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## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| AEC | U.S. Atomic Energy Commission |
| amu | atomic mass unit |
| ANP | aircraft nuclear propulsion |
| BSR | Bulk Shielding Reactor |
| Bq | Becquerel |
| CEF | Critical Experiments Facility |
| cfm | cubic feet per minute |
| Ci | curie |
| cm | centimeter |
| d | day |
| DOE | U.S. Department of Energy |
| DOSAR | Dosimetry Applications Research Calibration Laboratory |
| FCAF | Fuel Cycle Alpha Facility |
| ft | foot |
| $ft^2$ | square foot |
| g | gram |
| *g* | an acceleration equal to the force of gravity at the Earth's surface |
| gal | gallon |
| GCR | Gas-Cooled Reactor |
| HEPA | high-efficiency particulate air |
| HFIR | High Flux Isotope Reactor |
| HPRR | Health Physics Research Reactor |
| hr | hour |
| HRE | Homogeneous Reactor Experiment |
| in. | inch |
| IPL | Interim Plutonium Laboratory |
| kg | kilogram |
| kW | kilowatt |
| kW(t) | kilowatt (thermal) |
| L | liter |
| LITR | Low Intensity Test Reactor |
| MeV | megavolt-electron |
| mi | mile |
| ml | milliliter |
| mph | miles per hour |
| mR | milliroentgen |
| mrad | millirad |
| mrem | millirem |
| MRF | Metals Recovery Facility |
| MSRE | Molten Salt Reactor Experiment |

| | |
|---|---|
| MTR | Materials Test Reactor |
| MV | megavolt |
| MW | megawatt |
| ORNL | Oak Ridge National Laboratory |
| ORR | ORNL Research Reactor |
| PCA | Pool Critical Assembly |
| PUREX | plutonium uranium extraction |
| RaLa | radioactive lanthanum |
| REDOX | reduction oxidation |
| s | second |
| SNAP | Systems for Nuclear Auxiliary Power |
| SWSA | Solid Waste Storage Area |
| TBP | tributylphosphate |
| THOREX | thorium extraction |
| TSF | Tower Shielding Facility |
| TSR | Tower Shielding Reactor |
| WAG | Waste Area Grouping |
| X-10 | Oak Ridge National Laboratory |
| Y-12 | Y-12 National Nuclear Security Complex |
| μCi | microcurie |

## 2.1 INTRODUCTION

Since its operations began in 1943, the mission of Oak Ridge National Laboratory (ORNL) has been to conduct research and development and production missions in support of the U.S. Department of Energy (DOE) and its predecessor agencies. (ORNL has also been known as X-10 or Clinton Laboratories and, briefly, Holifield National Laboratory.) Much of the earliest site work was devoted to the development and operation of the original reactor to test the larger production reactors for the Hanford site. The Graphite Reactor was used to produce gram quantities of plutonium and later fission products [e.g., radioactive lanthanum (RaLa)] and other types of radioactive materials were separated in other site facilities. Waste control technologies during early operations were in their infancy and much of the current knowledge of transport of radionuclides in the environment was obtained during this time. The ability to detect, identify, and quantify radiation types and radiation exposures was similarly progressing along with the new technologies being discovered in radioisotope production. Much of the early information gained during the early years at ORNL was used for the design of future U.S. Atomic Energy Commission (AEC)/DOE facilities and detection systems. Waste radioactive material was released from early site operations as gaseous, liquid, and solid effluents with little or no pretreatment. Later, methods were developed to capture many of the contaminants at their source and to reduce overall plant emissions. In some cases this increased direct exposures to individuals in the area and also created locations in which incidents and spills occurred.

During the more than 60 years of operations at the site, facilities have been constructed, operated, decontaminated, and decommissioned based on need. Many of the buildings that have remained standing in the main plant area were renumbered in the early 1950s to the current building numbering system. Attachment 2-A lists the buildings under the current numbering system along with the previous numbers if the building existed before the current system.

Major historical operations and processes that have occurred at ORNL include:

- The operation of the Graphite Reactor for producing plutonium and other radioisotopes
- The development of chemical processes to separate plutonium, uranium, and thorium from irradiated fuel
- Chemical separations of RaLa from irradiated fuel slugs for use in implosion dynamics studies at Los Alamos
- Operation of various facilities for the separation, packaging, and distribution of radioisotopes for government and commercial use

The ORNL site was also used to develop new reactor technologies. Various different reactor designs (pool, pressurized-water, boiling-water, liquid-metal, gas-cooled) were designed and in most cases tested at ORNL and then either scrapped or further developed elsewhere. Reactors operated by ORNL include the Low Intensity Test Reactor (LITR), Critical Experiments Facility [CEF, at the Y-12 National Nuclear Security Complex (Y-12)], Bulk Shielding Reactor (BSR)/Pool Critical Assembly (PCA), ORNL Research Reactor (ORR), Tower Shielding Reactor (TSR), Health Physics Research Reactor (HPRR), Homogeneous Reactor Experiment (HRE), Aircraft Nuclear Propulsion (ANP) Program, the High Flux Isotope Reactor (HFIR), and the Molten Salt Reactor Experiment (MSRE).

In 1947, several ORNL divisions moved to Y-12. These divisions were responsible for conducting research in biological sciences, production of stable isotopes, and engineering technology.

## 2.2 MAJOR FACILITY DESCRIPTIONS

The ORNL site has been used to test new ideas for DOE and other agencies. Thus, many of the earliest buildings at the site have transitioned through various mission objectives. For example, Building 3019 was the original pilot plant facility used to separate plutonium from irradiated uranium slugs received from the Graphite Reactor. The original bismuth–phosphate separation process was inefficient and created a lot of waste. Subsequent chemical separations processes conducted in Building 3019 better refined the dissolved material, leaving less final product in the waste stream.

The majority of the land and facilities at the ORNL site are owned by DOE. The management and operation of the site has been contracted to various organizations over the years (see Table 2-1).

Table 2-1. Contractors of the Oak Ridge National Laboratory.

| Period | Operated by | Name |
|---|---|---|
| 1/1943–6/30/1945 | E. I. DuPont de Nemours for The University of Chicago | Clinton Laboratories |
| 7/1945–12/1946 | Monsanto Chemical Company | Clinton Laboratories |
| 1/1/1947–2/28/1948 | Atomic Energy Commission | Clinton Laboratories |
| 3/4/1948 | Carbide & Carbon Chemicals Company, Union Carbide Corporation | ORNL |
| 1950 | Carbide & Carbon Chemical Division, UCC | ORNL |
| 1956 | Union Carbide Nuclear Corporation, Division of UCC | ORNL |
| 1964–1974 | Union Carbide Nuclear Corporation, Nuclear Division | ORNL |
| 1975 | Union Carbide Corporation, Nuclear Division | Holifield National Laboratory |
| 1976–3/31/1984 | Union Carbide Corporation, Nuclear Division | ORNL |
| 4/1/1984–3/31/1995 | Martin Marietta Energy Systems, Inc. | ORNL |
| 4/1/1995–12/31/1995 | Lockheed Martin Energy Systems, Inc. | ORNL |
| 1/1/1996–3/31/2000 | Lockheed Martin Energy Research, Inc. | ORNL |
| 4/1/2000–Present | UT-Battelle | ORNL |

Since the late 1990s, two parcels of land immediately east of the main ORNL plant site within Bethel Valley have been deeded to organizations outside of DOE (Battelle and the State of Tennessee). Many of the new buildings currently being constructed at ORNL are using joint, private funding sources and are being occupied by non-DOE contractors. Though ownership and maintenance is the responsibility of the owner, the individuals within those facilities that are included under the ORNL Site Radiation Protection Program plan are issued thermoluminescent dosimetry and/or included in the internal dosimetry program as necessary.

The original building identification numbers from the 1940s were different than they are today. At the beginning, buildings were given three digit numbers, (e.g., 105, 225, 706). In the early 1950s, the building numbering nomenclature was changed to one with predominantly four digits. The current general ORNL site building numbering system is as follows:

- Numbers 0000 to 0999 are north of Bethel Valley Road.
- Numbers 1000 to 1499 are north of Central Avenue and west of First Street.
- Numbers 1500 to 1999 are south of Central Avenue and west of First Street.
- Numbers 2000 to 2499 are north of Central Avenue, east of First Street, and west of Third Street.

- Numbers2500 to 2999 are south of Central Avenue, east of First Street, and west of Third Street.
- Numbers 3000 to 3499 are north of Central Avenue, east of Third Street, and west of Fifth Street.
- Numbers 3500 to 3999 are south of Central Avenue, east of Third Street, and west of Fifth Street.
- Numbers 4000 to 4499 are north of Central Avenue, east of Fifth Street, and west of the East Vehicle Gate.
- Numbers 4500 to 4999 are south of Central Avenue, east of Fifth Street, and west of the East Vehicle Gate.
- Numbers 5000 to 5499 are north of Central Avenue, east of East Vehicle Gate, and west of Main Entrance Drive.
- Numbers 5500 to 5999 are south of Central Avenue, east of East Vehicle Gate, and west of Swan Pond.
- Numbers 6000 to 7499 facilities are further east of the main plant site in Bethel Valley.
- Numbers 7500 to 7999 are south of Haw Ridge in Melton Valley.
- The ORNL facilities in the Y-12 National Nuclear Safety Complex begin with the 9000 numbers.

Maps of the main ORNL campus and sub-areas are provided in Attachment 2C.

A March 1, 1953, document from the ORNL site Facilities and Operations Directorate, *Oak Ridge National Laboratory Building List* (ORNL 1953), indicated a cross-linking from the old and new building numbering nomenclature at that time. In addition, the Directorate provided a current ORNL building list for all facilities at the site (ORNL 2002). Attachment 2A shows the combined list.

The remainder of this section provides information for those buildings where information was available for specific facilities. For convenience, the principal facilities and radionuclides of concern identified in the following sections are summarized in Attachment 2B, "Major Facilities and Radionuclides of Concern." Section 2.3 provides additional information on ORNL processes and programs.

### 2.2.1 Building 2000 (formerly 101-D) Metallurgy Laboratory

Building 2000 is a Quonset-style hut. It was built in 1948 to house Metallurgy Operations. The 23,000-$ft^2$ building had equipment and facilities to produce fuel elements containing highly enriched uranium. Processes in the building included metal casting and fabrication equipment; laboratories for testing the mechanical, chemical, and physical properties of uranium and fuel elements; and office space. The building was equipped with a once-through ventilation system to remove radioactive materials from the air using a cyclone separator system and absolute filters before release to the environment. This facility was used in the development of the aluminum-clad, aluminum-uranium fuel element used in the Materials Test Reactor (MTR) and Low Intensity Testing Reactor (LITR) (ORNL 1997a).

### 2.2.2 Building 2005 (formerly 706-B) Metallurgy Annex

Building 2005 was a frame structure built to serve Manhattan Project operations. It had approximately 4,000 $ft^2$ of floor space. The building was modified in 1950 to contain multiple test loops as well as early equipment for studying welding, braising, and nondestructive inspection. Liquid metals and molten salts were tested for compatibility with reactor materials in thermally driven test loops in the building.

### 2.2.3 Building 2026 Radioactive Materials Analytical Laboratory

Building 2026 was constructed in 1964 (with additions in 1966 and 1985) and provides 22,600 $ft^2$ of laboratory and office space dedicated to the application of general analytical chemistry of radioactive materials. The facility is equipped with special containment and ventilation systems to handle radioactive materials with high gamma dose rates (hot cells) and high levels of alpha radiation bearing material (glovebox system). The building houses facilities designed to segregate both low and high levels of radioactivity. In addition, the facility includes a radioactive liquid waste system that meets current regulatory requirements. The facility is fully equipped to handle the packaging and disposal of radioactive solid waste (ORNL 2001).

### 2.2.4 Building 3001 (formerly 105) Graphite Reactor Building (Clinton Pile)

The Graphite Reactor is described in Section 2.3.1. Radionuclides produced in the reactor included $^{35}S$, $^{32}P$, $^{31}Si$, $^{42}K$, $^{41-45}Ca$, $^{46}Sc$, $^{51}Ti$, $^{59}Fe$, $^{55}Fe$, $^{60}Co$, $^{65}Ni$, $^{64}Cu$, $^{75}Se$, $^{110}Ag$, $^{114}In$, $^{115}Cd$, $^{124}Sb$, $^{152}Eu$, $^{154}Eu$, $^{155}Eu$, $^{182}Ta$, $^{185}W$, $^{185}Os$, $^{191}Os$, $^{193}Os$, $^{204}Tl$, $^{206}Tl$, $^{210}Bi$, $^{24}Na$, $^{76}As$, $^{82}Br$, $^{86}Rb$, $^{99}Mo$, $^{198}Au$, $^{131}I$, $^{141-143}Ce$, $^{14}C$, and $^{192}Ir$. Activation of the cooling air resulted in the chronic release of $^{41}Ar$ from the Building 3018 stack whenever the reactor was operating. In 1948, $^{41}Ar$ releases totaled 540 Ci $d^{-1}$at a reactor power of 4,000 kW(t) and an exit airflow rate of 51,000 cfm. Fuel slug ruptures in 1947 resulted in emissions of $^{131}I$, $^{133}I$, $^{129}I$, $^{137}Cs$, $^{90}Sr$, $^{85}Kr$, $^{133}Xe$, $^{239}Pu$, $^{103}Ru$, $^{106}Ru$, $^{144}Ce$, $^{140}La$, $^{140}Ba$, $^{95}Zr$, $^{89}Sr$, $^{235}U$, $^{238}U$, and $^{95}Nb$.

### 2.2.5 Building 3002 (formerly 114) Graphite Reactor Filter House

The Graphite Reactor Filter House is north of the Graphite Reactor outlet air duct, and west of the Fan House (Building 3003) and Exhaust Stack (Building 3018). The purpose of the building was to provide high-efficiency particulate air (HEPA) filtration to prevent the release of radioactive particulates from the 3018 stack due to ruptured fuel slugs. The building was constructed in 1948 and operated until 1963.

### 2.2.6 Building 3003 (formerly 115) Graphite Reactor Fan House and Surface Modification and Characterization Laboratory

The Graphite Reactor fan house provided negative pressure and served as a passageway for the filtered exhaust from the graphite reactor air filter building to the stack (Building 3018). The building was in operation from 1948 to 1963. Information concerning operations at the Characterization Laboratory was not available.

### 2.2.7 Building 3004 (formerly 807) Water Demineralization

The water demineralizer building no longer exists, but was identified in an early building listing. Building 3004 supported reactor operations for the Low Intensity Training Reactor (LITR), but it appears that the water from this facility was also used in the Bulk Shielding Reactor pool (Rupp and Cox 1955).

### 2.2.8 Building 3005 (formerly 106) Low Intensity Training Reactor (LITR)

The Low-Intensity Test Reactor (LITR) facility consists of three buildings: the Low Intensity Test Reactor Building (3005), the Demineralization Water Building (3004), and the Low-Intensity Test Reactor Water-to-Air Heat Exchanger (3077). The LITR is made up of five cylindrical steel and aluminum sections with all but the lowest tank section above ground. It measures 70 by 62 by 57 ft. The LITR facility is immediately east of the Graphite Reactor. Section 2.3.6.1 describes the LITR facility further.

### 2.2.9 Building 3010 Bulk Shielding Reactor Facility

The Bulk Shielding Reactor (BSR) is a two-story steel-frame building with corrugated metal siding with a footprint of approximately 4000 $ft^2$. The pool has internal dimensions of 40 by 20 ft. In addition to the pool, the building contains offices, instrument rooms, experiment rooms, and a small shop. Section 2.3.6.3 describes the BSR further.

### 2.2.10 Building 3018 Exhaust Stack (for Building 3003)

Building 3018 is a 200-ft stack of steel-reinforced concrete used for venting exhaust from the Graphite Reactor from 1943 until 1963. Section 2.3.1 describes the Graphite Reactor further.

### 2.2.11 Building 3019 (formerly 205) Radiochemical Processing Pilot Plant

This building contained the reprocessing cells and equipment to chemically dissolve irradiated fuel slugs and separate plutonium from solution. The facility contains six thick concrete hot cells used in the separation processes. Section 2.3.1 describes several of the more important operations that occurred in Building 3019.

### 2.2.12 Building 3020 Exhaust Stack (for Building 3019)

Building 3020 was initially used to exhaust from Building 3019. Later the exhausts were directed to the Building 3039 stack.

### 2.2.13 Building 3021 Fan House (Northeast of Building 3020)

This facility provided negative pressure to Building 3019 process activities and exhausted through the Building 3020 Exhaust Stack.

### 2.2.14 Building 3023 (formerly 206) North Tank Farm

The North Tank Farm occupies an area of approximately 100 by 200 ft in the northeast corner of the intersection of Central and Third Streets and contains eight buried tanks (four gunite and four stainless steel). Wastes generated from chemical separations were collected in these tanks. Section 2.3 describes the North Tank Farm further. Table 2-2 lists tank contents in the North Tank Farm.

Table 2-2. North Tank Farm (Facility 3023) contents.

| Tank | Years of operation | Radioisotopes of concern |
|---|---|---|
| W-1 | 1943-1960 | $^{238,239}$Pu, $^{90}$Sr, $^{137}$Cs, $^{60}$Co, and $^{3}$H |
| W-1A | 1951 to 1986 | $^{233}$U, $^{241}$Am, $^{244}$Cm, $^{238,239}$Pu, $^{90}$Sr, $^{137}$Cs, $^{60}$Co, and $^{3}$H |
| W-2 | 1943 until the 1960s | $^{233}$U, $^{235}$U, $^{237}$Np, $^{238,239}$Pu, $^{90}$Sr, $^{137}$Cs, $^{60}$Co, and $^{3}$H |
| W-3 | 1943 until the 1960s | $^{233}$U, $^{235}$U, $^{237}$Np, $^{241}$Am, $^{244}$Cm, $^{238,239}$Pu, $^{90}$Sr, $^{137}$Cs, $^{60}$Co, and $^{3}$H |
| W-4 | 1943 until the 1960s | $^{233}$U, $^{235}$U, $^{237}$Np, $^{241}$Am, $^{244}$Cm, $^{238,239}$Pu, $^{90}$Sr, $^{137}$Cs, $^{60}$Co, and $^{3}$H |
| W-13 | 1943 to 1958 | $^{238}$Pu, $^{90}$Sr, $^{137}$Cs, $^{60}$Co, and $^{3}$H |
| W-14 | 1943 to 1958 | $^{238,239}$Pu, $^{90}$Sr, $^{137}$Cs, $^{60}$Co, and $^{3}$H |
| W-15 | 1943 to 1958 | $^{238,239}$Pu, $^{90}$Sr, $^{137}$Cs, $^{60}$Co, and $^{3}$H |

### 2.2.15 Building 3025E Physical Examination Hot Cells

The facility was constructed in 1950 and is about 70% to 80% utilized. The literature indicates that the facility handled more radioactive material in the early years, but as the years progressed lesser quantities of radioactive materials were examined there. The hot cells were used to assess activated radioisotopes. A remote storage facility was added in 1958 and decommissioned in 1985. Cell 6 was enlarged and upgraded to a sealed cell in 1958. Sealed storage wells were installed in 1985. A major upgrade of the LLLW system was completed in 1998 (ORNL 2001).

### 2.2.16 Buildings 3026-C and 3026-D (formerly 706-C and 706-D) By-Product Processing and Chemical Separation Laboratory

The chemical separations facilities in Buildings 3026-C and –D were specifically designed and constructed to process 1- to 100-Ci amounts of RaLa. Quantities of radioactivity much larger than those designed for the facilities were processed. After RaLa operations ended in 1956, the operational areas within each facility were later used for other operations. Section 2.3.2 further describes the major operations in Buildings 3026-C and –D. The following isotopes would have been in the Building 3026-C and –D complex: $^{129}$I, $^{131}$I, $^{79}$Se, $^{107}$Pd, $^{147}$Pm, $^{137}$Cs, $^{140}$Ba/La, $^{90}$Sr, $^{85}$Kr, $^{188}$W, $^{191}$Os, $^{133}$Xe, actinides, U, $^{99}$Tc, $^{60}$Co, Pu, and $^{3}$H.

### 2.2.17 Building 3027 Special Nuclear Materials Storage Vault

The Special Nuclear Materials Storage Vault was constructed in 1980. The building is used for the storage of Security Category III radioactive materials. No material processing is performed in the building and special nuclear materials are contained by two sealed barriers at all times. The materials stored in the vault are inspected weekly. The building contains eight rooms and is constructed with an 18-in. concrete slab, reinforced 18-in. thick walls, and a 10-in. reinforced concrete roof. The building was designed and constructed to withstand both a 0.15*g* earthquake and a 350-mph wind. The rooms are equipped with drains piped to a steel storage tank in a below-grade pit. The building is ventilated to the central off-gas system (ORNL 2001).

### 2.2.18 Building 3028 (formerly 910) Alpha Powder Facility

Building 3028 was constructed in 1950 and originally housed the $^{131}$I processing facility and the separation facility for $^{147}$Pm. The building has a four-story central section with one-story cell operation areas on the east and west sides. The first floor covers 4000 ft$^2$ and has seven cells where various processes took place. Section 2.3.3 further describes Building 3028.

### 2.2.19 Building 3029 (formerly 909) Source Development Lab

Building 3029 was constructed in 1952 to support the Isotopes Program. The building is a single-story steel-frame structure covered by corrugated metal siding. The floor area is 3,000 $ft^2$ and has four cells where various processes took place. Section 2.3.3 further describes Building 3029.

### 2.2.20 Building 3030 (formerly 908) Radioisotope Processing Building “C”

Building 3030 was constructed for production and development of radioisotopes to be used in industry, medicine, and research. The building is a steel-frame structure covered by corrugated aluminum siding. The single story facility has a floor area of 825 $ft^2$, a hot cell, two lab hoods, and a glovebox. The hot cell has 2-ft concrete walls with 4 in. of lead brick on the west and south sides. Section 2.3.3 describes Building 3030 further.

### 2.2.21 Building 3031 (formerly 907) Radioisotope Processing Building “D”

Building 3031 was constructed for production and development of radioisotopes to be used in industry, medicine, and research. The building is a single-story frame structure, has a floor area of 825 $ft^2$, a hot cell, and two lab hoods. The hot cell has 1-ft thick barites concrete and 5 in. of steel armor plate. Section 2.3.3 describes Building 3031 further.

### 2.2.22 Building 3032 (formerly 906) Radioisotope Processing Building “E”

Building 3032 was constructed to house the analytical facility for radiochemical support of the Isotopes Production activities. The facility has a laboratory with five hoods on the north side of the building and an office on the south side connected by an open passageway. Section 2.3.3 further describes Building 3032.

### 2.2.23 Building 3033 (formerly 905) Radioactive Gas Process Facility

Building 3033 was used for processing $^{14}C$, $^{85}Kr$, and $^{3}H$. The building is a steel-frame structure covered with aluminum siding with about 1200 $ft^2$ of floor space. Three internal structures were present to process the three different gases. Section 2.3.3 describes Building 3033 further.

### 2.2.24 Building 3033A Actinide Fabrication Facility Annex

Building 3034 was constructed about 1960 and used to house and contain the facilities for the production, loading, welding, and decontamination of neutron dosimeter materials as well as weighing milligram to gram quantities of actinide materials for research. It is a metal structure with 242 $ft^2$ of floor space. Section 2.3.3 describes Building 3033A further.

### 2.2.25 Building 3034 Radioisotopes Services Building

Constructed in the late 1950’s, this facility currently houses the central electrical distribution station for the Isotopes Circle Area. The facility was used as a field shop for the Plant and Equipment Division and supported isotope production; however, no handling of radioactive materials occurred in this building.

### 2.2.26 Building 3038 (formerly 902) Isotope Research Materials Laboratory, Radioisotope Analytical and Packing Building

Building 3038 has been in operation since 1949. It was constructed to house all the radioisotope shipping activities for ORNL. It is a masonry structure divided by concrete brick interior walls into three sections. There is 7250 $ft^2$ of floor space. Section 2.3.3 further describes Building 3038.

### 2.2.27 Building 3039 (formerly 911) Central Exhaust Stack (Radioisotope Area)

The 3039 stack ventilation system, which was originally built in 1950, was extensively modified and upgraded in 1984 to increase its efficiency and reliability. The 3039 stack is a 76.2-m (250-ft) high, unreinforced radial, brick masonry chimney. The 3039 Stack Ventilation System consists of seven collection systems, each with its own underground or aboveground ducting, fans, and controls. Five of these are designed to handle the cell ventilation waste streams from limited-access areas and hot cells. The other two systems are designed to handle the off-gas from process equipment and laboratory experiments (ORNL 2002). Section 2.3.4 further describes the Central Exhaust Stack.

### 2.2.28 Building 3042 ORNL Research Reactor

Building 3042 was built to house the ORR. The facility covers approximately 11,000 $ft^2$. The building is a semi-airtight, steel-frame structure covered with insulated metal panels. The pool in which the reactor was placed had a minimum shield of 4 ft of barites concrete with a 10-ft thickness at the east end where the experimental beam ports were. Section 2.3.6.4 further describes the ORR.

### 2.2.29 Building 3047 Radioisotopes Development Laboratory

Constructed in 1962 and still in operation, Building 3047 is a three-story steel-frame building with concrete block exterior and interior walls. The building houses the Radioisotopes Development Laboratory. The facility has four high-level beta-gamma cells, one alpha hot cell, seven laboratories for handling low-level radioactive materials, a decontamination room, offices, and service areas. The facility is used to conduct research and development and to produce of radioisotopes. Radioactive materials normally handled at the facility include $^{90}Sr$ (up to 100,000 Ci), with single sealed sources of $^{90}Sr$ up to 350,000 Ci. Other radionuclides handled at the facility include $^{137}Cs$, $^{152,154}Eu$, $^{238}Pu$, $^{111m}Sn$, $^{166}Dy/^{166}Ho$, $^{186}Re$, and $^{188}W/^{188}Re$.

### 2.2.30 Building 3118 Radioisotope Processing Building "H"

Building 3118 was constructed to enclose the space between Buildings 3030 and 3031 to provide direct access between the hot cells in each facility. The steel frame structure is covered with corrugated aluminum siding.

### 2.2.31 Building 3505 Metal Recovery Facility

The Metal Recovery Facility was constructed in late 1951 and operated from 1952 until 1960 as a pilot and small-scale production facility for nuclear fuel reprocessing. It was a two-story, steel-frame metal siding structure with numerous windows. The building contained seven concrete or concrete block cells, which were secured and maintained under negative pressure, with ventilation using HEPA filters. The building was used to recover uranium, plutonium, neptunium, and americium from various waste solutions, scrap, and miscellaneous fuel elements. Twenty-five different processing campaigns were run through the facility. The facility was shut down due to lack of secondary containment.

### 2.2.32 Building 3507 (formerly 206) South Tank Farm

The South Tank Farm occupies an area of about 130 by 200 ft in the southeast corner of the intersection of Central and Third Streets and contains six buried, gunite tanks. It also includes an area to the east of approximately 80 by 230 ft containing another smaller buried gunite tank and six buried stainless-steel tanks. Wastes generated from chemical separations were collected in these tanks. Section 2.3.4 describes the South Tank Farm further. Table 2-3 lists the tank contents in the South Tank Farm.

Table 2-3. South Tank Farm (Facility 3507) contents.

| Tank | Years of operation | Radioisotopes of concern |
|---|---|---|
| W-5 | 1943-1978 | $^{233}$U, $^{235}$U, $^{3}$H, $^{60}$Co, $^{90}$Sr, and $^{238,239}$Pu |
| W-6 | 1943-1978 | $^{233}$U, $^{235}$U, $^{3}$H, $^{60}$Co, $^{90}$Sr, $^{238,239}$Pu, $^{244}$Cm, $^{152,154}$Eu, and $^{252}$Cf |
| W-7 | 1943-1978 | $^{233}$U, $^{235}$U, $^{3}$H, $^{60}$Co, $^{90}$Sr, $^{232}$Th, $^{238,239}$Pu, $^{244}$Cm, $^{152,154}$Eu, and $^{252}$Cf |
| W-8 | 1943-1978 | $^{233}$U, $^{235}$U, $^{3}$H, $^{60}$Co, $^{90}$Sr, $^{241}$Am, $^{238,239}$Pu, $^{244}$Cm, $^{152,154}$Eu, and $^{252}$Cf |
| W-9 | 1943-1978 | $^{233}$U, $^{235}$U, $^{3}$H, $^{60}$Co, $^{90}$Sr, $^{241}$Am, $^{238,239}$Pu, $^{244}$Cm, $^{152,154}$Eu, and $^{252}$Cf |
| W-10 | 1943-1978 | $^{233}$U, $^{235}$U, $^{3}$H, $^{60}$Co, $^{90}$Sr, $^{241}$Am, $^{238,239}$Pu, $^{244}$Cm, $^{152,154}$Eu, and $^{252}$Cf |

### 2.2.33 Building 3515 Fission Product Pilot Plant

The Fission Product Pilot Plant (formerly known as the $^{106}$Ru tank arrangement) began operation in 1948 as a two-room hot cell and was taken out of service in 1958. The facility consists of a concrete pad surrounded by stacks of concrete blocks; it is on the east end of the South Tank Farm. Section 2.3.1 further describes Building 3515.

### 2.2.34 Building 3518 Acid Neutralization Plant

In 1957, a new process waste treatment plant was built. The plant had the capacity of 500,000 gal $d^{-1}$. The plant included an 800,000-gal equalization and hold-up basin. The hold-up basin was able to store wastewater before treatment. A lime–soda softening process was used to remove strontium through co-precipitation. The neutralization plant was capable of removing 90% of the strontium and rare earths. After treatment the wastewater was monitored, sampled, and discharged to White Oak Creek.

### 2.2.35 Building 3525 High Radiological Level Examination Laboratory

Building 3525, constructed in 1963, is a two-story brick building with a partial basement. The first floor houses the primary containment-shielded cell complex, consisting of three hot cells arranged in a U-shape. The hot cells are constructed of 3-ft-thick barites concrete walls and compatible oil-filled, lead glass viewing windows, creating an essentially leak-tight barrier. The remainder of the laboratory outside the hot cell complex consists of the charging area, the equipment maintenance air lock areas, the operating area, the truck unloading area, the photographic rooms, the main change room, and the rooms housing supporting mechanical equipment. A small laboratory that houses the core conduction cool down test facility is on the east side of the truck unloading area. The core conduction cool down test facility is used to test radioactive samples under controlled thermal conditions while monitoring the samples to determine the release of radioactive materials.

The processes performed in the facility consist of:

- Receipt and handling of irradiated materials (fuel or non-fuel, typically as experimental capsules) in shielded casks

- Transfer of material into and out of the hot cells
- Capsule disassembly
- Nondestructive and destructive testing of irradiated materials
- Packaging and shipment of irradiated materials (on-site or off-site)
- Waste packaging for disposal
- Maintenance of remote equipment
- Decontamination of the facility and equipment

Examination and testing activities include metrology; metallographic sample preparation by sectioning, grinding, and polishing; optical and electron microscopy; mass spectrometry of fission gases; gamma spectrometry; and other physical properties evaluations as appropriate to the experimental objectives of a particular program.

### 2.2.36 Building 3544 Process Waste Treatment Facility

The process waste collection system consists of a series of underground pipes where process waste water flows from the source facility to a pumping station for transfer to the Process Waste Treatment Complex—either Building 3544 (for radiological treatment) or Building 3608 (for nonradiological treatment). The waste acceptance criteria administratively limits the wastes that can be added to the Process Waste system to a total radionuclide concentration of the ingestion dose equivalent of $1 \times 10^4$ Bq $L^{-1}$ $^{90}Sr$. Chemicals are limited based on treatment system capabilities and effluent discharge permit limits. At strategic points throughout the collection system, manholes are equipped with beta-gamma radiation monitors, pH monitors, and flow monitors that are continuously monitored at the Waste Operations Control Center (WOCC) to allow personnel to detect any unusual activity in the system (ORNL 2001).

### 2.2.37 Building 4500 Central Research and Administration Facility

The Building 4500 complex consists of two, two-story, brick buildings with basement and attic levels. Built in the early 1950s, the buildings consist of a main area with four wings. The buildings consist primarily of offices, laboratories, storage areas, maintenance shop areas, a mailroom, a canteen area, and utility equipment areas. Primary utilities include sanitary water and sewer; process water and sewer; steam and condensate return systems; compressed air; electrical utilities; and heating, ventilation and air conditioning systems. The facility contains numerous hoods and other sources that are vented locally. A radioactive hot drain from 4500 South no longer in use is in place and connects the service chases serving the first- and second-floor laboratories.

No information is available that specifically describes work conducted with radioactive materials in the Building 4500 complex, but it is believed that only small-scale operations with radioactive materials occurred in the two buildings. The ORNL annual stack report indicates many emission sources exist from the two buildings, but that they emit very low levels of total radioactivity.

### 2.2.38 Building 4501 High Level Radiochemistry Laboratory

Building 4501 is a steel, concrete, concrete block, and brick building. Interior partitions are made primarily of poured concrete and concrete block faced with transite, gypsum block, or steel paneling. The building was constructed in 1952 and has four floors. Except for the first floor, there are interior access connections from Building 4501 to Building 4505 through hallways and stairwells. The basement contains laboratories, shop areas, cell ventilation ducts, and storage areas. Four hot cells surrounded by support laboratories and operating areas are centrally located on the first floor. The outside part of this floor contains chemical and radiochemical laboratories and office space. On the second floor, immediately above the hot cells and surrounding laboratories, is the high bay area, which contains chemical and radiochemical laboratories and office space. The third floor is the attic area and provides space for building utilities, ventilation fans, and controlled storage. The roof of the building contains several exhaust stacks for building ventilation systems. A process to convert $^{233}U$ adsorbed on sodium-fluoride traps as part of the Molten Salt Reactor Experiment (MSRE) design and development was conducted in the building.

### 2.2.39 Building 4508 Metals and Ceramics Laboratory

Building 4508 is immediately west of Building 4500 South. The Interim Plutonium Laboratory (IPL) was assembled on the first floor of Building 4508 within the confines of the Ceramics Laboratory in the 1960s. Placement of the IPL in building 4508 was made possible by the secondary containment design. The IPL was equipped with very high-quality gloveboxes and a purge system that provided the gloveboxes with working atmospheres having very low oxygen and water contents. The inert atmosphere was required for work with plutonium and uranium nitrides. The gloveboxes were equipped to synthesize, press, and sinter pellets of these nitrides.

In addition, Building 4508 housed the Fuel Cycle Alpha Facility (FCAF). The FCAF fabricated plutonium oxide, and plutonium-uranium oxide fuel pellets, and was used for coating sol gel derived microspheres with pyrolytic carbon. Special target materials for the HFIR were also developed and fabricated in this facility. This laboratory was initially in the basement of Building 3019 before being relocated to Building 4508. Two additional and unique fuel-rod-loading techniques, vibratory compaction and slug injection, were also studied in the FCAF.

### 2.2.40 Building 5505 Transuranium Research Laboratory

Construction of Building 5505, the Transuranium Research Laboratory, was completed in 1967. The building is a one-story structure with an equipment room on the roof. The building is constructed of reinforced concrete with exterior walls of concrete block faced with brick. The equipment room is of steel-frame construction with exterior walls of uninsulated aluminum panels. The laboratories are back-to-back in the central portion of the building and are separated by a central corridor providing controlled access to each laboratory for transfer of radioactive materials. The offices occupy the north, west, and south perimeters of the building and are across a corridor from the laboratories. At present, no radioactive liquid waste is generated in the facility, but provisions are in place for a radioactive bottling station if needed. The facility maintains negative pressure through the interaction of the laboratory and office air supply system, the laboratory exhaust system, and the glovebox exhaust system. Research in the facility involves the chemistry, physics, and material science of actinides and their compounds to provide fundamental and technological information as well as a platform for the development of analytical instrumentation.

### 2.2.41 Building 6000 Holifield Radioactive Ion Beam Facility

Building 6000, immediately east of the main plant site, contains the Holifield Radioactive Ion Beam Facility. The high-voltage generator is inside a 100-ft-high, 33-ft-diameter pressure vessel, with both low- and high-energy acceleration tubes contained in the same column structure. Production of radioactive ions occurs using the Isotope-Separator-On-Line technique with subsequent injection into a 25-MV tandem electrostatic accelerator where the ions are accelerated to energies of 0.1 to 10 MeV per nucleon for light nuclei and up to 5 MeV per nucleon for nuclei heavier than 100 amu. Site preparation for the tandem accelerator was begun in August 1975. The first successful transmission of beam through the entire system occurred in May 1980.

### 2.2.42 Building 6010 Oak Ridge Electron Linear Accelerator

The ORELA facility consists of a 180-MeV electron accelerator, neutron producing targets, buried and evacuated flight tubes up to 200 m long leading to underground detector locations, a wide variety of sophisticated detectors, and data acquisition and analysis systems. Neutrons are produced by bremsstrahlung from a tantalum radiator. Moderated or unmoderated neutrons are available, and further tailoring of the spectral shape is accomplished with movable filters.

An intense, pulsed source of neutrons is produced at the accelerator when bursts of electrons from the linac stop inside a tantalum target. As the electrons slow down in the tantalum, they generate an intense flux of gamma □rays. These gamma □rays in turn produce neutrons via (gamma,*xn*) reactions on the tantalum. The neutrons are moderated in the cooling water surrounding the target and then travel to the various experimental stations through evacuated flight tubes. The resulting neutron spectrum is *white* in the sense that the covered energy range is relatively broad (from subthermal to approximately 50 MeV) and the flux is roughly proportional to $E^{-0.7}$ where $E$ is the neutron energy. The integrated flux is about $0.8 \times 10^{14}$ neutron $s^{-1}$ at a power of 50 kW.

### 2.2.43 Building 7500 Homogeneous Reactor Experiment Reactor Building

Section 2.3.6.7 describes the HRE Building.

### 2.2.44 Building 7503 Molten Salt Reactor Experiment

Section 2.3.6.10 describes the MSRE facility.

### 2.2.45 Building 7700 Tower Shielding Facility

Section 2.3.6.5 describes the Tower Shielding Facility.

### 2.2.46 Building 7735 Dosimetry Applications Research Calibration Laboratory

The DOSAR CalLab is a 2800-$ft^2$ concrete block building consisting primarily of a control room, a 6.1- by 7.0- by 4.3-m gamma irradiation room, a beta/X-ray room that is the same size as the gamma room, and a low-scatter 9.1- by 9.1- by 5.8-m neutron room. Sources currently at the DOSAR CalLab include a $^{90}$Sr/$^{90}$Y irradiator; a Büchler irradiator and PTB source set that includes $^{147}$Pm, $^{204}$Tl, and two $^{90}$Sr/$^{90}$Y sources; a 10-Ci $^{137}$Cs beam irradiator and 1.2-Ci $^{137}$Cs panoramic irradiator; a bare $^{238}$PuBe source; and two $^{252}$Cf sources that can be used bare and with various moderators, including polyethylene and heavy water ($^3H_2O$). Also available is a Pantak model HF320 X-ray generator for reproducing NIST beam codes. Table 2-4 lists the sealed sources present in the facility. The assay date for the radionuclide sources is September 2, 2003.

Table 2-4. Sealed sources available at DOSAR Calibration Laboratory (Building 7735).

| Radiation | Source | Dose rate | Source distance (cm) |
|---|---|---|---|
| Beta | $^{90}$Sr/Y | 5,861 mrad hr$^{-1}$ | 35 |
| Beta | $^{147}$Pm | 14.3 mrad hr$^{-1}$ (surface) | 20 |
| Beta | $^{204}$Tl | 8.8 mrad hr$^{-1}$ | 35 |
| Beta | $^{90}$Sr/Y | 1,012 mrad hr$^{-1}$ | 35 |
| Beta | $^{90}$Sr/Y | 25,375 mrad hr$^{-1}$ | 35 |
| Gamma | $^{137}$Cs | 1,042 mR hr$^{-1}$ | 51 |
| Gamma | $^{137}$Cs | 2,442 mR hr$^{-1}$ | 100 |
| Neutron | $^{252}$Cf (bare) | 140 mrem hr$^{-1}$ | 50 |
| Neutron | $^{252}$Cf (bare) | 35.0 mrem hr$^{-1}$ | 100 |
| Neutron | $^{252}$Cf (poly-moderated) | 16.4 mrem hr$^{-1}$ | 50 |
| Neutron | $^{252}$Cf (poly-moderated) | 4.1 mrem hr$^{-1}$ | 100 |
| Neutron | $^{252}$Cf ($D_2O$-moderated) | 93.9 mrem hr$^{-1}$ | 50 |
| Neutron | $^{252}$Cf ($D_2O$-moderated) | 23.5 mrem hr$^{-1}$ | 100 |
| Neutron | $^{238}$Pu:Be | 21.5 mrem hr$^{-1}$ | 100 |
| X-ray | Various beam qualities | 2 to 300 R hr$^{-1}$ | 318 |

### 2.2.47 Building 7852 Old Hydrofracture Facility

The Old Hydrofracture site was built in 1963 and used from 1964 to 1979 for permanent disposal of low-level liquid radioactive waste in shale formations at depths of more than 780 ft. Various facilities were required to support the waste disposal operations, including: a building containing a mixing cell, pump cell, and injection well cell; five underground tanks used for storage of the liquid waste prior to mixing it with grout; and an impoundment (Old Hydrofracture Pond) and waste pit (T-4 Waste Pit) for emergency storage of liquid waste due to system failures. Each of the cells had 1-ft thick concrete walls and roofs of diamond-plated steel. The liquid waste tanks, both interior to the building and the Pond, contained elevated levels of radioactive materials producing high exposure rates. Shielding was added to the roof in 1974 to reduce the dose rate over the mixer cell from 1 to 2 R hr$^{-1}$ to about 100 to 200 mR hr$^{-1}$ (ORNL 1996).

Operations ended in 1980 leaving approximately 50,000 gal of transuranic waste in the five underground storage tanks. This waste was removed and transferred to the Melton Valley Storage Tanks for processing and disposal.

### 2.2.48 Solid Waste Storage Areas

Section 2.3.4 discusses Solid Waste Storage Areas (SWSAs) 1 to 6 in further detail. The following paragraphs detail the known information about the presence of radioactive material.

1. Analyses from several SWSA 1 groundwater wells showed low concentrations of $^{90}$Sr, but no indication of $^{137}$Cs or transuranic elements.

2. Analyses of soil core samples taken from the SWSA 2 area indicated no contamination. Analyses included uranium, plutonium, and $^{137}$Cs. Groundwater samples also showed no contamination. Water sample analyses included tritium, gross alpha, and gross beta.

3. Groundwater samples indicated small amounts of trivalent rare earths, $^{90}$Sr, $^{89}$Sr, and $^{3}$H contamination.

4. Groundwater and surface-water samples from the area indicated radioactive contamination in both. One well sample indicated alpha contamination while another 8 of the 16 well samples indicated beta/gamma contamination. Identified radioactive contaminants include $^{90}$Sr, $^{106}$Ru, $^{137}$Cs, $^{60}$Co, $^{210}$Po, $^{239}$Pu, $^{3}$H, $^{125}$Sb, and trivalent rare earths.

5. Water sample analyses indicated radioactive contamination of $^{244}$Cm, $^{238}$Pu, $^{90}$Sr, $^{3}$H, $^{125}$Sb, $^{106}$Ru, $^{137}$Cs, $^{60}$Co, and trivalent rare earths.

6. Estimates of total radioactivity in SWSA 6 included 252,000 Ci through 1984, of which 211,000 Ci has been buried since 1977. Waste consists of 155,000 Ci europium; 2,970 Ci $^{90}$Sr; 5,110 Ci $^{137}$Cs; 32,200 $^{60}$Co; and 7,110 Ci $^{3}$H. Water seepage has occurred in a majority of the 49 trenches. In an attempt to decrease the water seepage, a near-surface seal of a mixture of bentonite-shale was applied to three sections of SWSA 6, and the area was covered with grass. Water seepage has been observed under the seal since it was applied; the migration of water has been both lateral and vertical.

## 2.3 OAK RIDGE NATIONAL LABORATORY SITE OPERATIONS AND PROCESSES

Section 2.2 provides information concerning specific operating facilities and the radioactive materials that were or are present at those facilities. This section describes specific processes associated with many of those facilities (e.g., the Graphite Reactor had a fan house, filter house, stack and other ancillary facilities associated with its operation). Section 2.3.1 discusses early operation of the Graphite Reactor, the Hot Pilot Plant (Building 3019), and some associated facilities. Section 2.3.2 describes RaLa activities. Section 2.3.3 describes isotope production areas. Section 2.3.4 discusses waste areas and processes. Section 2.3.5 describes biological and life sciences research in ORNL facilities at Y-12. Section 2.3.6 describes the remaining reactor development and operation activities at ORNL.

### 2.3.1 Early Operation of Graphite Reactor and Associated Facilities

After Glenn Seaborg had proven that plutonium could be produced from the bombardment of $^{238}$U with a cyclotron and Enrico Fermi had designed a graphite-moderated reactor that had achieved a self-sustaining, critical reaction; it was recognized that to produce plutonium in quantities great enough for weapons production could only be attained by the construction of large reactors. The Federal government decided to build an air-cooled, graphite-moderated reactor using natural uranium (enrichments), with sufficient concrete shielding to minimize radiation exposures to site personnel. The U.S. Army Corps of Engineers constructed the reactor at the Clinton Laboratories, which became the Oak Ridge National Laboratory in 1948. In 1942, the Manhattan Engineering District of the Corps became responsible for the management of uranium and plutonium plant construction and nuclear weapons production.

The Graphite Reactor, Building 3001 (originally 105), operated from November 1943 to November 1963. The reactor was designed and built as a pilot plant to test the control and operating procedures of the proposed larger production reactors and to provide needed quantities of plutonium for Manhattan Engineering. The reactor was designed to operate at a thermal power rating of 1,000 kW, but with subsequent modifications reached at least 4,400 kW (Rupp and Cox 1955). There were 7 ft of concrete shielding between the reactor and the front wall of the shield that operators would work from [5 ft of barites concrete with 1 ft of structural concrete on each side as retaining walls (Rupp 1955)]. Natural uranium fuel slugs (4 in. long by approximately 1.1 in. diameter) were loaded in the reactor by inserting them through holes in the front face into horizontal channels in the graphite matrix. (The Aluminum Company of America provided the aluminum-clad fuel slugs for use in the reactor.) Following irradiation, slugs were pushed out the back side of the reactor into a water-filled transfer canal.

In 1958, the maximum radiation levels in the transfer canal area ranged from 30 to 40 mR $hr^{-1}$ due to highly contaminated concrete on its sides. Cox (1958) stated that the majority of the exposure to reactor operations personnel occurred during work adjacent to the transfer canal. The water level was increased and steel plate was placed over the contaminated concrete the next year. Exposure rates to the workers who worked "several hours at a time" were "reduced to about one-tenth of its former value" (Cox 1959). Ruptured fuel slugs, allowed to oxidize in the transfer canal, were the major source of contamination and dose in the reactor building. Irradiated fuel slugs were moved underwater to the separations building (Building 3019, originally 205) after a cooling period to allow for decay of the short-lived radioisotopes. Rupp and Cox (1955) reported that elevated levels of $^{60}$Co and $^{137}$Cs were present in the canal waters in 1954.

Airborne wastes were removed from Building 3001 and exhausted to the atmosphere from a 200-ft stack (Building 3018) immediately north of the Graphite Reactor Building. Initial design of the exhaust system did not include a filtering mechanism. By 1948, it was recognized that radioactive particulates were being emitted from the stack. Particulate filtration was added to reduce the emissions. Researchers later discovered that particulate contamination became elevated in the airborne effluent stream when fuel slugs, pushed out the back of the reactor, would fall and strike the mattress plates. The impact would sometimes breach or further breach the aluminum cladding, resulting in a release of particulate matter into the air. The large building ventilation fans would entrain these particles and exhaust the particles out the stack. Therefore, concentrations of gaseous wastes such as noble gases ($^{41}$Ar and several xenon/krypton isotopes) and radioiodines were not filtered and were not quantified.

Construction activities for Building 3019 (originally 205) began in March 1943. Primary construction included six hot cells: one for dissolution of uranium from the irradiated fuel slugs, four that housed equipment for successive chemical treatment of the uranium (precipitation, oxidation, and reduction); and one that stored contaminated equipment removed from the other cells. The cell area was within a frame structure that also contained the operating gallery and office areas. This facility, known as the Pilot Plant, was where various new chemical separations processes were tested [e.g., bismuth phosphate, reduction-oxidation (REDOX), Hexone-25, TBP (tributyl phosphate)-25, plutonium-uranium extraction (PUREX), fluoride volatility chemical process, and thorium extraction (THOREX)].

Because of the variety of processes that took place in the building, many different radioisotopes were and are still present in the facility. At first, airborne emissions were exhausted through the 200-ft stack from Building 3020 (the fanhouse was adjacent in Building 3021). In about May 1962, a deep bed glass fiber filter was added, and effluents were then sent to the large Central Exhaust Facility stack at Building 3039 (Klima 1962). Arnold, Gesky, and Nichols (1961) provide a description of the types of materials expected to be exhausted through the filter. A description of all processes that have taken place in Building 3019 is given in *Historical and Programmatic Overview of Building 3019* (Brooksbank, Patton, and Krichinsky 1994). This facility conducted much of the research and development operations for separations at the site. Several of the processes are described below.

From 1943 until 1945, the Bismuth Phosphate Process took place in Building 3019. The process recovered plutonium from the fuel slugs from the Graphite Reactor. The process took place in six hot cells. The fuel slugs were transported from the Graphite Reactor through an underground water-filled canal. The process included the slugs being dissolved in acid in the initial cell. The remaining cells housed the equipment used in precipitating the plutonium from the dissolved fuel slugs and oxidation and reduction of the uranium. This batch process is based on the fact that plutonium will co-precipitate with bismuth phosphate in the +4 valence state, but not in the +6 valence state. Aluminum cladding was dissolved away from the fuel elements using boiling sodium hydroxide solution. The bare uranium was then dissolved in concentrated aqueous nitric acid and plutonium was separated and concentrated by many cycles of precipitation and dissolution using bismuth phosphate. The bismuth-phosphate process could only extract plutonium; the uranium remained as a waste product. Radionuclides of concern include $^{234}U$, $^{235}U$, $^{238}Pu$, $^{239}Pu$, and mixed fission products.

The REDOX Process took place in Building 3019 from 1945 until 1951. The REDOX facility was a pilot plant for the Argonne National Laboratory REDOX Processing Plant. REDOX was a method of extracting uranium and plutonium from reactor fuel using solvents. Radionuclides of concern include $^{234}U$, $^{235}U$, $^{238}Pu$, $^{239}Pu$, and mixed fission products.

PUREX processing took place in building 3019 from 1949 to 1960. The PUREX process involved the use of TBP for solvent extraction. The TBP was used in organic and hydrocarbon diluents to isolate plutonium, uranium, zirconium, niobium, and ruthenium from fission product wastes. Radionuclides of concern include $^{234}U$, $^{235}U$, $^{238}Pu$, and mixed fission products.

Building 3019 housed the fluoride volatility chemical process. This process used the volatility of uranium hexafluoride to separate $^{235}U$ from molten salt fuels and other fuels that were soluble in molten salt. Radionuclides of concern include $^{234}U$, $^{235}U$, $^{85}Kr$, $^{133}Xe$, $^{127}Te$, $^{129}Te$, $^{131}I$, $^{103}Ru$, $^{106}Ru$, and $^{238}Pu$.

The THOREX process was used in Building 3019 to separate $^{233}U$, $^{232}Th$, $^{233}Th$, and $^{233}Pa$ from irradiated thorium metal and other fission products. During 1956 and 1957 the thorium metal was decayed at shorter periods than normal to test the equipment and processes under high radiation conditions. In 1959, an explosion in the THOREX pilot plant released 0.6 g of plutonium from a hot cell, spreading it onto the street and the graphite reactor. Radionuclides of concern include $^{238}Pu$, $^{239}Pu$, $^{233}U$, $^{232}Th$, $^{233}Th$, $^{85}Kr$, $^{95}Zr$, $^{95}Nb$, $^{103}Ru$, $^{106}Ru$, $^{131}I$, $^{132}I$ ($^{132}Te$), $^{133}Xe$, $^{140}Ba$/$^{140}La$, $^{141}Ce$, $^{144}Ce$, and $^{233}Pa$.

Building 3019 also originally housed the Fuel Cycle Alpha Facility (FCAF) in a basement area before it was relocated to Building 4508. The FCAF fabricated PuO and (Pu,U)O fuel pellets and was used for coating sol gel-derived microspheres with pyrolytic carbon. Special target materials for the High Flux Isotope Reactor were also developed and fabricated in this facility. Two additional and unique fuel-rod-loading techniques, vibratory compaction and slug injection, were also studied in the FCAF.

Wastes generated from Building 3019 operations flowed to the underground storage tanks in the North and South Tank Farm area, facilities 3023 and 3507. At times volatile gases were released from the head space of the tanks when liquids were being filled in the tanks. Section 2.3.4 contains additional information concerning waste operations.

A chemical explosion occurred in Building 3019 on November 20, 1959 at approximately 11:00 p.m. in the intercycle evaporator in Cell 6. The explosion contaminated the interior of the cell area and blew the door to the outside open and contaminated the area immediately outside with significant levels of plutonium. The explosion also contaminated the Graphite Reactor and several other buildings, but “it was slight and readily cleaned up” (King 1960). The same report indicates that environmental contamination was immediately fixed at buildings and grass with paint, with asphalt on the roads, and with either paint or tar on the roofs. With the exception of Building 3019, the Graphite Reactor Building, and Hillside Road between Third Street and Building 3042, all areas were back in service by Monday morning, November 23 (King 1960). A report issued August 25, 1961 (Parrott 1961) indicates that decontamination efforts took place over an extended period and that approximately 141 g of plutonium were flushed from the cell area. The report indicates that though many entries were made into the cell area for decontamination efforts, that none of the workers involved were overexposed to beta/gamma radiation and that there was "no detectable increase in the body burden of plutonium of any individual involved" in the decontamination efforts (Parrot 1961)

Other buildings in the Main Plant Area where radioisotopic separations were conducted using slugs irradiated in the Graphite Reactor included 3026C, 3026D, 3505, 3515, and 3517. (Section 2.3.2 discusses the activities in Buildings 3026C and -D.) The Building 3505 Metal Recovery Facility received irradiated fuel slugs from 1952 to 1960 and reprocessed the slugs to produce 320,662 kg of uranium, 184 kg of plutonium, 1,344 kg of neptunium, and 55 kg of americium (Alexander et. al. 1982). Radiological fission products would have been present during the reprocessing of the irradiated fuel. A radiological survey conducted in 1981, indicated that the facility had widespread residual fission products, $^{137}$Cs and $^{90}$Sr, and uranic and transuranic radioisotopes present. The building was demolished and removed from the site in the 2000 timeframe.

Buildings 3515 (Fission Product Pilot Plant) and 3517 (Fission Product Development Laboratory) were used in the further separation of fission products from the waste solutions that came from Building 3505. Building 3515 operated from 1948 to 1958 and was originally known as the $^{106}$Ru tank arrangement. It was used to extract radioisotopes of ruthenium, strontium, cesium, cerium, and other fission products (ORNL 1994). In 1948, the facility consisted of a concrete pad with tanks surrounded by stacks of concrete blocks three rows deep. The pad was once covered by a tent. In 1950 or 1951, an 18-in.-thick, walled concrete hot cell with a 2-ft-thick concrete roof was constructed. Numerous spills occurred over the years in the building, and the internal structure, particularly the concrete floor, was frequently soaked with contaminated waste. The building was posted as a high radiation area. Operations in Building 3515 were moved to Building 3517 in 1958.

The hot cells in Building 3517 processed kilocurie amounts of fission products from REDOX and PUREX waste streams. A total of $1 \times 10^6$ Ci of fission products were processed until building operations ended in 1975. The radioisotopes separated during the late 1950s and early 1960s included $^{144}$Ce, $^{137}$Cs, $^{90}$Sr, $^{147}$Pm, $^{106}$Ru, and $^{99}$Tc, but some uranic and transuranic isotopes would have been present in the waste as would be other fission products.

### 2.3.2 Radioactive Lanthanum Activities

During mid-1942, much research was being directed at small-scale studies of various different radioisotopes in the Metallurgical Laboratory at the University of Chicago. While most of the radiological research was focused on the production of fissionable material for use in weapons manufacturing, some was conducted on other radioisotopes (i.e., activation and fission products) to determine their potential value to the war effort. While the Graphite Reactor was still being conceptualized by its designers, special attention was being given to barium, strontium, and lanthanum separation chemistry. It was found that though initially purified $^{140}$Ba had little gamma activity present, the activity of $^{140}$La growing into the purified $^{140}$Ba created much interest due to the presence of a 1.6-MeV gamma emitted from $^{140}$La. Production activities were called the RaLa Project. In the fall of 1943, much of the Metallurgical Laboratory moved to ORNL to continue the research on fission products. This research was initiated at ORNL in Building 3550 (706-A) and soon (October 21, 1943) a request to construct a larger production facility was made. Building 3026-C (originally 706-C) was designed and constructed with larger containers and equipment during the following year, and the new facility was placed in operation with its initial production run beginning on September 10, 1944.

The 3026-C facility was designed to handle 1- to 10-Ci amounts of radioactivity, but due to time constraints and unusual circumstances the facility was producing greater-than-100-Ci amounts of product upon startup. The 3026-C facility processed irradiated slugs from the Graphite Reactor. In addition, nine production runs of RaLa were completed for shipment to Los Alamos, for a total of 3,852 Ci in the building. (Multiple batches of irradiated slugs were dissolved to make up a completed run.) The last run in Building 3026-C was conducted May 28, 1945. During these initial, lower-activity production runs, there were many incidents of spills, plugged lines, low chemical yields (requiring additional batches of slugs to be dissolved), and failed equipment that affected the completion of runs (Thompson 1949).

After the second successful RaLa run in Building 3026-C, discussions were held that indicated the need to further increase production rates. Though the use of existing facilities in the Pilot Plant (Building 3019) was discussed and evaluated, it was determined that a new facility annexed to the current facility would be needed. Building 3026-D (originally 706-D) was designed to process much larger (up to 1,000 Ci) amounts of radioactivity and was attached to the east end of the existing 3026-C facility. As in the construction of Building 3026-C, time constraints caused the design and development work for the new facility to coincide with facility construction. The first production run of materials occurred on May 26, 1945 as the ninth and final run of RaLa was being completed within Building 3026-C. This facility also processed much higher activities than were designed for the facility.

Around 1948 the AEC decided to use irradiated slugs from the Hanford production reactors as feed for RaLa. The higher power of the Hanford reactors (relative to the Graphite Reactor) meant much larger quantities of RaLa could be produced in a shorter time even after the slugs were shipped across the country. A total of 68 RaLa runs had been completed at ORNL when operations ended in October of 1956. The RaLa program was subsequently transferred to the Idaho Chemical Processing Plant.

Due to the relatively short half-life of the parent $^{140}$Ba, the freshly irradiated fuel slugs used in the RaLa process still contained relatively large quantities of short-lived fission products, most notably noble gases and radioiodines.

Much of the iodine volatilized during the slug dissolving process was effectively removed from the dissolver offgas stream by the reflux condenser and chemical scrubber that were in line before the gaseous waste went to the stack. Dissolver offgas from RaLa production was vented to the 3020 stack from 1944 to 1950 and to the 3039 stack from 1950 to 1956. From 1944 to 1950, other airborne wastes were withdrawn from the building's two process cells to a 30-ft stack adjacent to the building, until this stream to was routed to the 3039 stack. In the latter part of 1948, it was determined that the operations within Building 3026-D were a major contributor of airborne particles on the site. Air filter houses were installed to reduce particulate material in the effluent stream before release from the building. Liquid wastes from RaLa operations went to the local tank farms.

Other than operational problems (failed equipment, breached control systems, plugged feed lines) that occurred at times during RaLa operations, the worst incident occurred at about 5:00 p.m. on April 29, 1954. The incident was described as "the most serious accidental release of activity ever experienced in the history of the process" (Rupp and Witkowski 1955). The Building 706-D logbooks indicate that during Run 56, 161 Hanford slugs had been loaded into the dissolver and 3 successful batches had been processed. After the third batch dissolution, the slugs that remained in the dissolver tank were not covered with liquid for approximately 28 hr and became thermally hot due to radioactive decay. When the fourth batch addition of acid was poured into the dissolver to initiate additional dissolution, a violent reaction occurred forcing dissolver solution up the slug-loading chute and solution addition lines. Air monitors in the building immediately sounded an alarm, indicating elevated airborne radioactive material. The investigation that followed indicated that individuals in the building donned gas masks and evacuated the building soon. The release lasted from between 10 min to 2 hr before the scrubbers could recover and begin filtering radioiodine from the building. A letter written by the Laboratory Shift Superintendent to the ORNL Director indicated that "all people involved in the incident and later in the high level decontamination work are being given the standard HP check including urine checks, etc." (Stanley 1954). Radiation levels reached 100 R $hr^{-1}$ on the third floor, but were reduced to 100 mR $hr^{-1}$ by 7:00 a.m. the next day; air sample results did not exceed the tolerance level of 3.0E-08 µCi $ml^{-1}$. A preliminary check of film badge results was indicated as having been conducted, but the reference did not provide confirmation.

Detailed information concerning RaLa operations, source terms, emissions, and offsite radiation doses is available in ChemRisk (1999). This document provides much of the historical process information, as well as modeled concentrations of iodine to conduct offsite dose assessments.

### 2.3.3 Isotope Production Areas

Following the small-scale production of plutonium from the Graphite Reactor and large quantity production of RaLa in Buildings 3026-C and –D, other site facilities were constructed to produce various other radioisotopes. Table 2-5 provides a list of the facilities involved in the ORNL isotope production program, including radioisotopes that would have been present. Note that Building 3026-C was the initial facility for commercial isotope production at ORNL (ORNL 1997b). The majority of all the other isotope production facilities were built in the early 1950s. While some of the facilities have not produced any product material since the 1960s, some are still used for storage. The following paragraphs provide additional information for several of the isotope production buildings.

Table 2-5. Radioisotopes of concern in isotope production facilities.

| Building name | Building number | Isotopes formerly stored, used, or produced |
|---|---|---|
| Krypton-85 Enrichment Facility | 3026-C | $^{129}$I, $^{131}$I, $^{79}$Se, $^{107}$Pd, $^{147}$Pm, $^{137}$Cs, $^{90}$Sr, actinides, $^{85}$Kr, U, $^{99}$Tc, $^{60}$Co, Pu, $^{3}$H |
| Alpha Powder Facility | 3028 | $^{131}$I, $^{133}$Xe, $^{242/244}$Cm, $^{147}$Pm, $^{99}$Mo, $^{238}$Pu |
| Source Development Laboratory | 3029 | $^{192}$Ir, $^{60}$Co, $^{137}$Cs, $^{90}$Sr, $^{131}$I, $CH_3{}^{131}I$, $^{14}$C, $^{99}$Tc |
| Radioisotope Production Laboratory–C | 3030 | $^{56/57}$Co, $^{198}$Au, $^{55}$Fe, $^{234}$Np, $^{75}$Se, $^{90}$Sr nitrate, $^{110}$Sn, $^{237}$U, $^{33}$P, $^{192}$Ir, $^{63}$Ni |
| Radioisotope Production Laboratory–D | 3031 | $^{90}$Y, $^{153}$Gd |
| Radioisotope Production Laboratory–E | 3032 | $^{241}$Am, $^{235}$U, $^{233}$Pu, $^{152,154}$Eu, $^{153}$Gd, $^{56}$Co, $^{57}$Co, $^{198}$Au, $^{55}$Fe, $^{234}$Np, $^{75}$Se, $^{90}$Sr, $^{137}$Cs, $^{111}$Sn, $^{237}$U, $^{33}$P, $^{192}$Ir, $^{244}$Cm, $^{131}$Xe, $^{131}$I, $^{99}$Mo, and $^{147}$Pm |
| Radioactive Gas Processing Facility | 3033 | $^{3}$H, $^{85}$Kr, $^{14}$C |
| Radioactive Production Laboratory Annex | 3033-A | $^{14}$C, $^{241}$Am, $^{237}$Np, $^{238}$Pu, highly enriched actinide isotopes |
| Radioisotopes Area Services | 3034 | Not established - former field shop for Plant and Equipment Division support |
| Alpha Handling Facility | 3038-AHF | $^{252}$Cf, $^{244}$Cm, $^{241}$Am, $^{238}$Pu, $^{234}$U, $^{237}$Np, $^{231}$Pa, and others |
| Isotope Materials Laboratory | 3038-E | Transuranics, $^{90}$Y, $^{235}$U, $^{147}$Pm, $^{90}$Sr, $^{244}$Cm, $^{241}$Am |
| Radioisotope Packaging and Shipping Facility | 3038-M | $^{129}$I, $^{137}$Cs, $^{60}$Co, $^{90}$Sr, $^{99}$Tc, $^{89}$Mn, $^{106}$Ru, $^{36}$Cl |
| Isotope Technology Building | 3047 | $^{14}$C, $^{152,154}$Eu, $^{60}$Co, $^{153}$Gd, $^{241}$Am, $^{242/243}$Cm |
| Storage Cubicle | 3093 | $^{85}$Kr |
| Storage Pad | 3099 | N/A |
| Radioisotope Production Laboratory–H | 3118 | not established |

Table 2-5. (Continued).

| Building name | Building number | Isotopes formerly stored, used, or produced |
|---|---|---|
| Fission Products Development Laboratory | 3517 | $^{90}Sr$, $^{137}Cs$, $^{144}Ce$, $^{147}Pm$, $^{106}Ru$, $^{99}Tc$, $^{60}Co$, $^{192}Ir$, $^{235}U$, $^{152,154}Eu$, $^{241}Am$ |
| Tritium Target Preparation Facility | 7025 | $^{3}H$, $ThO_2$, $UO_2$, $^{90}Sr$, $^{137}Cs$, $^{244}Cm$ |

Building 3028, also referred to as the Alpha Powder Facility, was constructed in 1950 and originally housed the $^{131}I$ processing facility and the separation facility for $^{147}Pm$. The $^{131}I$ facility was converted to manipulator cells and expanded to the Short-Lived Fission Product Facility in the early 1960s, which operated until 1985. The $^{133}Xe$ facility was added at that time and operated until 1980. Isotopes made for sale included $^{133}Xe$, $^{131}I$, and $^{99}Mo$. Curium source fabrication began in 1964 to support Space Nuclear Systems. The process took place on the first floor of the building in water-shielded cells. The cells were partially decontaminated in the mid 1980s and the facility was redesignated as the Alpha Powder Facility to support full-cost-recovery isotopes program. In the late 1970s the target facility was moved to Building 3038 and the upper floors were occupied by Nuclear Medicine Research until 1988.

Building 3029 was constructed in 1952 to support the Isotopes Program. A small manipulator cell (now called Cell 4) and a system of remotely operated barricades were used to support source fabrication of $^{192}Ir$. There were also some small $^{60}Co$ sources fabricated in the facility. In 1955 and 1956 an additional cell (Cell 1) was built to handle large amounts of $^{60}Co$ for source fabrication. The amount of $^{60}Co$ sources fabricated in the facility diminished in the late 1950s. Between 1960 and 1962, Cell 3 was built for $^{137}Cs$ source fabrication. Cell 2 is located between Cells 1 and 3 and was used to handle waste and served as a pass-through between the two cells. The exact dates of operation of this facility are not known, but the program ended in the late 1980s.

Building 3030 was constructed for production and development of radioisotopes for industry, medicine, and research. The building contained a hot cell for processing irradiated cyclotron and reactor targets to produce, purify, and separate numerous radioisotopes such as $^{56}Co$, $^{57}Co$, $^{198}Au$, $^{55}Fe$, $^{234}Np$, $^{75}Se$, $^{90}Sr$, $^{111}Sn$, $^{237}U$, $^{33}P$, and $^{192}Ir$. There is also $^{63}Ni$ and $^{103}Pd$ contamination in the facility. The exact dates of operation of this facility are not known. The program it supported began in the late 1940s and ended in the late 1980s.

Building 3032 was constructed to house the analytical facility for radiochemical support of the Isotopes Production activities. The facility has a laboratory with five hoods on the north side of the building and an office on the south side connected by an open passageway. The exact dates of operation of this facility are not known. The program it supported began in the late 1940s and ended in the late 1980s.

Building 3033 was used for processing $^{14}C$, $^{85}Kr$, and $^{3}H$. Processing of $^{14}C$ ended in 1975. Radioactive gas processing of tritium and krypton took place in Building 3033. Bulk tritium shipments from the Savannah River Site were received, purified, loaded into canisters, and shipped. Krypton from Idaho was received and purified for sale to private industries or used as feed to the thermal diffusion columns in Building 3026-C. The exact dates of operation of this facility are not known. The program it supported began in the late 1940s. The processing of $^{3}H$ ended in 1990. The last $^{85}Kr$ was produced in September 1989.

Building 3038 was used for packaging, inspection, and shipping activities for radioisotopes from 1949 until 1990. The building contained five hot cells shielded by water-filled steel tanks. The operating face of each cell consisted of 3 ft of shielding, a viewing window, and manipulator ports. Each cell was 10 ft deep. From 1968 until 1990 part of the facility was used for the fabrication of targets and was referred to as the Alpha Handling Facility.

Section 2.3.6.9 discusses the High Flux Isotope Reactor, which is currently in operation for isotope production.

### 2.3.4 Waste Areas and Processes

Due to the varied history and growth of operations at ORNL, several waste disposition areas have been used. Early sites were on or near the ORNL Main Plant Area to accept both solid and liquid production wastes. In later years the disposal areas were moved south of the Main Plant Area (across Haw Ridge) into Melton Valley. The following paragraphs provide a short description of the areas and amounts of radioactive materials that are present, if available.

The original design of the ORNL site was to operate for a short time to develop processes for use at other DOE facilities. Because of this short-term design, much of the wastes were expected to be maintained in consolidation areas on the site. The North and South Tank Farms were put in place to temporarily store liquid wastes. Processing included treatment and precipitation of solids and draining off of the supernatant. The waste was then sent to the waste holding basin and then to White Oak Creek. These holding areas were able to treat the liquids and precipitate much of the radioactivity out of solution offsite release. However, the sediments in White Oak Creek and Lake do contain radioactive materials that settled from the process liquids.

The North Tank Farm (Facility 3023) was constructed in 1943. It included four large concrete (gunite) underground tanks to store liquid chemical and radioactive wastes, identified as W-1, W-2, W-3, and W-4. In 1950 an additional four underground stainless-steel tanks were constructed in the same general area (W-1A, W13, W-14, and W-15). An extensive underground piping system transported the liquid waste from Buildings 3019 and 3026 to the tanks.

The South Tank Farm (Facility 3023) is a series of six 170,000-gal underground gunite storage tanks placed into service in 1943. The South Tank Farm was part of the liquid low-level waste collection system used for the collection, neutralization, storage, and transfer of the aqueous radiological and chemical wastes generated at the ORNL.

The Waste Holding Basin (Facility 3513) was constructed in 1944 by scooping out a depression in the native clay and constructing earthen berms to contain the liquids. The unlined disposal area had dimensions of 220 by 220 ft and was 6.5 ft deep. Supernatant wastes from the South Tank Farm were piped to the northern end of the basin. Later, water from the process waste treatment plant that had been treated with fly ash and lime was discharged to the Building 3513 holding basin before discharge to White Oak Creek. The Waste Holding Basin was removed from service in 1976, but still contains water and contaminated sediments.

The contaminants maintained in the three areas discussed above consisted of soluble and insoluble radioisotopes that flowed from the chemical separations areas. Often, the liquid wastes were treated with caustic material to increase the pH of the liquid and prompt much of the radioactive material to settle out. Once treated, the liquid waste could be transferred elsewhere to make room for additional waste transfers into the holding basin. Initially, the treated waste liquid was pumped into White Oak Creek. Later, liquid wastes were transported by truck to Melton Valley where they were poured directly into pits and trenches, where the liquid evaporated and chemically combined with the soil. The Old Hydrofracture Facility (Building 7852, described in Section 2.2.47) was constructed to dispose of low-level liquid radioactive wastes deep in the geological faults separate from sources of drinking water.

Several additional underground storage tanks exist in the main ORNL plant area (thorium tanks, area 4500 tanks, and several additional tanks near the South Tank Farm).

Solid wastes were originally placed in disposal areas on or very near the main plant site (SWSAs 1, 2, and 3). Later, solid wastes were transported to Melton Valley where other landfills were operated. The following paragraphs describe SWSAs 1 to 6.

Solid Waste Storage Area (SWSA) 1 is a 1.5-acre site on the north side and at the foot of Haw Ridge and immediately southeast of White Oak Creek in Bethel Valley at the ORNL site. Solid waste was buried in this area in trenches south of Incinerator Road beginning in April 1944. Additional solid waste was added in 1944, but the site was abandoned later in the year due to water accumulating in the trenches. The area contains only a small amount of solid radioactive waste because fissionable material was being maintained at the site. At the time of waste generation, site operations did not include isotope separation and concentration of the waste. Analyses from groundwater wells show low concentrations of $^{90}$Sr, but no indication of $^{137}$Cs or transuranic elements.

SWSA 2 is approximately 3.6 acres in size and is north of the East Vehicle Gate, on the lower half of the hill adjacent to the main parking lot. The site is neither fenced nor marked to readily identify its location. The site was used from 1944 until 1946 for the disposal of waste. Beta/gamma contaminated solid waste was placed in black drums and buried in trenches. Liquid waste contaminated with plutonium was placed in stainless-steel drums and either buried in trenches or stored above ground in a ravine. Following the closure of SWSA 2, both the stainless-steel and black drums were removed, transferred, and reburied in SWSA 3. Following the drum removal, the hillside of SWSA 2 was bulldozed, backfilled and contoured, and seeded sometime between 1946 and 1949. Analyses of core samples taken from there indicated no contamination. Analyses included uranium, plutonium, and $^{137}$Cs. Groundwater samples taken at SWSA 2 also showed no detectable contamination. Groundwater analyses included tritium, gross alpha, and gross beta.

SWSA 3 is about 7 acres in size and about 0.5 mi west of SWSA 1 and about 0.6 mi west of the west entrance of ORNL. The disposal facility was opened in 1946 and received contaminated trash, laboratory equipment, and other materials. The drums that were removed from SWSA 2 were placed in this burial area. Alpha-contaminated waste was placed in drums and disposed in concrete-lined trenches on the northeast end of the burial ground. Later, as the burial ground was extended to the west, the drums were placed directly in unlined trenches and covered with concrete. Beta/gamma-contaminated wastes were buried in separate unlined trenches and backfilled with soil. Some large equipment contaminated with low levels of radioactivity was stored above ground until 1979 when they were removed. Some of those items were relocated to an area between SWSA 4 and the Chemical Waste Pits, while other items were transferred to SWSA 5 or 6 and buried. SWSA 3 was closed in 1951. Groundwater samples indicate small amounts of trivalent rare earth, $^{90}$Sr, $^{89}$Sr, and $^{3}$H contamination.

SWSA 4, which is approximately 23 acres, received waste from 1951 until 1959. The disposal area is in Melton Valley on the south side of and at the foot of Haw Ridge, immediately west of White Oak Creek. Records about the waste disposed in SWSA 4 before 1957 are incomplete due to a fire. ORNL generated about 50% of the waste buried in SWSA 4 during 1957 and 1958; the remainder came from over 50 other agencies. Argonne National Laboratory, Knolls Atomic Laboratory, Mound Laboratory, and the General Electric Company (Evendale, Ohio) were some of the principal generators of waste disposed in SWSA 4. Surface- and groundwater samples taken from the area indicate the presence of radioactive contamination. One well sample indicated alpha contamination while another 8 of the 16 well samples indicated beta/gamma contamination. Radioactive contaminants in SWSA 4 include $^{90}$Sr, $^{106}$Ru, $^{137}$Cs, $^{60}$Co, $^{210}$Po, $^{239}$Pu, $^{3}$H, $^{125}$Sb, and trivalent rare earths.

SWSA 5 is in Melton Valley, north of Melton Branch and east of the area where White Oak Creek and Melton Branch merge. The waste area is 33 acres and was opened in 1958 after burial space in SWSA 4 became limited. Low-level radioactive waste is stored in trenches in the larger southern section of the disposal area and transuranic waste is stored in trenches in the SWSA 5 North area in the northwest corner. Disposal of waste in SWSA 5 ended in 1975. Water seepage problems have caused the trenches to fill with water because the trenches were excavated with the long portions extending in a downslope manner parallel to the hydraulic gradient of the water table. In 1975, two underground dams were installed across two parallel trenches to reduce the water seepage in the south end of the area. A plastic membrane was installed to cap the southern area where the dams were installed and grass was planted to inhibit erosion. A bentonite-shale mixture was added to seal the northern part of the disposal area in over 14 trenches in the transuranic waste area. Water sample analyses indicate the presence of $^{244}$Cm, $^{238}$Pu, $^{90}$Sr, $^{3}$H, $^{125}$Sb, $^{106}$Ru, $^{137}$Cs, $^{60}$Co, and trivalent rare earths.

SWSA 6 opened in 1969 and is still operational, receiving low-activity solid radioactive waste and $^{235}$U for storage. The 68-acre disposal area is in Melton Valley, north of White Oak Lake, southeast of Lagoon road and Haw Ridge, and immediately east of Highway 95. Beta/gamma and transuranic radioactive waste is buried in trenches and auger holes at the site.

The Central Exhaust Facility (Building 3039) is the major exhaust stack in the main plant area. The 3039 Stack Ventilation System off-gas and cell-ventilation facilities include various cell-ventilation, off-gas scrubber, and waste systems. Because of the diversity of the activities carried out in the buildings that the system serves, any gaseous waste stream can contain transuranic or fission product radioisotopes. Building operators, as the waste generators, are responsible for keeping the amounts of radionuclides in the gaseous waste streams that discharge into the 3039 Stack Ventilation System to levels that limit risk to the health and safety of the public and employees. This is accomplished through a combination of administrative controls, input controls, application of health physics procedures, and treatment (usually by HEPA filters) of the gaseous waste stream before discharge into the 3039 Stack Ventilation System.

### 2.3.5 ORNL Facilities at the Y-12 National Nuclear Security Complex

Due to a moratorium on construction activities immediately after the war, insufficient space at the ORNL site caused the Biological Sciences division to move to building space at the Y-12 National Nuclear Security Complex. The building complex included Buildings 9207, 9208, 9210, 9211, 9220, 9224, 9743, 9767-3, 9767-5, and 9982. This list of facilities does not include several cooling towers. The Biological Sciences division was tasked with conducting animal research, typically using low-strength radiological sources for carcinogenic research, determination of the relative biological effectiveness of differing radiation types and source strengths, and dosimetry in space flight. Many of the studies were conducted in Building 9210, known as The Mouse House.

Discussions with the current Radiological Control Officer for the Life Sciences Division (Biological Sciences later became the Life Sciences division) indicated that the type of radiological studies conducted in the building complex used sealed radioactive sources for direct radiological exposures. The sources were sealed sources that consisted of welded metal capsules. The greatest potential hazard was a direct exposure to an unshielded capsule. This is unlikely to have presented a contamination hazard except in the event of a broken capsule weld. No information was available that indicated that this type accident ever occurred in these facilities. The source rooms had lead-lined walls and doors at all locations where there was any potential for personnel or public exposure. Procedures and safety interlocking devices were in place to minimize the potential for personnel to be exposed.

The sources are no longer present in any of the Y-12 Biological Sciences facilities. Table 2-6 depicts the radiation sources used by the Biological Sciences Division at Y-12 over the last few decades.

Table 2-6. Radiation sources in Biology Division at Y-12.

| Building | Room | Radioactive source | Quantity (curies) | Dose rate (at 1 m, unshielded) (rad $hr^{-1}$) | Type of radiation | Main irradiation use |
|---|---|---|---|---|---|---|
| 9207 | 403A | $^{137}Cs$<br>$^{137}Cs$ | 1300<br>65 | 430<br>21.5 | Gamma | Mice, rats<br>Mice, rats |
| 9207 | 4040 | $^{137}Cs$ | 0.83 | 0.3 | Gamma | Mice, rats |
| 9210 | 341 | $^{137}Cs$ | 2.5 | 0.8 | Gamma | Mice |
| 9779-2 | | $^{137}Cs$ | 80 | 26.5 | Gamma | Mice |
| 9207 | 127 | $^{60}Co$ | 3.75 | 5 | Gamma | Insects, mammalian tissue |
| 9983-17 | Trailer | $^{252}Cf$ | 3.91 | 0.8 | Neutrons and gamma | Mice, rats, mammalian tissue |

In addition, two other programs from ORNL were moved to the Y-12 site. The Stable Isotopes Program emerged at the end of the war when site staff stopped using calutrons to separate uranium isotopes for atomic weapons. Researchers at first used four calutrons salvaged from electromagnetic equipment. Copper isotopes were the first to be collected, followed by isotopes of iron, platinum, lithium, and mercury. These were separated and shipped to universities, governments, and national laboratories. In 1958, the building containing two beta calutron tracks (Building 9204-3, Tracks 5 and 6) became available and was assigned to the Stable Isotopes Program. One track of calutrons was modified with heavy iron yokes so that individual sections could be operated to separate isotopes of different elements. As of 1963, the ORNL electromagnetic isotope separations program was providing more than 250 high-purity, highly enriched isotopes for use in a wide variety of research and technical applications. During 1963, more than 17,000 g of separated material were collected from 28 of the calutrons allocated for the Stable Isotope Program. As of late 1985, the Stable Isotope Program of ORNL, at Y-12, made over 229 isotopes available by direct sale or on a loan basis. At one time, the Stable Isotopes Program was the largest DOE involvement with commercial markets. Stable isotopes were used in preparing the specialty isotopes used in medical research, as tracers, and in a number of physics applications. Every year, the ORNL program produced and sold millions of dollars worth of these materials. Calutrons were last used for stable isotope production at Y-12 in 1990.

In the 1951, the ORNL Engineering Technology Division was split into two divisions, the Aircraft Nuclear Propulsion (ANP) and Reactor Experimental Engineering Divisions. Later that same year the two divisions were moved to Y-12 (ANP to Building 9201-3 and the Reactor Experimental Engineering Division to 9204-1). There is little indication from the material that this division used substantial amounts of radioactive materials.

The ORNL Critical Experiments Facility (CEF), also at Y-12, is discussed in Section 2.3.6.2.

### 2.3.6 Other Reactor Development and Operations

In addition to the Graphite Reactor operations described in Section 2.3.1, there have been numerous facilities at ORNL that were built to test reactor designs, train individuals, or to test criticality configurations. The facilities discussed in this section include:

- Low-Intensity Test Reactor (LITR)
- Critical Experiments Facility (CEF)
- Bulk Shield Reactor (BSR)/ Pool Critical Assembly (PCA)
- ORNL Research Reactor (ORR)
- Tower Shielding Facility (TSF)
- Health Physics Research Reactor (HPRR)
- Homogeneous Reactor Experiment (HRE)
- Aircraft Nuclear Propulsion Experiment (ANP)
- High Flux Isotope Reactor (HFIR)
- Molten Salt Reactor Experiment (MSRE)

In addition to routine, elevated external exposures present adjacent to these facilities, each facility was known to have had incidents that provided for increased external and internal exposures. The following sections provide information related to the operation of these facilities.

#### 2.3.6.1 Low-Intensity Test Reactor

The LITR (Building 3005) was originally built as a mock up of the Materials Test Reactor (MTR) in Idaho. It was a pool-type reactor with beryllium reflectors positioned on each side and water used as reflector on the top and bottom of the reactor. Reactor specifications indicate that there could be up to 25 fuel elements in a slab arrangement, but at times 25 fuel elements were not in place (Cox 1960b). (This reactor was sometimes described as a box-type reactor.) Minimum shielding around the reactor was 10 ft, 7 in. of unmortared concrete block with maximum measured exposure rates outside the shields of 6 mR $hr^{-1}$. Maximum radiation leakage around the beam plugs reached 1 R $hr^{-1}$ (Rupp and Cox 1955). During original operational testing of the reactor, it was noted that the core region of the original reactor was close enough to the final design of the reactor being built in Idaho that it could be brought up to criticality and operated. The LITR was used for testing and the checkout of instruments and controls of the MTR. It was also used as a training facility for the operators of the MTR. The LITR controls were co-located within the Graphite Reactor Building. Later, it was decided by ORNL and AEC to modify and operate the reactor for experimental and training purposes. It operated at a power level of 3 MW.

The reactor operated from 1951 until October 1968. Experiments that took place at LITR were allowed to be approved by one individual and no written procedures were followed during the experiments (Stapleton 1993). A series of documents (Cox 1960b) described several minor incidents that caused elevated external exposure rates as well as contamination in the pool waters and airborne contamination within the facility. The cotton cord filters used in the bypass filters had approximately a 6-week operational life and were required to be changed before disintegration. After eight years of satisfactory use, sintered stainless-steel filters replaced the cotton filters. These filters failed after about one year, possibly from the dissolution of nickel in the filters. In addition, high-exposure conditions were encountered when experimental beam ports were vacuumed to minimize the spread of contamination when taking experiments from the beam ports. Radioactive particles were removed when vacuuming that caused exposure rates to exceed 10 R $hr^{-1}$ at 4 in. Some contamination was dropped on blotter paper and on the floor, with exposure rates of 10 and 4 R $hr^{-1}$, respectively. The demineralizers used to filter radioisotopes out of solution would become sources of direct radiation exposure. Concentrations of $^{239}Np$ were detected in the pool waters in 1954 (Rupp and Cox 1955).

#### 2.3.6.2 Critical Experiments Facility

The CEF is at a remote site in the southwest portion of the Y-12 Main Plant Site in a pocket formed by the surrounding hills (Stapleton 1993). It began critical and near-critical experiments in August 1950 in support of upcoming reactor designs (e.g., ANP, liquid fuels, TSR (Tower Shielding Reactor)-II, and HFIR). The facility has three assembly areas and a control room and was designed with several safety features (water-filled windows and an intercom system) to minimize occupational exposures to personnel. The facility operated until March 1987, and shutdown permanently in 1992. Four incidents occurred:

- A polonium-beryllium neutron source, containing nearly 7 Ci of polonium and 0.4 g of beryllium, was accidentally opened in a CEF assembly area. This caused widespread dispersal of the polonium throughout one of the assembly areas and resulted in internal and external contamination of an employee.

- On May 26, 1954, in an experiment with a uranium solution in a vertical cylinder, a poison cylinder, placed in the center of the larger cylinder to absorb neutrons, accidentally became tilted from its proper vertical position, resulting in 2.1% excess reactivity. Approximately $1 \times 10^{17}$ fissions occurred. Automatic safety systems functioned and the reaction was terminated. The incident occurred inside an area shielded by 5 ft or more of concrete. Personnel exposures indicated on film badges ranged from 0.08 to 0.9 rem, with an average of about 0.3 rem.

- On February 2, 1956, in an experiment with a uranium solution in a vertical cylinder, there was an unintentional over-addition of solution. The safety system actuated, and waves caused in the solution by a falling cadmium sheet formed a prompt-critical configuration. About $1.6 \times 10^{17}$ fissions occurred. The incident occurred in the shielded CEF facility designed for such tests under remote operation. A considerable volume of solution was ejected from the cylinder. Personnel exposure indicated on film badges ranged from 0.14 to 0.575 rem.

- On November 10,1961, a criticality incident occurred when enriched uranium metal that was paraffin-reflected was being assembled. Two pieces of metal were brought together too quickly, which caused an excursion that yielded $1 \times 10^{15}$ to $1 \times 10^{16}$ fissions. There was reportedly no exposure to personnel in the building, and no dispersal of radioactive material beyond the assembly area where the incident occurred.

#### 2.3.6.3 Bulk Shielding Reactor/Pool Critical Assembly

The BSR (Building 3010) was a pool type reactor, originally designed to operate at a power level of 10 kW for the purposes of conducting radiation shielding experiments (Stapleton 1993). It served as a model for many university, industry, and government pool reactors. It began operating in 1951 for conducting shielding experiments, but in 1963 it was made available to the site as a general research reactor due to the shutdown of the Graphite Reactor. The BSR shutdown in March 1987. (The reactor was permanently shutdown September 10, 1991.) Modifications to the reactor allowed it to run at a thermal power level of 2 MW when it was designated as a general research reactor. Reactor fuel was aluminum-clad uranium-aluminum alloy fuel and appears to have been highly enriched similar to that used in the MTR.

The PCA is in the northwest corner of the same pool as the BSR (Stapleton 1993). It was designed as a low-power reactor (up to 10 kW) to supplement experiments that took place at several other site reactors. The reactor controls were similar to those for the BSR. PCA was used to train nuclear engineering students from around the country. It was shut down in 1987 and has not operated since.

#### 2.3.6.4 ORNL Research Reactor

Construction of the ORR (Building 3042) was completed near the end of 1957 and criticality was attained in March 1958 (Stapleton 1993). The reactor was a light-water moderated and cooled, beryllium- and water-reflected research reactor using highly enriched uranium-aluminum alloy plate fuel. It was located at one end of the pool. Though it initially operated at 20 MW, during mid-1960 power levels up to 30 MW were reached. The reactor was designed to produce high neutron fluxes for basic research in the fields of physics and chemistry and to test materials and potential fuels for power-producing reactors. When operational, the ORR produced greater quantities of radioisotopes for research, medical, and industrial use than any reactor in the world. It also contained the most advanced safety devices, including filters and scrubbers to minimize airborne releases. A document written by Cox (Cox 1961) indicates several releases from 1959 to 1961.

Building 3042 housed several facilities used for experiments over the years. These experiments included the following:

- The Gas Cooled Reactor (GCR) A9-B9 experiment from 1960 to 1969 to measure fission-product gases from ceramic fuels
- A molten salt test loop from 1959 to 1967 for the analysis of homogenous fuels
- The maritime ship reactor test loop from 1959 to 1962 for testing structural materials and fuel pins for nuclear merchant ship applications
- A pneumatic tube irradiation facility from 1968 until 1973 used to transfer irradiated samples from the ORR to a laboratory in Building 3001
- The GCR test loop from 1960 until 1967 to test new fuels for gas-cooled reactors
- The GCR Loop I from 1962 to 1963 for irradiation of unclad graphite fuel to study fission product releases.

#### 2.3.6.5 Tower Shielding Facility

The TSF (7700 area) was built in 1954 to support the ANP Project. Four 315-ft towers erected on a 200- by 100-ft rectangle were used to raise an operating reactor out of a shielded position and suspend it from the towers (Holland 1970). The design of the towers was such that various different shielding configurations could be tested. The TSF is on a knoll approximately 2.4 mi south-southeast of the ORNL main plant area. The facility allowed radiological measurements to be made free of radiation scattering from the ground or enclosed structures. Four different reactor designs have been employed at the TSF. The original, Tower Shielding Reactor I (TSR-I), was a box-shaped, 500-kW MTR-type reactor. It was replaced in 1960 with a spherically symmetric reactor (TSR-II) that operated at power levels up to 100 kW. For a period during 1958, the Aircraft Shield Test Reactor was used for shielding research for an operating aircraft. It operated at a power level of 1 MW. The fourth reactor, the TSF-SNAP (Systems for Nuclear Auxiliary Power) reactor, was used at the facility at a power level of 10 kW. The TSF-SNAP reactor was removed from the site in 1973. Since 1975, the TSR-II has been inside a ground-based concrete shield (Big Beam Shield) (Stapleton 1993).

Safety control procedures are in place to ensure that personnel do not receive elevated exposures. A fence surrounds the reactor at a distance of 600 feet. Warning horns sound three minutes before the reactor is brought out of the shielded location. In addition, safety interlocks are in place that automatically shut the reactor down if a door or gate is opened while the reactor is out in the open (Stapleton 1993). There have been no known incidents at TSF. It is expected that external exposures to both neutron and gamma radiations would have been present.

#### 2.3.6.6 Health Physics Research Reactor

The HPRR (also known as the Fast Burst Reactor) was a small, unshielded, unmoderated, fast reactor designed at ORNL and constructed under the Laboratory's supervision. Following initial tests at the CEF in 1961, the HPRR was loaned to Operation Bare Reactor Experiment Nevada at the Nevada Test Site where it was used to simulate nuclear weapon effects. The reactor was returned to ORNL in 1963 and was operated at the Dosimetry Applications Research (DOSAR) facility (Building 7709). When not in use, the reactor was stored in a steel and concrete vault below floor level. All the ancillary buildings were behind a hill and approximately 900 feetfrom the reactor building. There were no occurrences in which the safety of personnel was compromised or in which any failure seriously affected the equipment (Stapleton 1993).

#### 2.3.6.7 Homogeneous Reactor Experiment

Building 7500 was constructed to conduct testing of homogeneous (fluidized fuel) reactors. The building initially contained the first experiment (HRE-1). A second reactor (HRE-2) took its place in 1953. The HRE-1 was an aqueous, homogeneous fuel reactor. Its purpose was to prove the theory that a homogeneous reactor could generate electricity. The initial test run was completed in October 1952 and the designed power level of 1 MW was achieved on February 24, 1953. Many experiments were performed with the HRE-1 before its shutdown and dismantling in 1954.

The HRE-2 replaced the HRE-1 in Building 7500. It was constructed between 1953 and 1956. HRE-2, or sometimes referred to as the Homogeneous Reactor Test, consisted of a homogeneous reactor that could produce electricity as well as act as a breeder reactor, irradiating $^{232}$Th source material to create $^{233}$U for use as reactor fuel. The HRE-2 reactor consisted of the core and the thorium blanket. The reactor reached criticality in 1957 and operated at normal full power of 5 MW. After 16,295 MW-hr of operation, the reactor was shut down in 1961 due to a hole that developed in the core tank, which allowed mixing of the fuel and blanket regions.

#### 2.3.6.8 Aircraft Nuclear Propulsion Experiment

The ANP Experiment took place in an area of Melton Valley approximately 0.75 mi from the main ORNL site from October 30 until November 12, 1949. The reactor operated a total of 221 hr at a maximum power output of 2.5 MW. The reactor fuel was a mixture of fluorides of sodium and zirconium that flowed in a closed loop from a pump to the reactor to a heat exchanger and back to the pump. The active core area was a cylinder approximately 3 ft in diameter and 3 ft high. Beryllium oxide blocks were used to both moderate and reflect the neutron flux. Liquid sodium was pumped through the bottom of the reactor shell for cooling. Radioactive releases were indicated as being minimal with practically all gaseous fission products and probably some of the other volatile fission products removed from the circulating fuel (ORNL 1955). Off-gas treatment was provided by nitrogen-cooled, charcoal tanks used to holdup the gaseous wastes. Waste gas was subsequently released via the effluent stack when the wind speed was greater than 5 mph and when the concentration was less than 0.8 µCi $ml^{-1}$.

### 2.3.6.9 High Flux Isotope Reactor

The HFIR is a beryllium-reflected, light-water-cooled and moderated, flux trap reactor that uses highly enriched $^{235}U$ as fuel (Stapleton 1993). It began low power testing in August 1965 and was completed in January 1966. The design power output of 100 MW was attained in September 1966. Radioisotopes produced in the HFIR include transuranics (most notably $^{252}Cf$), $^{192}Ir$, and $^{60}Co$.

The Radiochemical Engineering Development Center operates in conjunction with the HFIR, and includes the Transuranic Facility (Building 7920) and the Thorium-Uranium Recycle Facility (Building 7930).

### 2.3.6.10 Molten Salt Reactor Experiment

The MSRE (the Building 7503 complex) was an 8-MW reactor operated from 1965 through 1969 to investigate the possibility of using molten salt reactor technology for commercial power applications. The reactor used a fluoride salt mixture of lithium, beryllium, and zirconium fluorides with uranium tetrafluoride as the fuel components. The reactor was initially fueled with $^{235}U$ and later replaced with $^{233}U$ in 1968. In 1969, the reactor also contained less than 1 kg of plutonium trifluoride. A plan written in 1998 indicated the presence of 28,200 Ci of fission and activation products, 21.7 g of $^{233}U$, 915 g of $^{235}U$, and 709 g of $^{239}Pu$ in drain tanks and the fuel flush tank (ORNL 1998). Greater than 99% of the activity in salt is from $^{90}Sr/Y$ and $^{137}Cs$. Radionuclides of concern for the MSRE include $^{232}Th$, $^{233}U$, $^{90}Sr$, $^{90}Y$, $^{137}Cs$, $^{137m}Ba$, $^{151}Sm$, $^{147}Pm$, $^{155}Eu$, $^{154}Eu$, $^{99}Tc$, $^{125}Sb$, and $^{93}Zr$.

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## GLOSSARY

**barites concrete**
Concrete containing barium sulfate ($BaSO_4$).

**calutron (California University Cyclotron)**
An accelerator used to electromagnetically separate isotopes based on their mass.

**supernatant**
A highly radioactive liquid overlying material deposited by settling, precipitation, etc.; also called supernate.

## ATTACHMENT 2A
## OAK RIDGE NATIONAL LABORATORY FACILITY INDEX

| Facility ID | Description | Old numbering |
|---|---|---|
| 807 | CS-137 EROSION/RUNOFF STUDY AREA | |
| 813 | FIELD LABORATORY #1 TRAILER | |
| 814 | Trailer | |
| 816 | CESIUM PLOTS STUDY AREA | |
| 817 | OZONE GENERATOR BUILDING | |
| 818 | ATMOSPHERIC INSTRUMENT TRAILER | |
| 819 | FARM IMPLEMENT STORAGE | |
| 820 | CARBON DIOXIDE TANK | |
| 821 | AMBIENT AIR STATION NO. 39 | |
| 822 | ESD/NOAA TRAILER | |
| 823 | FREE AIR CARBON EXPERIMENT (FACE) COMPLEX | |
| 0823A | FACE RING #1 SHED | |
| 0823B | FACE RING #2 SHED | |
| 0823C | FACE RING #3 SHED | |
| 0823D | FACE RING #4 SHED | |
| 0823E | FACE CO2 TANK/EVAPORATORS | |
| 830 | White Oak creek embayment structure | |
| 853 | White Oak Creek Below Dam | |
| 855 | OPERATIONS BUILDING | |
| 857 | Goat Building | |
| 858 | SYCAMORE PLANTATION TRAILER | |
| 870 | RACCOON CREEK MONITORING STA. | |
| 900 | FIREARMS RANGE | 745-A,-B |
| 0900A | FIRING RANGE STORAGE | |
| 0900B | FIRING RANGE CANOPY | |
| 901 | 161 KV SUBSTATION | 501-H |
| 902 | MAIN RESERVOIR | 803 |
| 903 | BETHEL VALLEY CHURCH | |
| 907 | WALKER BRANCH WATERSHED LAB | |
| 910 | BOOSTER PUMP STATION | |
| 926 | 1,500,000 STEEL WATER RESEVOIR | |
| 0926A | VALVE HOUSE | |
| 0926B | EMERGENCY GENERATOR | |
| 927 | STORAGE BUILDING | |
| 929 | ISH CREEK WEIR | |
| 932 | WBW SOIL BLOCK 1 | |
| 933 | WBW SOIL BLOCK 2 | |
| 934 | WBW SUBSURFACE WEIR INSTRUMENT TRAILER | |
| 935 | WBW SUBSURFACE WEIR | |
| 936 | ESD TWIN TOWERS WALKER BRANCH | |
| 937 | ATDD/NOAA RAIN GAUGE 2 BLDG. | |
| 940 | INSTRUMENT BLDG 1 | |
| 941 | INSTRUMENT BLDG 2 | |
| 0945A | RAIN GAGE 1 SITE | |

Attachment 2A (Continued)

| Facility ID | Description | Old numbering |
|---|---|---|
| 0945B | RAIN GAGE 2 SITE | |
| 0945C | RAIN GAGE 3 SITE | |
| 0945D | RAIN GAGE 4 SITE | |
| 0945E | THROUGH-FALL EXPERIMENT SITE | |
| 0945F | THROUGHFALL STORAGE BUILDING | |
| 946 | KATIE'S KITCHEN WELL | |
| 950 | WALKER BRANCH, EAST INSTRUMENT HOUSE | |
| 951 | WALKER BRANCH, WEST INSTRUMENT HOUSE | |
| 952 | WALKER BRANCH EAST WEIR | |
| 953 | WALKER BRANCH WEST WEIR | |
| 954 | REFUSE TRANSFER STATION | |
| 955 | WALKER BRANCH STORAGE BLDG. | |
| 956 | SPRING WATER PUMPHOUSE | |
| 957 | SAMPLE STORAGE BUILDING | |
| 958 | WATER WELL NO. 1 | |
| 960 | WATER WELL NO. 2 | |
| 961 | ORNL VISITOR OVERLOOK | |
| 963 | WHITE OAK CREEK HEADWATERS MONITORING STATION | |
| 965 | PARKING PASSENGER SHELTER | |
| 966 | WEST ENTRY CONTROL FACILITY, POST 50 | |
| 967 | POWER CONDUCTOR ACCELERATED TEST FACILITY | |
| 1000 | ENGINEERING OFFICE BUILDING | 703-C |
| 1001 | SWSA #3 BURIAL GROUNDS | |
| 1005 | LABORATORY FOR FUNCTIONAL AND COMPARATIVE GENOMICS | |
| 1055 | WATER WELL NO. 9 | |
| 1057 | 100-METER METEOROLOGICAL TOWER | |
| 1058 | SUBSTATION NO. 7-2 | |
| 1059 | HEALTH EFFECTS INFORMATION OFFICE BUILDING | |
| 1060 | ENVIRONMENTAL & LIFE SCIENCES LABORATORY FACILITY | |
| 1060COM | 1060 COMMERCE PARK DRIVE | |
| 1061 | HEALTH PROTECTION SERVICES OFFICE BUILDING | |
| 1062 | WEST OFFICE BUILDING | |
| 1096 | PASSENGER SHELTER, WEST PARKING LOT | |
| 111UNV | 111 UNION VALLEY ROAD | |
| 115UNV | RECEIVING, ACCEPTANCE, TESTING & STORAGE FACILITY | |
| 1503 | ENVIRONMENTAL SYSTEMS LAB | |
| 1504 | AQUATIC ECOLOGY LAB | |
| 1505 | ENVIRONMENTAL SCIENCES LAB | |
| 1506 | PLANT SCIENCES LAB | |
| 1507 | LIFE SCIENCES DATA ANALYSIS OFFICE BUILDING | |
| 1508 | AQUATIC STORAGE BUILDING | |
| 1509 | ENVIRONMENTAL ENGINEERING OFFICE BUILDING | |
| 1510 | AQUATIC STORAGE BUILDING 1 | |
| 1511 | AQUATIC STORAGE BUILDING 2 | |
| 1512 | AQUATIC STORAGE BUILDING 3 | |

Attachment 2A (Continued)

| Facility ID | Description | Old numbering |
|---|---|---|
| 1513 | AQUATIC STORAGE BUILDING 4 | |
| 1514 | AQUATIC STORAGE BUILDING 5 | |
| 1515 | AQUATIC STORAGE BUILDING 6 | |
| 1542 | GAS STORAGE FACILITY | |
| 1552 | WATER MONITORING EQUIPMENT SHED | |
| 1553 | SERVICE PIT FOR 1504 | |
| 1554 | Contractor Disposal Area | |
| 1556 | EAST COOLING TOWER | |
| 1557 | WEST COOLING TOWER | |
| 1558 | NW TRIBUTARY MONITORING STATION | |
| 1559 | BOAT SHED | |
| 1560 | EAST GREENHOUSE | |
| 1561 | WEST GREENHOUSE | |
| 1562 | SCRAP METAL AREA | |
| 1563 | SUBSTATION NO. 234-4 | |
| 1566 | FIRST CREEK MONITORING STATION | |
| 2000 | SOLID STATE ANNEX | 101-D |
| 2001 | INFORMATION CENTER COMPLEX | 104-B |
| 2003 | PROCESS WATER CONTROL STATION | |
| 2007 | CALIBRATION LAB | |
| 2008 | ORNL WHOLE BODY COUNTER | 719-B |
| 2009 | CAFETERIA WAREHOUSE | 802 |
| 2010 | ORNL CAFETERIA | |
| 2011 | ELECTRIC & AC SERVICE CENTERS | |
| 2013 | WEST MAINTENANCE SERVICE CENTER | 719-A |
| 2016 | SECURITY PATROL HQ ANNEX | 614-6 |
| 2016A | PUMP STATION NO.1, CORE HOLE-8 | |
| 2016B | PUMP STATION NO. 2, CORE HOLE-8 | |
| 2016C | GROUND WATER COLLECTION AND TRANSFER, CORE HOLE-8 | |
| 2017 | EAST RESEARCH SERVICE SHOP | |
| 2018 | ELECTRIC & AIR CONDITIONING SERVICE CENTER | 717-C or 305 |
| 2019 | LASER LABORATORY | |
| 2024 | QUALITY ASSURANCE AND INSPECTION OFFICE BUILDING | |
| 2026 | RADIOACTIVE MATERIALS ANALYTICAL LABORATORY (RMAL) | |
| 2026A | Tank SE of Building 2026 | |
| 2032 | Manhole 240 Monitoring Station | |
| 2033 | MEASUREMENTS & CONTROLS BUILDING | |
| 2034 | Manhole 95 Monitoring Station | |
| 2061 | STACK | |
| 2069 | CHANGE HOUSE | 708 |
| 2087 | STORAGE I-E | |
| 2088 | EMERGENCY GENERATOR BUILDING FOR 2000 | |
| 2092 | STORAGE | |
| 2093 | ENVIROMENTAL STORAGE BUILDING | |
| 2097 | COOLING TOWER FOR 2001 | |

Attachment 2A (Continued)

| Facility ID | Description | Old numbering |
|---|---|---|
| 2098 | SUBSTATION NO. 6-3 | |
| 2099 | Building 2026 monitoring control station | |
| 2101 | LGWOD Health & Hygiene Support Building | |
| 2102 | PCM TRAILER | |
| 2500 | FIRE STATION AND PROTECTIVE SERVICES HEADQUARTERS | 720 |
| 2506 | P&E MAINTENANCE SHOP & SUPPORT BUILDING | 717-B |
| 2508 | INSTRUMENTATION TRAILER, AT W-TANKS | |
| 2510 | AIR COMPRESSOR BUILLDING | |
| 2517 | HRDP/TRAINING | 735-A |
| 2518 | FACILITIES AND OPERATIONS OFFICE BUILDING | |
| 2519 | STEAM PLANT | 801-D |
| 2519A | STANDBY EMERGENCY GENERATOR FOR 2519 | |
| 2519C | EMERGENCY GENERATOR, 2519 | |
| 2521 | SEWAGE TREATMENT PLANT | |
| 2521A | SEWAGE TREATMENT AREATION BASIN | |
| 2521B | EMERGENCY GENERATOR BUILDING | |
| 2521C | SLUDGE DRYING BED | |
| 2521D | AERATOR SHED | |
| 2521E | CALGON TANK SHED | |
| 2521F | SEWAGE DIGESTER BUILDING | |
| 2522 | FUEL OIL TANK | |
| 2523 | DECONTAMINATION LAUNDRY | |
| 2523A | DECONTAMINATION LAUNDRY ANNEX | |
| 2525 | P&E MACHINE SHOP FACILITY | |
| 2528 | WHPP DEVELOPMENT FACILITY | |
| 2528A | STORAGE TANK | |
| 2531 | LLLW EVAPORATOR BUILDING | |
| 2532 | HLW Storage Cooling Pump House | |
| 2533 | CELL VENTILATION FILTER PIT FOR 2531 AND 2537 | |
| 2534 | OFF-GAS FILTER PIT FOR 2531 AND 2537 | |
| 2535 | Cooling Tower #1 for Building 2531 | |
| 2536 | COAL SAMPLE PREPARATION BUILDING | |
| 2537 | EVAPRORATOR SERVICE TANK & CONTROL ROOM FOR 2531 | |
| 2539 | Cooling Tower Substation for 2531 | |
| 2540 | STEAM PLANT SUBSTATION | |
| 2543 | EAST AERATION POND | |
| 2544 | WEST AERATION POND | |
| 2545 | SEWAGE TREATMENT FACILITY | |
| 2546 | MONITORING BUILDING FOR 2545 | |
| 2547 | GENERAL MACHINE SHOP | |
| 2548 | SLUDGE DRYING FACILITY | |
| 2549 | STEAM PLANT STORAGE BUILDING | |
| 2555 | 250,000 FUEL OIL STORAGE FACILITY | 717-I |
| 2568 | CELL VENT & OFF-GAS FILTER FOR 2531 | |
| 2572 | EMERGENCY GENERATOR FOR 2500 | 502 #9 |

Attachment 2A (Continued)

| Facility ID | Description | Old numbering |
|---|---|---|
| 2600 | Bethel Valley Storage Tank | 713-S |
| 2609 | SENTRY POST 3, WEST PORTAL | |
| 2621 | WASTE OPERATIONS SUPPORT SHOP | |
| 2624 | SWSA #1 Burial Grounds | |
| 2628 | FIRE PROTECTION MAINTENANCE AND STORAGE BUILDING | |
| 2630 | CASK COMPONENT DROP TEST FACILITY | |
| 2632 | 5000-KVA SUBSTATION | |
| 2636 | WEST PRECIPITATOR | |
| 2637 | EAST PRECIPITATOR | |
| 2638 | STEAM PLANT SCALE HOUSE | |
| 2643 | CHLORINATOR BUILDING | |
| 2644 | COAL YARD RUNOFF TREATMENT PLANT | |
| 2645 | EMERGENCY GENERATOR, COAL HANDLING | |
| 2646 | SUBSTATION NO. 33-6 | |
| 2648 | FIRE TRAINING TOWER | |
| 2649 | Transported Waste Receiving | |
| 2650 | Evaporator Chemical Shed | |
| 2651 | Emergency Generator, 2600 Area | |
| 2652A | TRAILER, RADIOLOGICAL SURVEILLANCE | |
| 2652B | TRAILER, RADIOLOGICAL SURVEILLANCE | |
| 2652C | TRAILER, RADIOLOGICAL SURVEILLANCE | |
| 2653 | COAL YARD BUILDING | |
| 2656 | SEWAGE TREATED PLANT-WATER MONITOR STATION | |
| 2657 | Manhole 243 Monitoring Station | |
| 2658 | F-4005 Monitoring Station | |
| 2660 | WASTE OPERATIONS SUPPORT FACILITY | |
| 2661 | ORNL TRAINING BUILDING | |
| 2663 | OZONE GENERATOR EQUIPMENT BUILDING | |
| 2664 | SODIUM METABISULFITE BUILDING | |
| 3000 | 13.8 KV SUBSTATION | |
| 3001 | OAK RIDGE GRAPHITE REACTOR, OGR | 105 |
| 3002 | OGR Filter House & Canal | 114 |
| 3002A | Drain Tank South of 3002 | |
| 3003 | SURFACE MODIFICATION AND CHARACTERIZATION FACILITY | 115 |
| 3003A | Drain Tank South of 3003 | |
| 3005 | Low Intensity Testing Reactor | 106 |
| 3008 | SECURITY PATROL STORAGE | 103 |
| 3009 | Pump House for Bldg 3010 | |
| 3010 | Bulk Shielding Reactor, BSR | |
| 3010A | BULK SHIELDING REACTOR SUPPORT FACILITY. N. ANNEX | |
| 3012 | ROLLING MILL | 101-B |
| 3017 | QUALITY SERVICES DIVISION BUILDING | |
| 3018 | OGR Exhaust Stack for 3003 | |
| 3019A | RADIOCHEMICAL DEVELOPMENT FACILITY | 205 |
| 3019B | HIGH LEVEL RADIATION ANALYTICAL LAB. | |

Attachment 2A (Continued)

| Facility ID | Description | Old numbering |
|---|---|---|
| 3020 | OFF GAS STACK FOR 3019 | |
| 3023 | NORTH TANK FARM | 206 |
| 3025E | IMET HOT CELL FACILITY | |
| 3025M | SOLID STATE OFFICE & LABORATORY BUILDING | 107 |
| 3026C | Krypton-85 enrichment facility | 706-C |
| 3026D | Metal segmenting hot cell facility | 706-D |
| 3027 | SPECIAL NUCLEAR MATERIALS VAULT | |
| 3028 | Alpha powder facility | 910 |
| 3029 | Source development lab | 909 |
| 3030 | Radioisotope Production Lab-C | 908 |
| 3031 | Radioisotope Production Lab-D | 907 |
| 3032 | Radioisotope Production Lab-E | 906 |
| 3033 | Radioactive gas process facility. | 905 |
| 3033A | Actinide fabrication facility annex | |
| 3034 | RADIOISOTOPE AREA SERVICES | 904 |
| 3036 | RADIOISOTOPE MATERIAL SHIPPING AND PACKAGING | 903 |
| 3037 | CHEMICAL TECHNOLOGY OFFICES | 901 |
| 3038 | Radioisotopes Laboratory | 902 |
| 3039 | Central radioactive gas disposal facility | 911 |
| 3042 | Oak Ridge Research Reactor, ORR | |
| 3044 | WEST COMPLEX FIELD SHOP | |
| 3047A | RADIOISOTOPE DEVELOPMENT LABORATORY | |
| 3047B | RADIOISOTOPES DEVELOPMENT LABORATORY | |
| 3074 | INTERIM MANIPULATOR REPAIR FACILITY | |
| 3078 | SEPTIC TANK FOR 3000 PUMP STA. | |
| 3080 | SUPERCONDUCTIVITY LABORATORY | |
| 3082 | DATA CONCENTRATOR 2, WOCC DAS | |
| 3083 | Neutron flight tube building | |
| 3084 | RIS SENSOR DEVELOPMENT, NORTH ANNEX | |
| 3085 | Pump House for ORR | |
| 3086 | COOLING TOWER NO.1 - ORR | |
| 3087 | Heat Exchanger - ORR | |
| 3089 | Cooling Tower No.2 - ORR | |
| 3091 | FILTERS FOR 3019 | |
| 3092 | OFF-GAS SCRUBBER FACILITY | |
| 3093 | Krypton Storage Cubicle | |
| 3095 | REACTOR AREA EQUIPMENT BUILDING | |
| 3098 | Filter facility-BSR | |
| 3099 | Storage Pad between 3031&3032 | |
| 3100 | SOURCE & SPECIAL MATERIAL VAULT | |
| 3102 | Heat Exchanger No.2 - ORR | |
| 3103 | COOLING TOWER NO.3 - ORR | |
| 3104 | WEST COMPLEX MAINTENANCE SHOP | |
| 3105 | LGWOD HP OFFICE BUILDING | |
| 3106 | CELL VENT FILTER FOR 4501,4505,AND 4507 | |

Attachment 2A (Continued)

| Facility ID | Description | Old numbering |
|---|---|---|
| 3107 | 25-meter Target House | |
| 3108 | FILTER HOUSE FOR BUILDING 3019 | |
| 3109 | Off-Gas Filters for ORR | |
| 3110 | Filter House, Isotope area | |
| 3111 | SECURITY POST 8A | |
| 3112 | STORAGE BUILDING | |
| 3114 | EFFICIENCY RESEARCH LABORATORY | |
| 3115 | SOLID STATE OFFICES | |
| 3116 | Nitrogen Cylinder Storage Bldg | |
| 3117 | BSR Cooling Tower | |
| 3117A | Sulfuric acid tank | |
| 3118 | Radioisotope Production Lab-H | |
| 3119 | BSR Heat Exchanger & Pump house | |
| 3121 | CELL OFF-GAS FILTER HOUSE FOR 3019B | |
| 3123 | DIESEL GENERATOR | |
| 3125 | 3039 Stack Area Emergency Generator | |
| 3126 | Charcoal Filter (NOG) ORR | |
| 3127 | PDS record storage | |
| 3129 | PERSONNEL MONITORING STATION | |
| 3130 | Waste Operation Control Center | |
| 3131 | EMERGENCY GENERATOR | |
| 3132 | EMERGENCY GENERATOR FOR 3127,3129,AND 3027 | |
| 3133 | BV valve box 1A | |
| 3135 | SENTRY POST 8D, BLDG. 3019 | |
| 3136 | EQUIPMENT TEST FACILITY-3019 | |
| 3137 | SURFACE SCIENCE LAB | |
| 3138 | ROOF THERMAL RESEARCH CENTER | |
| 3139 | Cell Ventilation Filters-ORR | |
| 3140 | CELL VENTILATION FILTERS FOR 3026 | |
| 3144 | ROOF RESEARCH CENTER | |
| 3145 | LGWOD storage building | |
| 3146 | EMERGENCY GENERATOR FOR 3020 STACK | |
| 3147 | EFFICIENCY & RENEWABLE RESEARCH OFFICE BUILDING | |
| 3150 | CERAMICS & THIN FILM LAB | |
| 3153 | ENVELOPE SYSTEMS RESEARCH CTR. | |
| 3154 | Manhole 112 Monitoring Building | |
| 3155 | Manholes 114 & 234 Monitoring | |
| 3156 | ENERGY DIVISION OFFICE BUILDING | |
| 3158 | North CV duct monitoring bldg. | |
| 3159 | South CV duct monitoring bldg. | |
| 3160 | 3019 MOTOR CONTROL CENTER #1 AND #2 | |
| 3161 | QSD STORAGE BUILDING | |
| 3162 | QSD STORAGE | |
| 3163 | WEST WEATHERPORT | |
| 3164 | WEST WEATHERPORT | |

Attachment 2A (Continued)

| Facility ID | Description | Old numbering |
|---|---|---|
| 3500 | I&C DIVISION OFFICES | |
| 3501 | SEWAGE PUMPING STATION | |
| 3502 | EAST RESEARCH SERVICE CENTER | 706-HD |
| 3502B | DATA CONCEN 4 WOCC DAS 3502 | |
| 3503 | HIGH RAD. LEVEL CHEM. ENG. LAB | 706-HB |
| 3503A | 3503 STORAGE PAD | |
| 3504 | GEOSCIENCES LAB | |
| 3507 | South Tank Farm | 206 |
| 3508 | I&C METROLOGY AND CALIBRATION | |
| 3513 | Settling Basin | 206 |
| 3515 | Fission Prod Lab No. 1 | |
| 3517 | Fission Products Development Lab | |
| 3518 | ACID NEUTRALIZATION PLANT | |
| 3518A | LGWOD SPARE PARTS TRAILER | |
| 3523 | EXPENSED BENCH STOCK BUILDING | |
| 3524 | Equalization basin | |
| 3525 | IRRADIATED FUELS EXAMINATION LABORATORY | |
| 3532 | PAINT STORAGE SHED | |
| 3536 | NITROGEN CYLINDER TANK STORAGE | |
| 3538 | COOLING TOWER FOR 3525 | |
| 3539 | 190 POND NO. 1, NORTH | |
| 3540 | 190 POND NO. 2, SOUTH | |
| 3541 | ENGINEERING DEVELOPMENT LAB | |
| 3542 | STORAGE BLDG. FOR 3506 & 3517 | |
| 3543 | MACES STORAGE BUILDING | |
| 3544 | PROCESS WASTE TREATMENT PLANT | |
| 3544A | ORNL WASTE WATER TREATMENT TRAILER | |
| 3544B | Filter Press Building | |
| 3546 | CCSD OFFICE BUILDING | |
| 3547 | Cell Vent Roughing Filter for 3517 | |
| 3548 | CELL VENT FILTERS FOR 3517 | |
| 3550 | RESEARCH MATERIALS PREPARATION FACILITY | 706-A |
| 3550T | INTERCOMPARISON STUDY DILUTIONS LAB. | |
| 3584 | SOLVENT OPERATIONS CONTAMINENT | 713-UA |
| 3587 | MAIL SERVICES BUILDING | |
| 3592 | COAL CONVERSION FACILITY | |
| 3594 | WASTE MANAGEMENT STORAGE | |
| 3597 | HOT STORAGE GARDEN | |
| 3598 | EMERG. GENERATOR FOR 3500 AREA | |
| 3602 | CYLINDER TANK STORAGE FOR 3525 | |
| 3605 | TSD STORAGE BUILDING | |
| 3606 | SOUTH OFFICE ANNEX | |
| 3607 | CASK STORAGE BUILDING | |
| 3608 | Process waste treatment plant | |
| 3609 | SUBSTATION NO. 25-1-C | |

Attachment 2A (Continued)

| Facility ID | Description | Old numbering |
|---|---|---|
| 3610 | STORAGE BUILDING | |
| 3610A | FLAMMABLE STORAGE | |
| 3613 | Diversion box monitor station | |
| 3614 | MH 190 monitoring station | |
| 3615 | MH 235 monitoring station | |
| 3616 | MH 149 monitoring station | |
| 3617 | MH 229 monitoring station | |
| 3618 | Pump. station, WC-10,11,12,13,14 | |
| 3619 | WHITE OAK CREEK GAUGING STATION | |
| 3620 | HOT OFF GAS COLLECTION POT | |
| 3621 | SPILL RESPONSE VEHICLE STORAGE FACILITY | |
| 3624 | FLAMMABLE STORAGE FOR 3517 | |
| 4000 | 13.8/2.4 KV SUBSTATION | |
| 4001 | PUMPING STATION | |
| 4003 | SWSA #2 BURIAL GROUNDS | |
| 4007 | SECURITY AND COUNTERINTELLIGENCE OFFICE BUILDING | |
| 4500N | CENTRAL RESEARCH & ADMINISTRATION BUILDING - NORTH | |
| 4500S | CENTRAL RESEARCH & ADMINISTRATION BUILDING - SOUTH | |
| 4501 | RADIOCHEMISTRY LABORATORY | 4501 |
| 4503 | STANDBY EMERGENCY GENERATOR FOR 4500N | |
| 4505 | EXPERIMENTAL ENGINEERING | 4501 |
| 4507 | High Level Chemical Dev Lab | |
| 4508 | METALS & CERAMICS LAB | |
| 4509 | CENTRAL CHILLED WATER PLANT | |
| 4510 | COOLING TOWER FOR 4509 | |
| 4511 | COOLING TOWER FOR 4509 | |
| 4512 | LABORATORY EMERGENCY RESPONSE CENTER | |
| 4513 | HTML ELECTRICAL SUBSTATION | |
| 4514 | GENERATOR - HTML | |
| 4515 | HIGH TEMPERATURE MATERIALS LAB | |
| 4516 | HTML COOLING TOWER | |
| 4521 | COOLING TOWER FOR BLDG 4509 | |
| 4556 | Filter pit for bldg 4507 | |
| 4557 | SENTRY POST | |
| 4559 | PASSENGER SHELTER | |
| 4560 | 4512 LIFT STATION | |
| 4561 | FLAMMABLE STORAGE, 4509 | |
| 5000 | MAIN PORTAL BUILDING | 4502 |
| 5002 | SCIENCE & TECHNOLOGY PARTNERSHIPS OFFICE BUILDING | |
| 5100 | JOINT INSTITUTE OF COMPUTER SCIENCE (JICS) | |
| 5500 | HIGH VOLTAGE ACCELERATOR LAB | 4503 |
| 5500A | SOUTH OFFICE ANNEX | |
| 5505 | TRANSURANIUM RESEARCH LAB | |
| 5507 | CONTROLLED EXPERIM. ATMOSPHERE | |
| 5507A | RDTE FACILITY | |

Attachment 2A (Continued)

| Facility ID | Description | Old numbering |
|---|---|---|
| 5510 | ORG AND BIO MASS SPEC LAB | |
| 5510A | QSD METROLOGY & INTERCOMPARISONS STUDIES LABS | |
| 5554 | ELECTRICAL SUBSTATION FOR 5505 | |
| 5600 | COMPUTATIONAL SCIENCES BUILDING | |
| 5700 | RESEARCH OFFICE BUILDING | |
| 5800 | ENGINEERING TECHNOLOGY FACILITY | |
| 6000 | HOLIFIELD RADIOACTIVE ION BEAM FACILITY (HRIBF) | |
| 6000B | ATOMIC PHYSICS RESEARCH LAB | |
| 6001 | COOLING TOWER FOR 6000 | |
| 6005 | GAS COMPRESSOR HOUSE FOR 6000 | |
| 6007 | DORMITORY FOR JIHIR | |
| 6008 | JIHIR OFFICE/LAB FACILITY | |
| 6010 | ORELA | |
| 6011 | COMPUTATIONAL PHYSICS & ENGINEERING BUILDING | |
| 6012 | COMPUTER SCIENCES RESEARCH | |
| 6013 | CHEMICAL FEED SYSTEM ENCLOSURE | |
| 6014 | COMPRESSOR BUILDING, 6001 FIRE PROTECTION SYSTEM | |
| 6016 | OUTFALL 314 DECHLORINATION SYS | |
| 6025 | COMPUTATIONAL PHYSICS & ENGR. | |
| 6551 | WEST RESERVOIR ON HAW RIDGE | |
| 6552 | EAST RESERVIOR ON HAW RIDGE | |
| 6553 | STANDBY GENERATOR & VALVE PIT | |
| 6555 | 30M METEOROLOGICAL TOWER-B | |
| 6556-ST1 | STORAGE TRAILERS | |
| 6556-ST2 | FOREST MANAGEMENT STORAGE TRAILER | |
| 6556-ST3 | STORAGE TRAILERS | |
| 6556-ST4 | STORAGE TRAILERS | |
| 6556-ST5 | STORAGE TRAILERS | |
| 6556-ST6 | STORAGE TRAILERS | |
| 6556-ST7 | STORAGE TRAILERS | |
| 6556-ST8 | STORAGE TRAILERS | |
| 6556-ST9 | STORAGE TRAILERS | |
| 6556A | ER Field Operations Trailer | |
| 6556B | ER Field Operations Trailer | |
| 6556C | ER FIELD OPERATIONS TRAILER | |
| 6556D | ER Field Operations Trailer | |
| 6556E | ER FIELD OPERATIONS TRAILER | |
| 6556G | ER Field Operations Trailer | |
| 6556J | ER Trailer, Single Wide | |
| 6556K | ER Trailer, Single Wide | |
| 6556L | ER Field Operations Trailer | |
| 6556M | ER Field Operations Trailer | |
| 6556Q | FOREST MANAGEMENT TRAILER | |
| 6556R | ER Field Operations Trailer | |
| 6556S | ER FIELD OPERATIONS TRAILER | |

Attachment 2A (Continued)

| Facility ID | Description | Old numbering |
|---|---|---|
| 6556T | ER Field Operations Trailer | |
| 6556U | ENVIRONMENTAL MANAGEMENT OFFICE TRAILER | |
| 6556V | ENVIRONMENTAL MANAGEMENT OFFICE TRAILER | |
| 6556X | ENVIRONMENTAL MANAGEMENT OFFICE TRAILER | |
| 7000 | SEPTIC TANK FOR 7000 AREA | |
| 7001 | GENERAL STORES | |
| 7002 | GARAGE & IRONWORKING SHOP | |
| 7003 | WELDING & BRAZING SHOP | |
| 7005 | LEAD SHOP | |
| 7006 | STORAGE BUILDING | |
| 7007 | PAINT SHOP | |
| 7009 | CARPENTER SHOP | |
| 7010 | DRY LUMBER STORAGE | |
| 7012 | CENTRAL FABRICATION SHOP | |
| 7013 | CHEMICAL REUSE BUILDING | |
| 7015 | METAL STORAGE & CUTTING FACILITY | |
| 7018 | BULK RECEIVING AND STORES BUILDING | |
| 7019 | RRD WAREHUSE FACILITY - CAT C STORAGE | |
| 701SCA | 701 SCARBORO ROAD | |
| 7020 | INTERIM GROUNDS EQUIPMENT STORAGE BUILDING | |
| 7020AR | HVAC DECONTAMINATION FACILITY | |
| 7020B | TEMPORARY WASTE STORAGE FACILITY | |
| 7020C | TEMPORARY WASTE STORAGE FACILITY | |
| 7020D | OFFICE TRAILER-SWASA 6 | |
| 7020E | TEMPORARY WASTE STORAGE FACILITY | |
| 7020F | HP OFFICE TRAILER | |
| 7021 | FABRICATION EQUIPMENT STORAGE | |
| 7022 | GAS CYLINDER STORAGE SHED | |
| 7025 | TRITIUM TARGET PREP FACILITY | |
| 7026 | METALS & CERAMICS STORAGE | |
| 7030 | HEAVY EQUIP. STORAGE SHELTER | |
| 7031 | FABRICATION STORAGE SHED | |
| 7033 | LINE CREW FACILITY | |
| 7035 | VACUUM ASBESTOS EQUIPMENT CLEANING FACILITY | |
| 7035A | PAINT MIX BUILDING | |
| 7035B | PAINT STORAGE | |
| 7035C | EQUIPMENT STORAGE | |
| 7035D | CAN DRYING FACILITY | |
| 7035E | UTILITY MECHANICS STORAGE | |
| 7035F | SHED STORAGE FACILITY | |
| 7037 | COLD STORAGE FACILITY | |
| 7038 | P&E TEMP. WASTE STORAGE PAD | |
| 7039 | MATERIAL STAGING FACILITY | |
| 7040 | GAS CYLINDER STORAGE | |
| 7041 | STORAGE BUILDING | |

Attachment 2A (Continued)

| Facility ID | Description | Old numbering |
|---|---|---|
| 7042 | CORE STORAGE BUILDING | |
| 7043 | PERSONNEL SHELTER-WEST OF 7000 | |
| 7044 | SUBSTATION 27-8, WEST OF 7003 | |
| 7046 | ESH&Q OFFICE TRAILER | |
| 7053 | PERSONNEL SHELTER-NORTH | |
| 7055 | GROUNDS EQUIPMENT STORAGE FACILITY | |
| 7057 | SANDBLAST CLEANING FACILITY | |
| 7058 | REGULATOR REPAIR FACILITY | |
| 7060 | STEEL YARD | |
| 7061 | ENVIRONMENTAL SURV. AND PROTECTION STORAGE | |
| 7062 | CRANE INSPECTION CREW OFFICES | |
| 7063 | EMERGENCY GENERATOR FOR 7003 | |
| 7065 | RIGGER EQUIPMENT STORAGE | |
| 7066 | GROUNDS MAINTENANCE STORAGE | |
| 7067 | TRAINING FACILITY | |
| 7069 | GASOLINE SERVICE FACILITY | |
| 7069E | UNDERGROUND STORAGE TANK | |
| 7069F | UNDERGROUND STORAGE TANK | |
| 7070 | STORAGE SHED | |
| 7071 | LIQUID NITROGEN STORAGE TANK | |
| 7072 | SENTRY POST 20B, 7000 AREA | |
| 7073 | AIR MONITORING STATION | |
| 7074 | SENTRY POST 20C, PED GATE 7012 | |
| 7075 | WASTE STORAGE BUILDING | |
| 7077 | CRAFT SUPPORT OFFICE BLDG. | |
| 7077A | RESERVATION SERVICES OFFICES | |
| 7078A | Bechtel-Jacobs office trailer | |
| 7078B | Bechtel Jacobs office trailer | |
| 7078C | Bechtel Jacobs office trailer | |
| 7078D | Bechtel Jacobs office trailer | |
| 7078E | Bechtel Jacobs office support trailer | |
| 7078F | Bechtel Jacobs office trailer | |
| 7078G | SRINKLER CONTROL BUILDING | |
| 7078H | SPRINKLER CONTROL BUILDING | |
| 7079 | BOTTLE STORAGE BUILDING | |
| 7080 | CARDBOARD COMPRESSOR | |
| 7081 | PORTABLE GENERATOR STORAGE SHE | |
| 7082 | SALT STORAGE BUILDING | |
| 7083 | MODEL AIRPLANE SHOP | |
| 7085 | 90-DAY WASTE STORAGE | |
| 7086 | FLAMMABLE GAS STORAGE | |
| 7089 | FLAMMABLE STORAGE | |
| 7090 | ELECTRICAL STORAGE WEST | |
| 7091 | ELECTRICAL STORAGE EAST | |
| 7092 | HUSTLER MOWER STORAGE | |

Attachment 2A (Continued)

| Facility ID | Description | Old numbering |
|---|---|---|
| 7093 | PHYSICS DIVISION STORAGE 1 | |
| 7094 | PHYSICS DIVISION STORAGE 2 | |
| 7095 | PHYSICS DIVISION STORAGE 3 | |
| 7096 | ENVIRONMENTAL PROTECTION STORAGE | |
| 7097 | CRANE AND ELEVATOR CREW OFFICE TRAILER | |
| 7098 | TRANSPORTATION SERVICES OFFICE TRAILER | |
| 7099 | PRESSURE REDUCING VALVE STATION | |
| 7500 | Homogeneous reactor exp. facility. | |
| 7501 | SEPTIC TANK | |
| 7502 | Radioactive Waste Evaporator | |
| 7503 | Molten Salt Reactor Experiment | |
| 7505 | LGWOP MAINTENANCE SUPPORT OFFICE | |
| 7506 | LGWOP Maintenance Support Shop | |
| 7507 | Hazardous waste storage facility | |
| 7507W | Mixed hazardous waste storage pad | |
| 7509 | MSRE Office Building | |
| 7511 | Filter Pit for 7503 | |
| 7512 | Stack for 7503 | |
| 7513 | Cooling Tower for 7503 | |
| 7514 | Filter House for 7503 | |
| 7516 | Field Service Shop - 7500 Area | |
| 7548 | HAZARDOUS WASTE STORAGE SHED | |
| 7549 | STORAGE | |
| 7553 | PUMP HOUSE-TSF WATER SUPPLY | 20035 |
| 7554 | COOLING TOWER FOR 7500 | |
| 7554A | MK-FERGUSON TRAILER | |
| 7555 | Diesel Generator House - 7503 | |
| 7556 | HRE settling pond | |
| 7557 | Charcoal Absorber Pit for 7500 | |
| 7558 | Waste Evaporator Loading Pit | |
| 7559 | Adsorber Valve Pit | |
| 7560 | Waste Tank for 7500 | |
| 7561 | HRE decontamination pad/shed | |
| 7562 | Waste Condensate Tank for 7500 | |
| 7563 | Circulator Pump Pit for 7500 | |
| 7567 | Central pump. station, tanks T1,T2 | |
| 7568 | SENTRY POST 19, HFIR AREA | |
| 7569 | LLLW collection tank, WC-20 | |
| 7571 | 30-METER METEOROLOGICAL TOWER | |
| 7572 | CH-TRU waste storage facility | |
| 7574 | Waste storage facility | |
| 7575 | SWASA #7 | |
| 7576 | BULK CONTAMINATED SOIL FACILITY | |
| 7577 | TRU STORAGE FACILITY | |
| 7578 | CLASS 34 WASTE RETRIEVABLE STORAGE | |

Attachment 2A (Continued)

| Facility ID | Description | Old numbering |
|---|---|---|
| 7580 | SOLID LOW LEVEL WASTE STAGING FACILITIES | |
| 7582 | LGWOD SPARE PARTS STORAGE FAC. | |
| 7583A | WASTE OPERATIONS SPARE PARTS STORAGE | |
| 7583B | WASTE OPERATIONS SPARE PARTS STORAGE | |
| 7583C | WASTE OPERATIONS SPARE PARTS STORAGE | |
| 7584 | BJC OFFICE TRAILER | |
| 7600 | CONTAINMENT BUILDING | |
| 7601 | R&PS DIVISION OFFICE BUILDING | |
| 7602 | Integrated process demo. facility. | |
| 7603 | REMOTE OPERATIONS & MAINTENANCE | |
| 7603A | FUEL OIL STORAGE TANKS | |
| 7604 | UTILITY BUILDING | |
| 7605 | STORAGE BUILDING | |
| 7606A | ROBOTICS R&D LAB | |
| 7606B | RESEARCH SVC-MAINTENANCE BLDG | |
| 7607 | EGCR RIVER PUMP STATION | |
| 7608 | PLASMA TORCH CUTTING DEMO. FAC | |
| 7609 | STACK MONITORING HOUSE | |
| 7610 | STORAGE HOUSE - R&PS | |
| 7611 | SENTRY POST 30, R&PS COMPLEX | |
| 7613 | WASTE RETENTION BASIN | |
| 7614 | EXHAUST STACK | |
| 7615 | REDC STORAGE | |
| 7616 | SEPTIC TANK | |
| 7618 | DIESEL GENERATOR FOR 7600 | |
| 7619 | COOLING TOWER | |
| 7621 | HEADQUARTERS BLDG. | |
| 7623 | BATHOUSE | |
| 7624 | ROBOTICS STORAGE BUILDING | |
| 7630 | LOW-RISK INACTIVE STORAGE FAC. | |
| 7631 | LOW-RISK INACTIVE STORAGE FAC. | |
| 7632 | LOW-RISK INACTIVE STORAGE FAC. | |
| 7633 | LOW-RISK INACTIVE STORAGE FAC. | |
| 7651 | Clean, used oil storage pad | |
| 7652 | Hazardous Waste Storage Facility | |
| 7653 | Chemical Waste Storage Facility | |
| 7654 | Hazardous Waste Storage Facility | |
| 7658 | Contractors landfill | |
| 7658A | BECHTEL JACOBS OFFICE TRAILER | |
| 7658B | BECHTEL JACOBS OFFICE TRAILER | |
| 7658C | BECHTEL JACOBS OFFICE TRAILER | |
| 7658D | BECHTEL JACOBS OFFICE TRAILER | |
| 7659 | LEAKING OIS GAS CYLINDER AREA | |
| 7661 | ELECTRICAL UTILITY BUILDING | |
| 7662 | Emergency Generator | |

Attachment 2A (Continued)

| Facility ID | Description | Old numbering |
|---|---|---|
| 7666 | ENVIRONMENTAL EMER. RESPONSE | |
| 7666A | TRAILER | |
| 7666B | SPRINKLER CONTROL BUILDING | |
| 7667 | Chemical detonation area | |
| 7668 | Mixed Waste Storage Facility | |
| 7670 | STORAGE TENT | |
| 7671 | STORAGE | |
| 7672 | PASSENGER SHELTER | |
| 7700 | TOWER SHIELDING FACILITY (TSF) | 20035 |
| 7701 | TSF-POOL & PAD AREA | 20035 |
| 7702 | TSF-CONTROL HOUSE | 20035 |
| 7703 | TSF-HOIST HOUSE | 20035 |
| 7704 | TSF-CONTROL HOUSE NO. 2 | 20035 |
| 7705 | TSF-PUMP HOUSE | |
| 7706 | TSF-COOLER | |
| 7707 | TSF-BATTERY HOUSE | |
| 7708 | TSF-REACTOR SHIELD STORAGE | |
| 7709 | HEALTH PHYSICS RES. REACTOR | |
| 7710 | HPRR-DOSAR FACILITY | |
| 7711 | Process Waste Basin for 7709 | |
| 7712 | DOSAR LOW ENERGY ACCELERATOR | |
| 7716 | FILTER PUMP HOUSE MAIN. POOL | |
| 7720 | Civil Defense Bunker | |
| 7735 | RADIATION CALIBRATION LAB | |
| 7740 | RADIO TRANSMITTER FACILITY | |
| 7740A | MELTON HILL RADIO FACILITY | |
| 7740B | EMERGENCY GENERATOR BUILDING | |
| 7740C | MELTON HILL RADIO FACILITY | |
| 7750 | FLOOR DRAIN COLLECTION TANK | 20035 |
| 7751 | SENTRY POST 22, TSF EXCLU. | 20036 |
| 7755 | DOSAR (HPRR) RESERVOIR | |
| 7756 | METER HOUSE, HPM | |
| 7758 | HFIR PARTS STORAGE | |
| 7759 | CESIUM FOREST RESEARCH AREA | |
| 7800 | SWSA #4 BURIAL GROUNDS | |
| 7802 | SWSA #5 BURIAL GROUNDS | |
| 7802A | Seep "C" Collection and Treatment Unit | |
| 7802B | Seep D collection & treat. sys | |
| 7802C | Deep monitoring well #1 bldg | |
| 7802D | DEEP MONITORING WELL # 2 BLDG. | |
| 7802E | SLUDGE REMOVAL TEST TANK | |
| 7802F | Radiation monitoring equipment storage building | |
| 7802N | SWAS 5 North Trench disposal area | |
| 7803 | LAB TRAILER | |
| 7805 | Waste Pit No.1 | |

Attachment 2A (Continued)

| Facility ID | Description | Old numbering |
|---|---|---|
| 7807 | Waste Pit No.3 | |
| 7808 | Waste Pit No.4 | |
| 7809 | Waste Trench No.5 | |
| 7810 | Chemical Waste Trench No.6 | |
| 7810A | Interim Non-reg. Waste Storage | |
| 7811 | GEOSCIENCES STORAGE BUILDING | |
| 7811A | PILOT PITS EXPERIMENTS AREA | |
| 7813 | White Oak Creek Dam | |
| 7818 | Waste Trench No.7 | |
| 7821 | Emergency Waste Basin | |
| 7822 | SWSA #6 BURIAL GROUNDS | |
| 7822A | High range disposal wells | |
| 7822J | LLW Storage Pad | |
| 7823 | LLW staging/storage facility | |
| 7823A | Underground Storage Facility Well | |
| 7823B | TEMP. WASTE STORAGE FACILITY | |
| 7823C | TEMP. WASTE STORAGE FACILITY | |
| 7823D | TEMP. WASTE STORAGE FACILITY | |
| 7823E | TEMP. WASTE STORAGE FACILITY, TENT | |
| 7823F | STORAGE SHED (SWSA 5) | |
| 7824 | Waste examination and assay facility | |
| 7824A | WEAF Support Facility Trailer | |
| 7826 | TRU drum storage facility | |
| 7827 | Shielded Dry Well Facility | |
| 7829 | Shielded Dry Well Facility | |
| 7830 | Melton valley storage facility | |
| 7830A | Hazardous waste storage tank | |
| 7831 | FIELD OFFICE & COMPACTOR FACIL | |
| 7831A | SLLW storage building | |
| 7831C | SLLW storage shed | |
| 7831D | SWSA 5 storage pad | |
| 7833 | Alpha Greenhouse Facility | |
| 7834 | TRU drum storage facility | |
| 7835 | SLUDGE WASTE POND | |
| 7841 | CONTAMINATED EQUIPMENT STORAGE YARD | |
| 7841A | WASTE STORAGE AREA OFFICE TRAILER | |
| 7842 | Temp LLW storage facility | |
| 7842A | LWSP II SOLIDIFIED WASTE STO. | |
| 7842B | TEMP LLW STORAGE FACILITY | |
| 7842C | TEMPORARY LLW STORAGE FACILITY, TENT | |
| 7844 | ER STORAGE BUNKER | |
| 7846 | White Oak Lake | |
| 7847 | Vehicle/Personnel Monitoring Station | |
| 7848 | EPICORE II STORAGE BUILDING | |
| 7849 | WHITE OAK CRK WEIR & GAGING ST | |

Attachment 2A (Continued)

| Facility ID | Description | Old numbering |
|---|---|---|
| 7852 | Old Hydrofracture Facility | |
| 7853 | LGWOD storage building | |
| 7854 | DRILLING EQUIPMENT STORAGE | |
| 7855 | Concrete cask storage facility | |
| 7855A | SWASA 5 EQUIPMENT TENT | |
| 7856 | MVST Capacity Increase Project | |
| 7857 | IWMF Monitoring Station | |
| 7858 | WHITE OAK LAKE STORAGE BLDG. | |
| 7859 | SAMPLE EQUIPMENT STORAGE BLDG. | |
| 7859A | SAMPLE STORAGE BUILDINGS | |
| 7860 | New Hydrofracture facility | |
| 7863 | General Storage for 7860 | |
| 7864 | GAGING STATION - EAST SEEP | |
| 7865 | GAGING STATION - WEST SEEP | |
| 7866 | SAMPLING STATION - 7500 BRANCH | |
| 7867 | WEIR - MELTON BRANCH | |
| 7868 | SAMPLING STATION-WHITE OAK CK. | |
| 7869 | STREAM FLOW MONITORING STA. #5 | |
| 7870 | RUBB STRUCTURE | |
| 7871 | STREAM FLOW MONITORING STA. #3 | |
| 7872 | STREAM FLOW MONITORING STA. #4 | |
| 7874 | STORAGE BLDG. S.W. SWSA 4 | |
| 7875 | MONITORING STORAGE BLDG. | |
| 7876 | Health Physics Office Trailer | |
| 7877 | LLW Solidification Facility | |
| 7878 | CH-TRU waste storage facility | |
| 7878A | TEMPORARY WASTE STORAGE TENT | |
| 7878B | EQUIPMENT STORAGE TENT | |
| 7879 | TRU /LLLW staging storage facility | |
| 7880 | WASTE PROCESSING FACILITY | |
| 7880A | TRUPACT BUILDING | |
| 7880B | WASTE PROCESSING FACILITY PERSONNEL BUILDING | |
| 7880C | WASTE CHARACTERIZATION LABORATORY | |
| 7880D | WASTE PROCESSING FACILITY CONTROL ROOM | |
| 7880E | STEAM BOILER | |
| 7880F | AIR COMPRESSOR | |
| 7880G | SWITCHGEAR/TRANSFORMER, WASTE PROCESSING FACILITY | |
| 7880H | DIESEL GENERATOR, WASTE PROCESSING FACILITY | |
| 7880I | NDA TRAILER, WASYE PROCESSING FACILITY | |
| 7880J | NDE TRAILER, WASTE PROCESSING FACILITY | |
| 7880K | ACCESS CONTROL POINT, WASTE PROCESSING FACILITY | |
| 7880L | DOE OFFICE TRAILER, WASYE PROCESSING FACILITY | |
| 7880M | DOE OFFICE TRAILER, WASTE PACKAGING FACILITY | |
| 7880N | CONSTRUCTION MANAGAGMENT, WASTE PACKAGING FACILITY | |
| 7880P | BREAK FACILITY, WASTE PACKAGING FACILITY | |

Attachment 2A (Continued)

| Facility ID | Description | Old numbering |
|---|---|---|
| 7880Q | RESTROOM FACILITY, WASTE PACKAGING FACILITY | |
| 7880R | FWENC OPERATIONS TRAILER | |
| 7882 | Emergency Generator for 7877 | |
| 7883 | CH-TRU waste storage bunker | |
| 7886 | Interim waste storage pad #1 | |
| 7887 | SOLID LIQUID SEPARATOR | |
| 7888 | CASK LOADING FACILITY | |
| 7891 | SWASA OFFICE TRAILER | |
| 7892 | STORAGE BUILDING, 7856 OPERATIONS | |
| 7893 | PASSENGER SHELTER | |
| 7894 | WAG 6 MONITORING STATION #3 | |
| 7900 | HIGH FLUX ISOTOPE REACTOR | |
| 7901 | ELECTRICAL BUILDING FOR 7900 | |
| 7902 | COOLING TOWER FOR 7900 | |
| 7903 | 7900 COOLING TOWER EQUIPMENT BUILDING | |
| 7904 | SEWAGE TREATMENT PLANT - 7900 | |
| 7905 | RETENTION POND 1 FOR 7900 | |
| 7906 | RETENTION POND 2 FOR 7900 | |
| 7907 | TRU POND A | |
| 7908 | TRU POND B | |
| 7910 | RESEARCH REACTORS OFFICE BUILDING | |
| 7911 | STACK FOR 7900 | |
| 7911B | MONITORING EQUIPMENT BLDG. FOR 7911 | |
| 7911C | INSTRUMENT SHED FOR 7911 | |
| 7912 | FAN SHED AND ELECTRICAL EQUIPMENT FOR 7900 | |
| 7913 | FILTER PIT FOR 7911 STACK | |
| 7914 | EQUIP. & PARTS STORAGE BLDG. | |
| 7914A | HFIR CARPENTRY SHOP | |
| 7915 | OPERATIONS STORAGE BLDG. | |
| 7916 | HFIR COOLING TOWER WATER TREATMENT | |
| 7917 | RESEARCH REACTORS OFFICE BLDG. | |
| 7918 | REDC OFFICE & TRAINING BUILDING | |
| 7920 | RADIOCHEMICAL ENGINEERING DEVELOPMENT CENTER | |
| 7921 | EMERGENCY GENERATOR FOR 7920 | |
| 7922 | BREECHING & FAN AREA AND ELEC EQ FOR 7920 | |
| 7922A | DATA CONCENTRATOR #6 FOR WOCC DAS | |
| 7923 | REDC COOLING TOWER | |
| 7924 | MATERIALS STORAGE TENT | |
| 7924A | STORAGE BUILDING | |
| 7924B | STORAGE BUILDING | |
| 7925A | STORAGE BUILDING | |
| 7925B | STORAGE BUILDING | |
| 7927 | STORAGE TENT | |
| 7930 | RADIOCHEMICAL ENGINEERING DEVLOPMENT CENTER | |
| 7930A | FILTER PIT FOR 7930 | |

Attachment 2A (Continued)

| Facility ID | Description | Old numbering |
|---|---|---|
| 7931 | EMERGENCY GENERATOR FOR 7930 | |
| 7932 | WASTE SAMPLE BLDG. FOR 7930 | |
| 7933 | OFFICE TRAILER | |
| 7934 | CH-TRU WASTE STORAGE FACILITY | |
| 7935 | Equipment cleaning facility | |
| 7936 | REDC STORAGE BUILDING | |
| 7939 | STANDBY EMERGENCY GENERATOR FOR 7930 | |
| 7947 | MELTON BRANCH HEADWATER FLUME | |
| 7948 | MELTON BRANCH MONITORING STATION | |
| 7949 | MELTON BRANCH TRIBUTARY WEIR | |
| 7952 | Melton Valley waste pump station | |
| 7953 | PUMP HOUSE - HPRR WATERLINE | |
| 7953A | RESEARCH REACTORS OFFICE TRAILER | |
| 7953B | RESARCH REACTORS STORAGE TRAILER | |
| 7953C | CONSTRUCTION TRAILER AT HFIR | |
| 7955 | SENTRY POST 19B, HFIR ENTRY | |
| 7957 | OFFICE TRAILER FOR 7920 | |
| 7958 | SENTRY POST 23, HPRR | |
| 7960 | HIFR STORAGE BUILDING | |
| 7961 | Melton Valley Collection Tanks | |
| 7962 | NEUTRON USERS OFFICE & LAB | |
| 7964A | RESEARCH REACTORS OFFICE TRAILER | |
| 7964B | RESEARCH REACTORS OFFICE TRAILER | |
| 7964C | RESEARCH REACTORS OFFICE TRAILER | |
| 7964D | RESEARCH REACTORS OFFICE TRAILER | |
| 7964E | RESEARCH REACTORS OFFICE TRAILER | |
| 7964F | RESEARCH REACTORS OFFICE TRAILER | |
| 7964G | HIFR OPS/CHANGE HOUSE | |
| 7964H | SOLID STATE OFFICE TRAILER | |
| 7964I | SOLID STATE OFFICE TRAILER | |
| 7965A | CHEMICAL TECHNOLOGY OFFICE TRAILER | |
| 7965B | CHEMICAL TECHNOLOGY OFFICE TRAILER | |
| 7965C | CHEMICAL TECHNOLOGY OFFICE TRAILER | |
| 7966 | LLW collection tank, 7920, 7930 | |
| 7966A | FILTER HOUSE, 7966 | |
| 7967A | MELTON BRANCH SUBSURFACE WEIR | |
| 7967B | SUBSURFACE WEIR INSTRUMENT BUILLDING | |
| 7967C | UNDERGROUND WEIR | |
| 7968 | TRAILER | |
| 7969 | HAZARDOUS MATERIAL ENCLOSURE | |
| 7970 | NEUTRON SCIENCE SUPPORT BLDG. | |
| 7971 | H.O.G. FILTER FACILITY | |
| 7975 | WATER MONITORING STORAGE BLDG | |
| 7977 | COLD SOURCE EQUIPMENT BLDG. | |
| 7977A | COLD SOURCE LIQUID NITROGEN TANK | |

Attachment 2A (Continued)

| Facility ID | Description | Old numbering |
|---|---|---|
| 7980A | HFIR STORAGE 1 | |
| 7980B | HFIR STORAGE 2 | |
| 7980C | HFIR STORAGE 3 | |
| 7980D | HIFR STORAGE 4 | |
| 7980E | HIFR STORAGE 5 | |
| 7981A | P&E/HFIR STORAGE 1 | |
| 7981B | P&E/HFIR STORAGE 2 | |
| 7981C | P&E/HFIR STORAGE | |
| 7982 | TRU STAGING AREA STORAGE | |
| 7983 | TRU FACILITY STORAGE BUILDING | |
| 7984 | PASSENGER SHELTER | |
| 7985 | P&E/HFIR STORAGE 4 | |
| 7986 | P&E/HIFR STORAGE 5 | |
| 8520 | RING INJECTION DUMP BUILDING | |
| 9201-2 | FUSION ENERGY ADMINISTRATION & LABORATORY BUILDING | |
| 9204-1 | ENGINEERING TECHNOLOGY | |
| 9204-3 | ISOTOPE SEPARATIONS | |
| 9207 | BIOLOGY BUILDING | Y-12 |
| 9210 | MAMMALIAN GENETICS | Y-12 |
| 9211 | CO-CARCINOGENSIS | |
| 9220 | MOLECULAR BIOLOGY FACILITY | |
| 9224 | MOLECULAR BIOLOGY FACILITY | |
| 9401-1 | ENGINEERING TECHNOLOGY LABORATORY FACILITY | |
| 9409-15 | COOLING TOWER | |
| 9422 | LCTF COMPRESSOR | |
| 9610-2 | FLAMMABLE BUILDING STORAGE BUILDING | |
| 9732-2 | 86-INCH CYCLOTRON COUNTING ROOM | |
| 9743-2 | PIGEON QUARTERS | Y-12 |
| 9767-6 | UTILITIES - CONTROL CENTER | |
| 9767-7 | FAN HOUSE FOR 9207 | |
| 9770-2 | RADIATION SOURCE | Y-12 |
| 9983-FX | ESD TRAILER | |
| 9999-01 | MOTOR GENERATOR | |
| 9999-03 | ELECTRICAL SWITCHGEAR AND RECTIFIER | |
| 9999-04 | ELECTRICAL EQUIPMENT | |
| 9999-3 | POWER SUPPLY | |
| 9999-4 | ELECTRICAL EQUIPMENT | |
| NTRC | NATIONAL TRANSPORTATION RESEARCH CENTER | |
| X185249 | TRAILER-SWASA #6 | |
| X186600 | TRAILER-7002 AREA | |

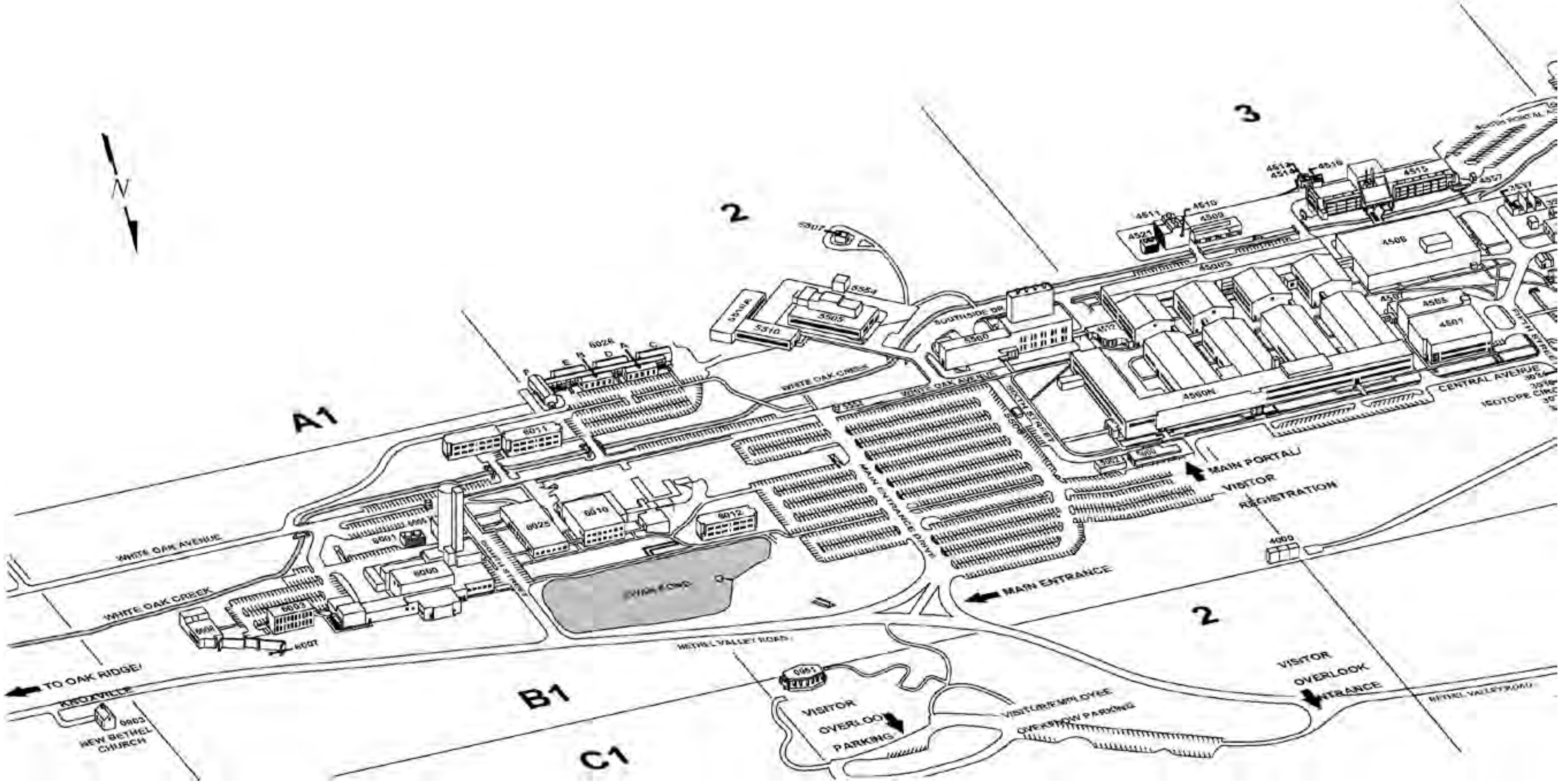
## ATTACHMENT 2B
## MAJOR FACILITIES AND RADIONUCLIDES OF CONCERN

| Current building number | Former building number | Facility name or description | Dates of operation | Principal radionuclides of concern |
|---|---|---|---|---|
| 3001 | 105 | Graphite reactor | Nov. 1943 – Nov. 1963 | Mixed fission/activation products, natural uranium |
| 3005 | 106 | Low-Intensity Test Reactor (LITR) | 1949 – Oct. 1968 | Volatile fission products, $^{24}Na$, $^{16}N$ |
| 3010 | | Bulk Shielding Reactor (BSR)/Pool Critical Assembly (PCA) | 1951 - 1987 | Volatile fission products, $^{24}Na$, $^{16}N$ |
| 3019 | 205 | Pilot Plant | Dec., 1943 – present (partly inactive and pending D&D) | Mixed fission/activation products, natural uranium, $^{232}Th$, $^{233}U$, TRU (liquid forms) |
| 3023 | 206 | North Tank Farm | 1943 - 1986 | Mixed fission/activation products, natural uranium, $^{232}Th$, $^{233}U$, TRU (liquid forms) |
| 3026-C | 706-C | Radiochemistry Lab (original RaLa building); $^{85}Kr$ enrichment facility | 1944 – ca. 1997 (pending D&D) | Mixed fission products, $^{131}I$, $^{85}Kr$ (liquid and gaseous forms) |
| 3026-D | 706-D | Radiochemistry Lab (RaLa building from May 1945 until 1958); Segmentation Facility | 1945 - ?? (pending D&D) | Mixed fission products, $^{131}I$, $^{106}Ru$, noble gases (liquid and gaseous forms); uranics/TRU (segmentation facility) |
| 3028 | 910 | Radioisotope Processing Building A/Alpha Powder Facility | 1950 - 1985 | $^{99}Mo$, $^{131}I$, $^{133}Xe$, $^{147}Pm$, $^{242/244}Cm$ |
| 3029 | 909 | Source Development Lab | 1952 – late 1980s | Fission/activation products |
| 3030 | 908 | Radioisotope Processing Building C | ca. 1950 – late 1980s | Fission/activation products |
| 3031 | 907 | Radioisotope Processing Building D | ca. 1950 – late 1980s | Fission/activation products |
| 3032 | 906 | Radioisotope Processing Building E | ca. 1950 – late 1980s | Fission/activation products |
| 3033 | 905 | Radioisotope Processing Building F, Radioactive Gas Processing Facility | ca. 1950 – 1990 | $^{3}H$, $^{14}C$, $^{85}Kr$ (gaseous forms) |
| 3038 | 902 | Isotope Research Materials Laboratory/Alpha Handling Facility | 1949 - 1990 | Fission/activation products, uranics, TRU |
| 3042 | | ORNL Research Reactor (ORR) | March, 1958 – ca. 1987 | Volatile mixed fission products; $^{24}Na$, $^{16}N$ |
| 3047 | | Radioisotopes Development Laboratory | 1962 - | Fission products, $^{238}Pu$ |

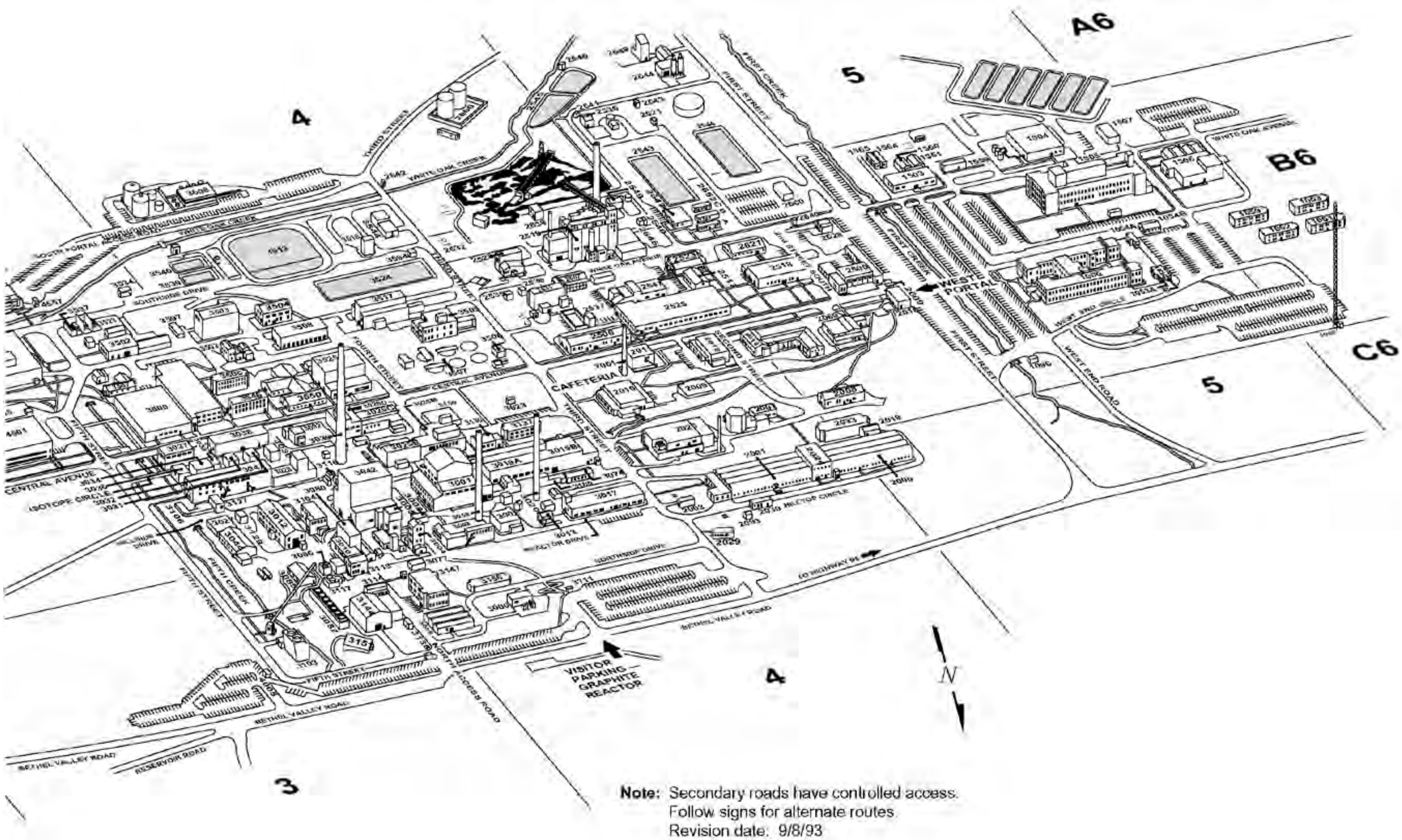
Attachment 2B (Continued)

| | | | | |
|---|---|---|---|---|
| 3505 | | Metals Recovery Facility | 1952 - 1960 | Mixed fission products, uranics, TRU (liquid form) |
| 3507 | 206 | South Tank Farm | 1943 - 1978 | Mixed fission/activation products, natural uranium, $^{232}Th$, $^{233}U$, TRU (liquid form) |
| 3508 | | Alpha Isolation Laboratory | 1952 – ca. 1976 | TRU, $^{233}U$ (gram quantities); mixed fission products |
| 3515 | | Fission Product Pilot Plant (F3P) | 1948 - 1958 | Mixed fission products, uranics, TRU (liquid form) |
| 3517 | | Fission Product Development Laboratory | 1958 - 1975 | Mixed fission products, uranics, TRU (liquid form) |
| 3525 | | High Radiation Level Examination Laboratory | 1963 – present | Fission/activation products |
| 4501 | | High Level Radiochemistry Lab | 1951 – present | $^{233}U$ (OREX process) |
| 4507 | | High-Level Chemical Development Facility | 1957 - ?? (pending D&D) | Mixed fission products (liquid forms) |
| 4508 | | Interim Plutonium Laboratory/Fuel Cycle Alpha Facility | 1962 – present | Uranics, TRU (nitride and oxide forms) |
| 7025 | | Tritium Target Preparation Facility | 1967 - ?? (pending D&D) | $^{3}H$, $ThO_2$, $UO_2$, $^{90}Sr$, $^{137}Cs$, $^{244}Cm$ |
| 7500 | | Homogeneous Reactor Experiment (HRE), Homogeneous Reactor Test (HRT) | 1952 – April, 1961 | Mixed fission/activation products, uranyl sulfate |
| 7503 | | Molten Salt Reactor Experiment (MSRE) | 1965 - 1969 | Mixed fission products, $^{232}Th$, $^{233}U$ |
| 7900/7920 | | High Flux Isotope Reactor/TRU Facility | 1966 - present | $^{252}Cf$, TRU, Dy/Ho-166, $^{186}Re$, $^{117m}Sn$, W/Re-188 |

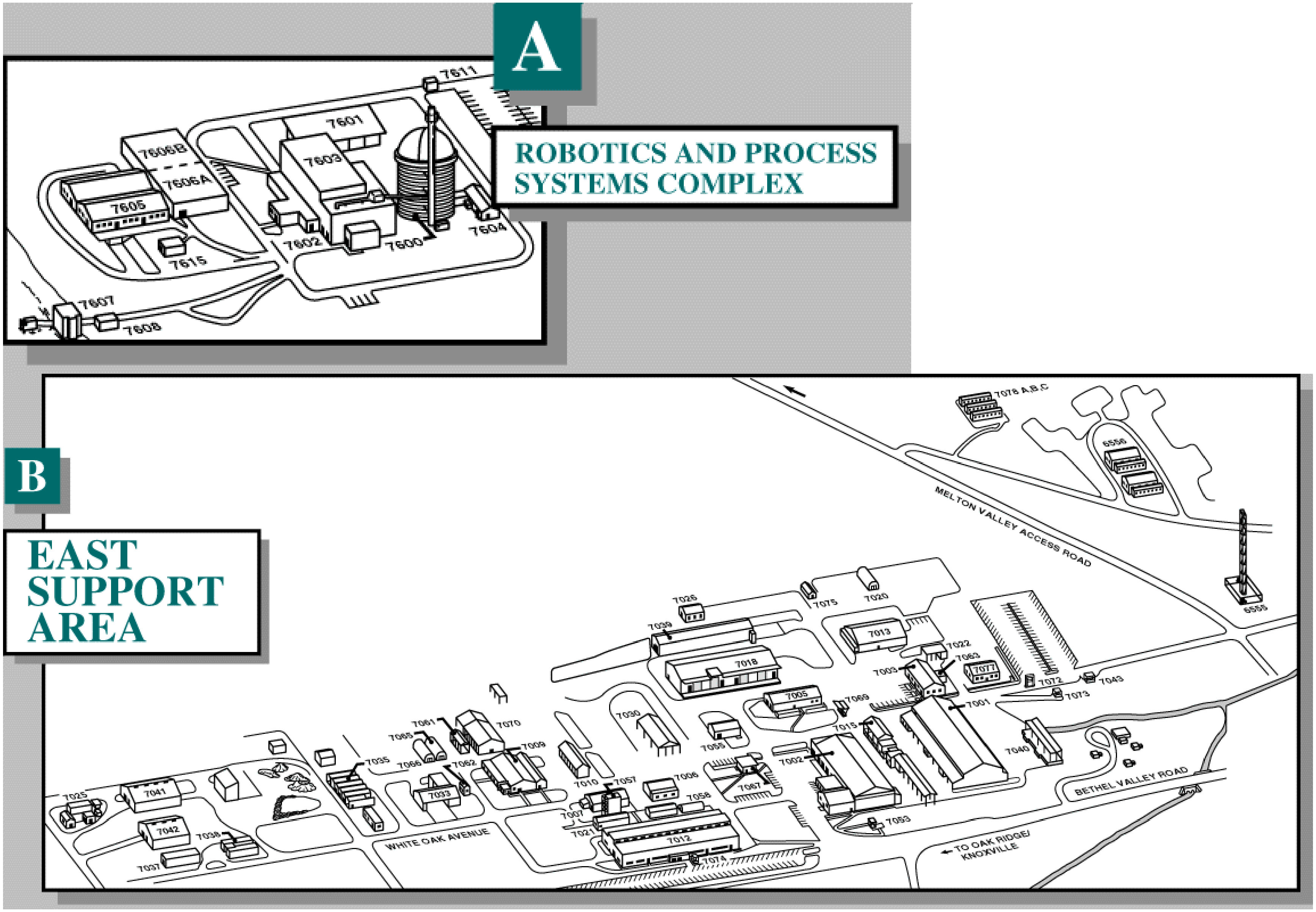
**ATTACHMENT 2C**
**ORNL FACILITY MAPS**



Attachment 2C (Continued)



Attachment 2C (Continued)



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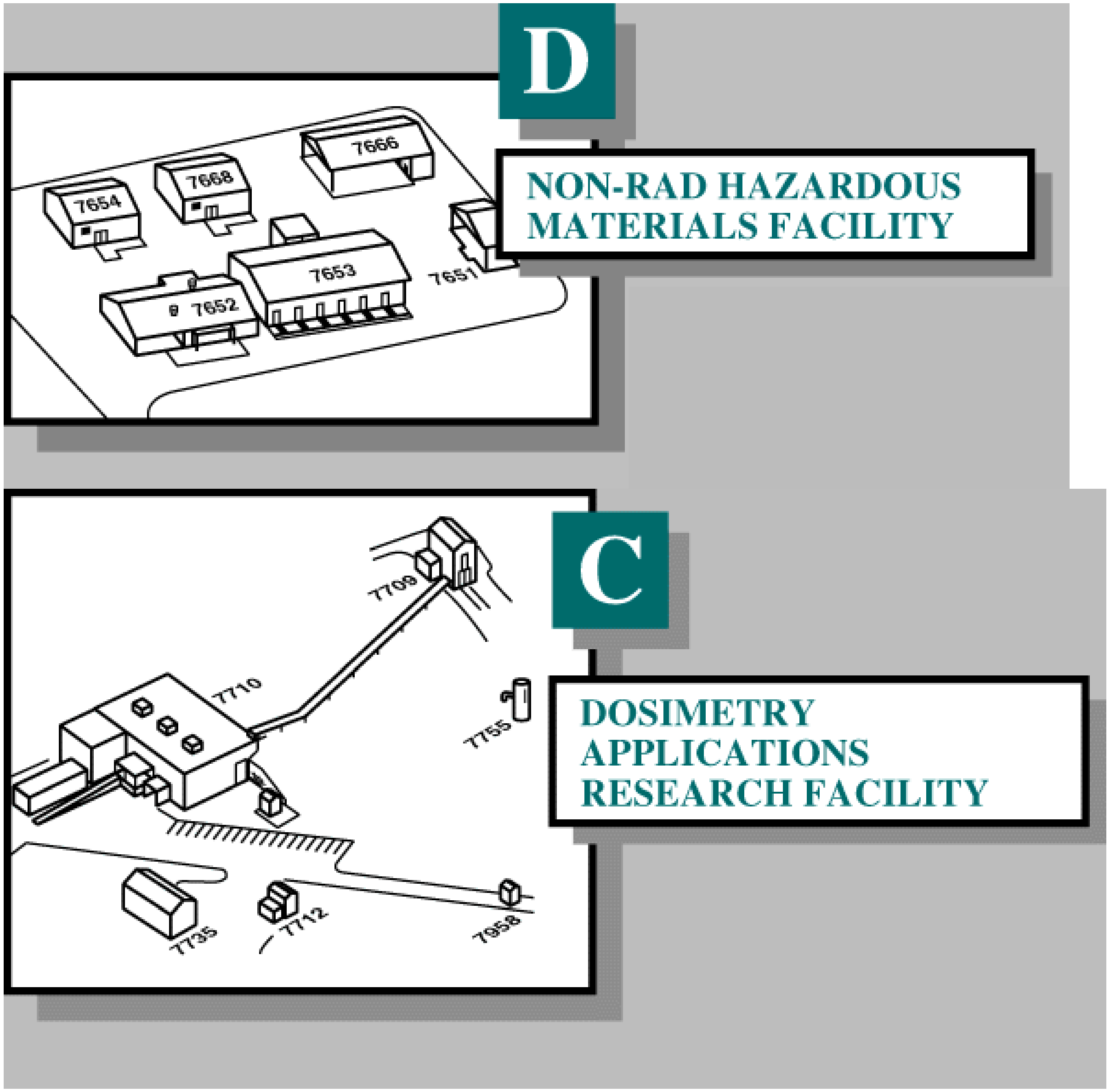
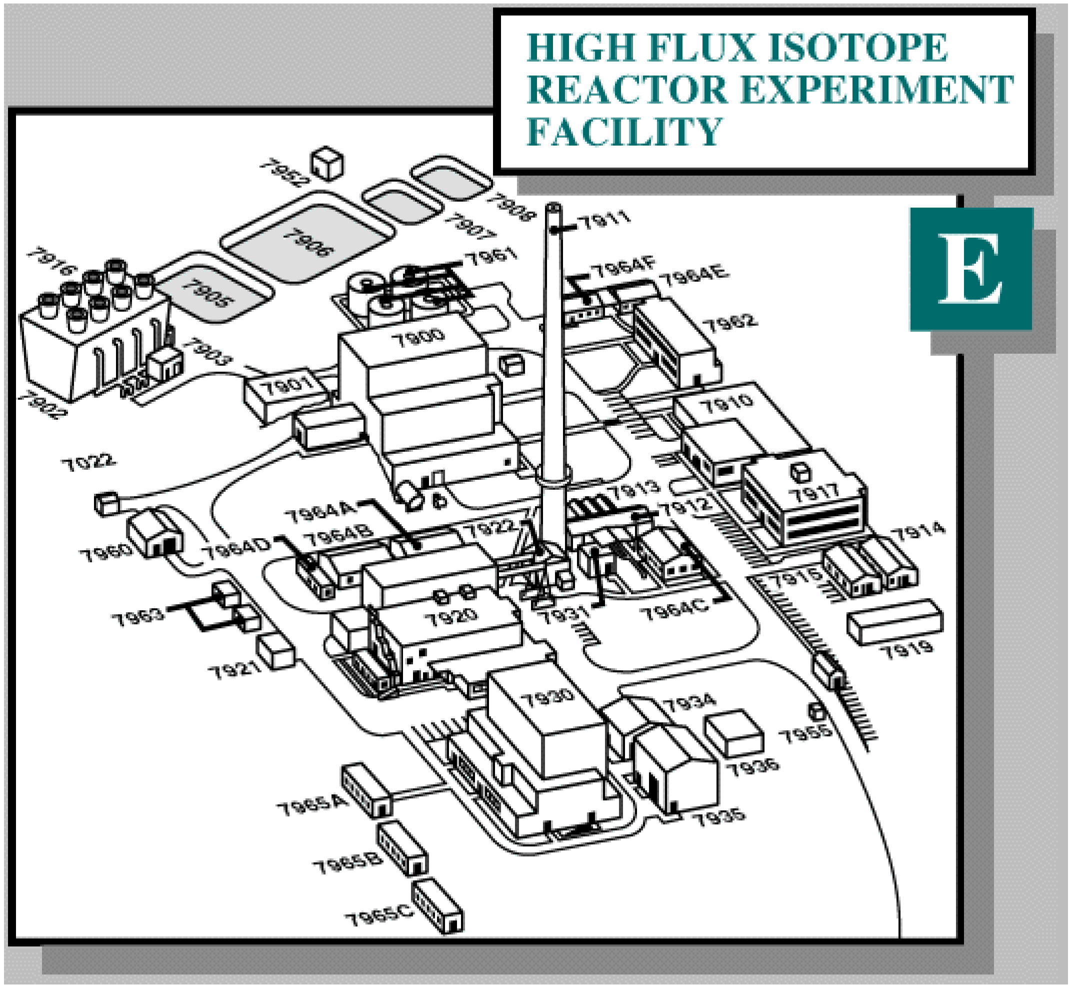


Attachment 2C (Continued)



Attachment 2C (Continued)