately sampled prior to transfer and waste operations personnel are responsible for transfers. This system has not been used since February 1998.

## **Natural Gas**

Natural gas was supplied to Building 881 by a 2-inch above-ground line that is routed along the west exterior of the building, entering the building at the southeast corner and routed to various chemical hoods via steel pipes. The natural gas system was locked and tagged out on August 5, 1998.

## **Compressed Air**

Compressed air (nominal 90 pounds per square inch (psi)) is provided to Building 881 shops and laboratories via steel lines from compressors in Room 121. Instrument air (nominal 40 psi) is also provided from Room 121. Plant air is not supplied to Building 881. A 3/4-inch line from Building 881 is used to supply compressed air to Buildings 885 and 887; however, the air system is planned to be shut down in August 2002.

## **Domestic Cold Water**

Domestic cold water is provided by the plant system; the system interface is planned to be shut down in August 2002.

## **Fire Suppression**

Sprinklers are installed throughout the building and are fed from the domestic cold water lines with appropriate backflow isolation. The Building 881F HEPA filter plenum is equipped with an Automatic Water Deluge System; this system was locked and tagged out on May 18, 1999. Building 881 is part of the RFETS Wireless Fire Alarm Network that interfaces the facility with the existing Simplex Fire Alarm System via wireless pull stations.

## **Raw Water**

The make-up water for cooling towers is supplied from a raw water line north of the building. This line also serves several fire hydrants in the vicinity of Building 881. The cooling towers are out of service.

## **Storm Drains**

Five storm drains in the vicinity of Building 881 route water away from the building to outfalls on the hillside. The water is pumped from the culvert south of Building 885 to the 881 hillside. The pump is powered from the fence line lighting circuit at Building 881.

## **Cooling Water Supply**

Process cooling water is provided to Building 881 by four exterior water-spray-type cooling towers. CT-1 and CT-2, located on the south exterior, were used primarily for cooling associated with the Central Computing Facility which has been removed from the building. These towers interface with cooling water circulating pumps in Rooms 10 and 302. CT-3, located east of the building near Column Line 10 provides cooling water to recirculating pumps in Room 121. CT-4, located on the north exterior of Building 881 near Column Line D provided water to Buildings 881 and 883; CT-4 has been taken out of

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detected no Pu gamma-ray activity in the facility. The sum-of-the-ratios of the radionuclides is 0.43, far less than 1.00.

Other than the MAR presented in Table 1, radiological and chemical material remaining in the facility is in the form of fixed or removable contamination in or on the walls, floors, ceilings, ducts, etc. Removable contamination does not exceed Radiological Engineering high contamination area (HCA) levels as confirmed in previous filter plenum, scrubber stack, and steel floor measurements (RFETS, 2002c).

**Table 1. Sum-of-Fractions for Building 881 Radiological Inventory**

Isotope	Inventory (grams)	Category 3 Threshold (grams)	Inventory/ Threshold Ratio
<sup>239</sup> Pu	3.6 <i>Note 1</i> <i>Note 2</i>	8.4	0.43
<sup>235</sup> U	632 (486 g in ducts and 146 g in filters in plena)	1.9E+06	0.00026
Sum-of-Ratios =			0.43

Note 1: No original measurement spectra, no long-count spectra, no recent re-measurement duct/plenum data indicate any Pu gamma-ray activity. The lower limit of detection (LLD) of not more than 3.6 grams of Pu is used here as the best-available data (RFETS, 2002f).

Note 2: *Building 881 Criticality Incredibility and the Interface with the Nuclear Criticality Safety Program* (RFETS, 2002d) cites 5.4 g Pu in plena filters originally described in RFETS 2002c. This safety analysis uses the 3.6 g Pu currently measured in RFETS, 2002e, however.

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## 4. HAZARDS ANALYSIS

Based upon the inventory documented in Section 2.3, Buildings 830, 881G, 881H, 885, and 890 are classified as *industrial* facilities because they do not contain chemicals or radioactive materials above the RQs listed in 40 CFR 302. These facilities are not evaluated further. Building 881, 881F, and 887 are considered *radiological* facilities because they contain low-level wastes, as discussed in Section 4.4. The hazards analysis and basis for the radiological categorization are provided in the following sections.

This hazards analysis uses a comprehensive checklist of hazards found in the nuclear industry as well as many other industries. The checklist includes radiological, hazardous material, and occupational hazards. Routine and standard occupational hazards are regulated by DOE-prescribed occupational safety and health administration (OSHA) standards (CFR, 1999) and are not evaluated further unless they initiate a release of hazardous materials, or worsen the consequences of a hazardous material release.

A preliminary hazard analysis technique was used to systematically and qualitatively evaluate the hazards associated with the Building 881 cluster. This methodology was described in Volume I, Chapter 4 of the Site SAR (RFETS, 1999a) and reported in the *Safety Analysis, Building 881 and Related Facilities*, Revision 2, Site SAR Appendix H, May 2002 (RFETS, 2002a) and is updated for the facility's current DD&D mission below. Section 4.3 "Worker Safety Evaluation" explains the connection of Tables 2 and 3 below to the planned preparation of a subcontractor-developed HASP to facilitate and transition to DD&D, including final facility demolition.

### 4.1 HAZARD IDENTIFICATION

The hazards currently associated with Buildings 881, 881F and 887 were identified through facility walkdowns, interviews, and a review of hazardous and radiological material inventories. Hazards associated with final facility DD&D are described in Section 4.1.1 below. Current hazards listed in Table 2 were evaluated to identify those associated with the buildings. Hazards associated with operation of these facilities are indicated with a "yes" and are described in more detail in Table 3, which provides information on quantity, form, packaging, and location of the hazards. As indicated in the "Remarks" column of Table 3, most of the hazards are considered standard industrial hazards.

#### 4.1.1 FSA Relationship to Subcontractor Health and Safety Plan

Prior to Kaiser-Hill LLC awarding a contract to the facility DD&D Subcontractor, worker safety and protection for DD&D activities will be effected through the hazard analysis and control process (e.g., JHAs) undertaken as part of the Integrated Work Control planning process for each work evolution. After DD&D Subcontractor award, all DD&D activities will be performed in accordance with a Subcontractor-developed and K-H-approved HASP (K-H, 2002).

Hazards to workers during DD&D activities will include those associated with, for example, use of power and hand tools, size reduction equipment (e.g., saws, welders, plasma arc cutters), heavy equipment (e.g., cranes, backhoes), mechanical, chemical, and or explosive decontamination (e.g., beryllium, asbestos, lead, pressure washers, scabbling equipment), and demolition (mechanical and/or explosive, or a combination thereof). These activities will be accomplished under the regulatory agreements contained in the *RFCA Standard Operating Protocol (RSOP) for Facility Disposition* (RFETS, 2001b) and the *RSOP for Facility Component Removal, Size Reduction, and Decontamination Activities* (RFETS, 2001c). All explosive DD&D activities are subject to the requirements of the Site SAR (RFETS, 2001a). As stated in the Disposition RSOP:

"Worker health and safety will be addressed on a project-specific Health and Safety Plans (HASP)s). The HASPs define mechanisms and procedures to identify, mitigate, and

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**Table 2. Building 881 and Related Facilities Hazard Identification Checklist**

HAZARD	Yes/No	HAZARD	Yes/No
1. High Voltage	No	14. High Intensity Magnetic Fields	No
2. Explosive Substances	No <sup>1</sup>	15. Effects of Chemical Exposures	Yes
3. Cryogenic Systems	No	16. Toxic, Hazardous, Noxious Material	No
4. Inert & Low-Oxygen Atmospheres	No	17. Inadequate Ventilation	No
5. Direct Radiation Sources	No	18. Material Handling	Yes
6. Radioactive Materials	Yes	19. Ambient Temperature Extremes	No
7. High Noise Levels	Yes	20. Working at Heights	Yes
8. Flammable Gases, Liquids, Dusts	Yes	21. Pesticide Use	No
9. Compressed Gases	No	22. Lasers	No
10. High Temperature & Pressure Sys.	No	23. Inadequate Illumination	No
11. Kinetic Energy	Yes	24. Biohazard	Yes
12. Potential Energy	No	25. Unknown or Unmarked Materials	No
13. Non-Ionizing Radiation Sources	No	26. Any Other Hazards	Yes

<sup>1</sup> The potential use of explosives during facility DD&D as described in this FSA is not addressed in Tables 2 and 3. However, the hazards and hazard controls associated with such potential use will be addressed in the aforementioned subcontractor-developed HASP, if appropriate.

**4.2 HAZARD DESCRIPTION**

The energy sources described in Table 2 are standard industrial energy sources and represent energy sources capable of initiating or enabling accidents involving personnel injury, including during preparations for and transition to full subcontractor DD&D operations. The preventive and mitigative features used to control the effects of the hazards identified for Buildings 881, 881F, and 887 are listed in Table 3.

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**Table 3. Building 881 and Related Facilities Hazard Description (cont.)**

Hazard/ Energy Source	Description	Preventive & Mitigative Features	Remarks
<b>20. WORKING AT HEIGHTS</b>			
Roof access	Infrequent maintenance on the building roof. Access via stairs in east courtyard.	Administrative controls for access, procedures, approved work plans, OSHA compliance, stairs and rails.	Standard industrial hazard.
Mezzanine areas	Some rooms have raised metal grate mezzanines for storage.	Restrictive floor loadings, OSHA compliance.	Standard industrial hazard.
<b>24. BIOHAZARD</b>			
Sanitary waste areas of Building 881 Complex facilities	Sanitary sewage areas with potential bacteriological or viral effects.	Training. PPE. HAZCOM Program. Infectious Agent Exposure Control Program.	Standard industrial hazard.
<b>26. OTHER HAZARDS</b>			
Contamination areas	Areas marked as contaminated from previous operations. Building 887, Rooms 114A, 243, Room 316 abandoned HVAC duct, abandoned exhaust stacks.	Areas clearly marked as CAs, RWP required for access.	Potential for material release if ductwork is damaged.
DD&D hazards	Hazards associated with component removal and facility disposition. See Worker Safety Evaluation below for Be, Asbestos, Lead, etc. hazards.	See Worker Safety Evaluation below. Test or operational Be monitors (Room 265, etc.)	See Worker Safety Evaluation below.

#### 4.3 WORKER SAFETY EVALUATION

Worker exposure to radioactive hazards are controlled through implementation of the Site Radiation Protection Program and associated training, protective equipment, ventilation, and radiation markings.

The other hazards identified in the facilities are standard industrial hazards. Controls sufficient for such hazards include 1) administrative controls and procedures, 2) following manufacturers' recommendations, 3) using proper PPE, and 4) following the occupational safety and industrial hygiene

## 5. SCOPE OF APPROVED ACTIVITIES AND OPERATIONAL CONTROLS

Operational controls for Building 881 are defined in applicable Site Level SMPs (Section 3) and in administrative controls set forth in the Building 881 procedures for material and waste management during DD&D. Approved activities and commensurate controls are summarized below.

- To protect the assumptions of this analysis and the facility's *radiological* hazard categorization, introduction of additional LL/LLM waste into Building 881 from other Site facilities is not allowed. Waste containers originally generated in the facility requiring repackaging may be received back by Building 881 provided the *radiological* facility MAR limit of 8.4 grams Pu equivalent is not exceeded.
- Packaging of waste generated during DD&D operations in approved containers in Building 881 is allowed. Staging and shipment of DD&D waste via cargo containers and approved waste containers from Building 881 to other onsite or offsite locations is allowed. The number of approved waste containers staged for shipment from the facility is unbounded provided the Nuclear Hazard Category 3 MAR threshold is not exceeded and means of egress from the facility or Fire Department access is not impeded (K-H, 2002).
- Activities supporting Building 881 and Related Facilities DD&D include general characterization, and hazard reduction and waste/equipment removal from the facility. Such hazard reduction activities may include: (a) identifying and radiological surveying to determine proper disposal of components, equipment, and miscellaneous items, (b) cleanup/decontamination, if necessary; of beryllium and radiological process equipment and general areas; (c) removal of cabinets, shelves, furniture, and other miscellaneous furnishings from rooms and areas; (d) dismantling of radiological and chemical waste treatment/processing equipment (e.g., piping, tanks, enclosures, treatment equipment); (e) removal of lab hoods, equipment, and ducting; (f) asbestos abatement, and (g) proper packaging of existing radiological waste, and miscellaneous items, and DD&D wastes generated for final disposal. Decontamination may include, but is not limited to, the use of small amounts of decontamination solution, e.g., water, etc., on wipes or towels to clean up, stabilize, or encapsulate beryllium and radionuclide contamination from equipment and building surfaces. Other decontamination techniques used may include methods such as mechanical hydrolazing, and mechanical, chemical, or explosive scabbling. Final facility demolition techniques authorized include mechanical and/or explosive demolition or a combination thereof. All explosive DD&D activities are subject to the requirements of the Site SAR (RFETS, 2001a). All above activities will be performed in accordance with the site-specific, subcontractor-developed HASP described in Section 4.3 of this FSA.

Any unforeseen and/or uncharacterized hazards shall be managed in accordance with applicable Site operations, documentation, and analysis requirements. Additionally, a revised or new analysis is required if facility operational controls are not sufficient to adequately address such unanticipated hazards or conditions encountered. The Responsible Manager shall immediately stop work and contact RISS Nuclear Safety to evaluate the discovered condition. A revised or new analysis will be required if project operational controls are deemed insufficient to adequately address the unanticipated hazards or conditions encountered. To ensure work is safely and compliantly completed, the Building 881 and Related Facilities Responsible Manager must recognize these unanalyzed situations and request the necessary evaluation and revision to this Facility Safety Analysis before proceeding with such work.

RFETS, 1997  
RFETS Resource Conservation and Recovery Act (RCRA) Part B Permit, #97-05-30-01, Rocky Flats Environmental Technology Site, Golden, CO, May 30, 1997.

RFETS, 1998  
RFETS Resource Conservation and Recovery Act (RCRA) Part B Permit, #97-05-30-01, Unit 881, 3B, Rocky Flats Environmental Technology Site, Golden, CO, November 4, 1997 (Hydrolysis), February 5, 1998 (Cementation).

RFETS, 2000  
Emergency Preparedness Hazards Assessment, Building 881, Revision 2, Rocky Flats Environmental Technology Site, 2001.

RFETS, 2001a  
Site Safety Analysis Report, Volume I, Rocky Flats Environmental Technology Site, September 19, 2001.

RFETS, 2001b  
RFA Standard Operating Protocol (RSOP) for Facility Disposition, Revision 0, Rocky Flats Environmental Technology Site, August 14, 2001.

RFETS, 2001c  
RFETS Chemical Management Manual, 1-MAN-019-CMM-001, Rev. 1, November, 2001.

RFETS, 2001d  
RSOP for Facility Component Removal, Size Reduction, and Decontamination Activities, Revision 0, Rocky Flats Environmental Technology Site, February 4, 2001.

RFETS, 2002a  
Safety Analysis, Building 881 and Related Facilities, Revision 2, Site SAR, Volume 1, Appendix H, May 2002.

RFETS, 2002b  
Fire Hazards Analysis, Building 881 Complex, FHA-881-003, Final, Revision 0, Rocky Flats Environmental Technology Site, May 20, 2002.

RFETS, 2002c  
Holdup Characterization of Building 881, HMT-02-008, Holdup Measurement Team, Rocky Flats Environmental Technology Site, January 29, 2002.

RFETS, 2002d  
Building 881 Criticality Incredibility and Interface with the Nuclear Criticality Safety Program, Criticality Safety Evaluation #NMSL:02-0058, Evaluation: BLK-179, Revision 0, Rocky Flats Environmental Technology Site, August 1, 2002.

RFETS, 2002e  
Building 881 Holdup Measurement Summary, HMT-02-282, Holdup Measurement Team, Rocky Flats Environmental Technology Site, July 26, 2002.

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