APPENDIX A: Y-12 PLANNING PROCESS
AND
FACILITY INFORMATION

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This appendix to the Y-12 Site-Wide Environmental Impact Statement (SWEIS) presents information on both the planning processes and facilities associated with the Y-12 National Security Complex (Y-12). This includes a summary of major Y-12 configurations and infrastructure; a description of the Y-12 production processes; a description of Defense Programs (DP) major facilities; a summary of principal Waste Management activities; information about traffic and transportation; and a description of the facility planning and transition process. Tables and figures related to these discussions are included to conveniently summarize selected facility information.

A.1 Y-12 SITE CONFIGURATION AND INFRASTRUCTURE

This section summarizes information dealing with the Y-12 Site configuration and infrastructure.

A.1.1 Site Configuration

The Y-12 Area of Responsibility in the Oak Ridge Reservation (ORR) covers about 5,400 acres. The main area of Y-12 is largely developed and encompasses about 800 acres, with nearly 600 acres enclosed by a security fence. The National Nuclear Security Administration (NNSA) is the Y-12 site landlord and is responsible for approximately 74 percent of the floorspace (approximately 5.3 million square feet today[1]) and approximately 390 facilities. The structures include laboratory, machining, dismantlement, storage, and research and development (R&D) areas. Because of the Site's defense programs manufacturing and storage facilities, the land in the Y-12 area is classified in the U.S. Department of Energy's (DOE's) industrial category. The *Y-12 Ten-Year Site Plan FY 2009–2018* (NNSA 2008a) identifies 13 mission critical facilities on Y-12.

More than 70 percent of the floor space at Y-12 was built prior to 1950 as part of the Manhattan Project. Many of the old buildings supported the Plant's original mission to electromagnetically separate isotopes of uranium. These buildings have been modified over the years to accommodate changing missions. The separation of lithium isotopes with column exchange technology was performed in some of the buildings, but that process was discontinued in the 1960s.

The Enriched Uranium (EU) Complex was built in the early 1940s with several buildings added in the 1950s. The most recent production facility additions at Y-12 were made in the late 1960s and early 1970s as part of the Production Facilities Modifications Program. Major facilities added at that time included the depleted uranium (DU) Metalworking Building, Assembly and Special Materials Process Buildings, and the Special Materials Machining Building.

[1] The 5.3 million square feet figure does not include approximately 550,000 square feet associated with the Jack Case and New Hope Centers which were completed in July 2007 and are leased by Babcock & Wilcox Technical Services Y-12, LLC (B&W).

Generally speaking, Y-12 can be divided into three areas: (1) the East End mission support area; (2) the West End manufacturing areas; and (3) the West End environmental area. East End facilities are generally technical, administrative, and Y-12 support functions. The West End manufacturing area is generally considered an area inside the Perimeter Intrusion Detection and Assessment System (PIDAS) fence. The area inside the PIDAS boundaries contains manufacturing and nuclear material storage facilities as well as technical and Y-12 support operations and program management, product certification, quality control, product engineering and scheduling, maintenance, and utilities. The West End environmental area formerly managed by the Office of Environmental Management (EM) and now managed by NNSA, contains tank farms, waste management treatment facilities, and storage areas; included are such facilities or areas as the Bear Creek Road Debris Burial Area, Rust Spoil Area, Liquid Organic Waste Storage Facility, Hazardous Chemical Disposal Area, Oil Landfarm, Oil Landfarm Contaminant Area, and Sanitary Landfill 1.

A.2 MAJOR Y-12 PRODUCTION PROCESSES

Y-12 plays an important role in U.S. national security and is a one-of-a-kind facility in the NNSA nuclear security enterprise. Y-12's role includes:

- manufacture and assessment of nuclear weapon secondaries, cases, and other weapons components;
- dismantlement of weapons secondaries, cases, and other weapons components returned from the stockpile;
- safe and secure storage and management of special nuclear materials (SNM);
- supply of SNM for use in naval reactors;
- promotion of international nuclear safety and nonproliferation; and
- reduction of global dangers.

Functional capabilities required to perform these activities include operations to physically and chemically process, machine, inspect, assemble, certify, disassemble, and store materials. Management of wastes generated from these operations is also required. The fabrication of secondaries and cases can be subdivided into the following major material production processes: uranium, lithium, and nonnuclear/special materials. The following typical process descriptions are provided to illustrate the functional activities and operations associated with each of the major production processes. These processes are based on traditional secondary and case fabrication methods and represent upper bounds to the types and number of processes that would be continued in the downsized and modernized Y-12.

A.2.1 Process Descriptions

Processes described in this section deal with uranium, lithium, special materials, and nonnuclear materials.

A.2.1.1 *Uranium*

The uranium process provides finished enriched and depleted uranium parts and products. The operations are capable of all uranium handling and processing functions, from raw materials handling to finished parts manufacturing. In addition, dedicated areas are provided for storage of in-process uranium materials and for the highly enriched uranium (HEU) strategic reserve.

The production of uranium parts and products involves casting or wrought processing; metal-working; machining, inspection, and certification; chemical recovery; assembly, disassembly, and quality evaluation; and in-process storage. The products from casting or wrought processing are billets and cast parts that feed directly to machining and metal-working. Billets are cropped and cast parts are delugged before they are sent to the next operation. The input to casting consists of retired weapons parts, metal buttons from storage, and recycled scrap metal from metal-working and machining. A casting charge is prepared and processed in a criticality-safe configuration in a vacuum induction furnace. Scrap metal and machine turnings are degreased, cleaned, and briquetted before direct recycle.

Metal-working operations prepare a wrought product as feed for machining operations. Cropped billets from casting are preheated in a salt bath, rolled into a sheet, annealed in a salt bath, blanked, and pressed. The blanking operations are a major source of recycled metal for casting. Formed parts are cleaned, debrimmed, and machined.

Both formed and cast blanks are machined to finished dimensions and inspected. Scrap metal and machine turnings are returned to casting for cleanup and reuse. Miscellaneous solids are sent to the chemical recovery systems for treatment to recycle the material back to metal buttons. Product inspections and certification are accomplished with coordinate measurement machines, optical gauges, high-energy x-ray radiography, ultrasonic and dye penetrant flaw-inspection methodology, plating thickness gauges, and mechanical properties tests.

Enriched uranium chemical recovery receives feed from virtually all areas in the process. The major feeds are residuals from casting, impure metal chips from machining operations, and a miscellaneous array of combustibles from all areas. The feeds are incinerated and processed in a head-end treatment that consists of acid dissolution, leaching, and feed preparation for solvent extraction. The feed solution is processed through primary extraction by which it is purified, concentrated by evaporation, and purified further by secondary extraction. The solution is then converted to oxide, then to UF_4, and then to uranium metal buttons. Secondary residues are returned to the head-end treatment. Finished metal is returned to casting for reuse.

Assembly operations assemble parts into subassemblies using joining techniques such as welding, adhesive bonding, and mechanical joining. Disassembly takes retired weapons apart and recycles all materials of value. The quality evaluation function receives weapons from the stockpile for disassembly, evaluation, and life cycle tests. Shipping containers for weapons parts and subassemblies are certified and refurbished as part of the assembly and disassembly process.

Uranium storage includes storage vaults for in-process uranium materials, which include buttons and other scrap materials directly recycled, as well as semi-finished and finished components.

The vaults at Y-12 are also used for the strategic reserve, which includes assembled secondaries and HEU metal castings and surplus HEU awaiting final disposition.

A.2.1.2 *Lithium*

The lithium process provides finished lithium hydride and lithium deuteride parts. Primary functional elements of this process include powder production and forming, finishing and inspection, and deuterium production. These systems are briefly described below.

The lithium hydride and lithium deuteride from storage, recycled weapons parts, and manufacturing scrap are broken, crushed, and ground to produce powder. The powder is loaded into molds and cold-pressed isostatically to form solid blanks.

The blanks are unloaded from the molds and placed into vacuum furnaces to be outgassed. After the outgassed blanks cool, they are loaded into form-fitting bags, heated, and warm-pressed. The blanks are then cooled to room temperature and removed from the bags. The fully dense machining blanks that result from forming operations are radiographed to detect any high-density inclusions. Powder production, mold loading, and radiography are all performed in dry gloveboxes to minimize reaction of the lithium hydride and lithium deuteride with moisture in the atmosphere. Mold unloading, furnace loading and unloading, and bag loading and unloading are all conducted in an inert glovebox. The lithium hydride or lithium deuteride is handled outside inert-atmosphere gloveboxes only when it is sealed in a mold or bag.

The blanks from forming operations are machined to final shapes and dimensions on lathes through single-point machining methods and finishing operations. Most machine dust is collected for direct recycle salvage operations. The finished part weight and dimensions are inspected with certified balances and contour measurement machines. All machining and inspection activities are conducted in dry gloveboxes to minimize any reaction with moisture in the atmosphere. Certified parts receive a final vacuum outgas treatment before final assembly.

Deuterium is required for many of the products and is stored for future use. Deuterium oxide, or heavy water, is electrolytically reduced. The resulting deuterium is compressed and stored for use. If necessary, the compressed deuterium gas is used to reconvert the lithium metal to deuteride in the final step of wet chemistry.

Lithium wet chemistry can be used to pre-produce lithium hydride and lithium deuteride to meet production requirements for many decades. The principal function of wet chemistry is to purify lithium hydride and lithium deuteride by removing oxygen and other trace elements. The principal feeds to this system are retired weapons components from the disassembly operation, machine dust, powder, and killed parts from other operations. Purification is accomplished by transforming the lithium hydride and lithium deuteride through a chemical dissolution process, then the solution is evaporated and crystallized. The crystals are then reduced to lithium metal and impurities are removed. The lithium metal is reconverted to lithium hydride and lithium deuteride by combining it with hydrogen or deuterium gas. The resulting lithium hydride and lithium deuteride billet, sealed in a thin stainless-steel can, is transferred to lithium storage.

The production of lithium hydride and lithium deuteride components creates a considerable amount of scrap that must be recycled to recover the lithium and deuterium. Much of the machine dust, unacceptable formed parts, machined parts that fail inspection, and stockpile returned parts are directly recycled. Salvage operations typically process material that is too impure to be recycled. Salvage operations primarily involve washing and chemical recovery. Items that require washing include machining tools and fixtures, filters used throughout the processes, and sample bottles. Oil-soaked lithium hydride and lithium deuteride blanks from the powder-forming operations are also prepared for storage. Solutions from the purification and wash operations, including mop and dike water streams, are neutralized, filtered, crystallized, and sent to storage or waste disposal.

Long-term storage is required for chemicals and pre-produced lithium hydride and lithium deuteride billets. Interim storage is provided for lithium hydride and deuteride components from disassembly or retired weapons and rejected components from forming and finishing operations.

A.2.1.3 *Special Materials*

Special materials such as diallyl-phthalate are required to support DP. Diallyl-phthalate based molding compound is formed into near-net-shape blanks that are later machined to finished parts. The primary forming operation is compression or transfer molding, which is followed by a drying and final curing step. Worker protection for potential exposure to hazardous materials is provided through the use of vent hoods, personal protective equipment, and administrative controls.

A.2.1.4 *Nonnuclear*

The nonnuclear process is responsible to produce certain weapons components composed of nonnuclear materials and to provide the uranium and lithium processes with specialized material and support services. Many types of materials are processed to provide a diverse product line that consists of both nonnuclear metal components and tooling and a variety of polymer-based items. The principal manufacturing technologies employed are hydroforming, hydrostatic forming, rolling, forging, heat treating, welding, machining, cold/hot isostatic pressing, grinding, winding, casting, plating, molding, and coating. The nonnuclear process handles several product streams, which are described briefly in the following paragraphs.

Several types of urethane foams are required to be produced. The urethane components and blowing agents are pumped into molds and allowed to expand to fill the mold. When cured, the foam moldings are ejected and trimmed to final shape.

Steel and aluminum are construction materials for both components and support tooling, making this a relatively high throughput product line. The usual fabrication route for both materials is rough machining, heat treatment, and finish machining.

Operations to produce stainless-steel cans consist of blanking, followed by hydroforming and hydrostatic forming with subsequent machining and heat treatment. Ultrasonic cleaning is required before heat treatment to ensure cleanliness for welding, which completes the assembly.

Ceramic finished parts are finished from blanks or procured. Procured parts are inspected and certified prior to final assembly.

Polyvinyl chloride is formed into bags and castings and is also applied as a coating. Items to be coated are dipped into a tank of curable, plasticized polyvinyl chloride formulation, whereas castings are produced by transferring the polyvinyl chloride liquid into a mold. All items are heat cured.

Figures A.2.1.4–1 through A.2.1.4–3 illustrates the waste management system associated with the Y-12 production missions. Waste management facilities for treatment and storage are described in Section A.4.

A.3 Y-12 DEFENSE PROGRAMS MAJOR FACILITIES DESCRIPTION

NNSA, DOE's Offices of Science (DOE-SC), Nuclear Energy (DOE-NE), and Environmental Management (DOE-EM) are the major tenants on Y-12 and have programmatic responsibility for various facilities. Real property includes over 400 buildings with a floor area of about 7.1 million square feet. NNSA is the Y-12 site landlord and is responsible for approximately 74 percent of the floorspace and approximately 390 facilities; DOE-SC and DOE-NE have programmatic responsibility for about 1.2 million square feet, and DOE-EM is responsible for about 0.6 million square feet. UT- Battelle, the Management and Operating contractor for Oak Ridge National Laboratory (ORNL), is in the process of relocating all operations (except those located in the EU Laboratory) to ORNL site. The vast majority of their facilities will be shut down and placed under long-term S&M.

All Y-12 facilities that process or store HEU are located in the protected area of Y-12 surrounded by the PIDAS (except for the two buildings which house only calibration sources managed by Radiological Control and the Protective Services Organization). The following information, which was derived from information contained in the *Final Site-Wide Environmental Impact Statement for the Y-12 National Security Complex*, DOE/EIS-0309 (DOE 2001a) and the Ten Year Comprehensive Site Plans (NNSA 2005c, NNSA 2007, and NNSA 2008a), provides information on the major DP facilities located at Y-12.

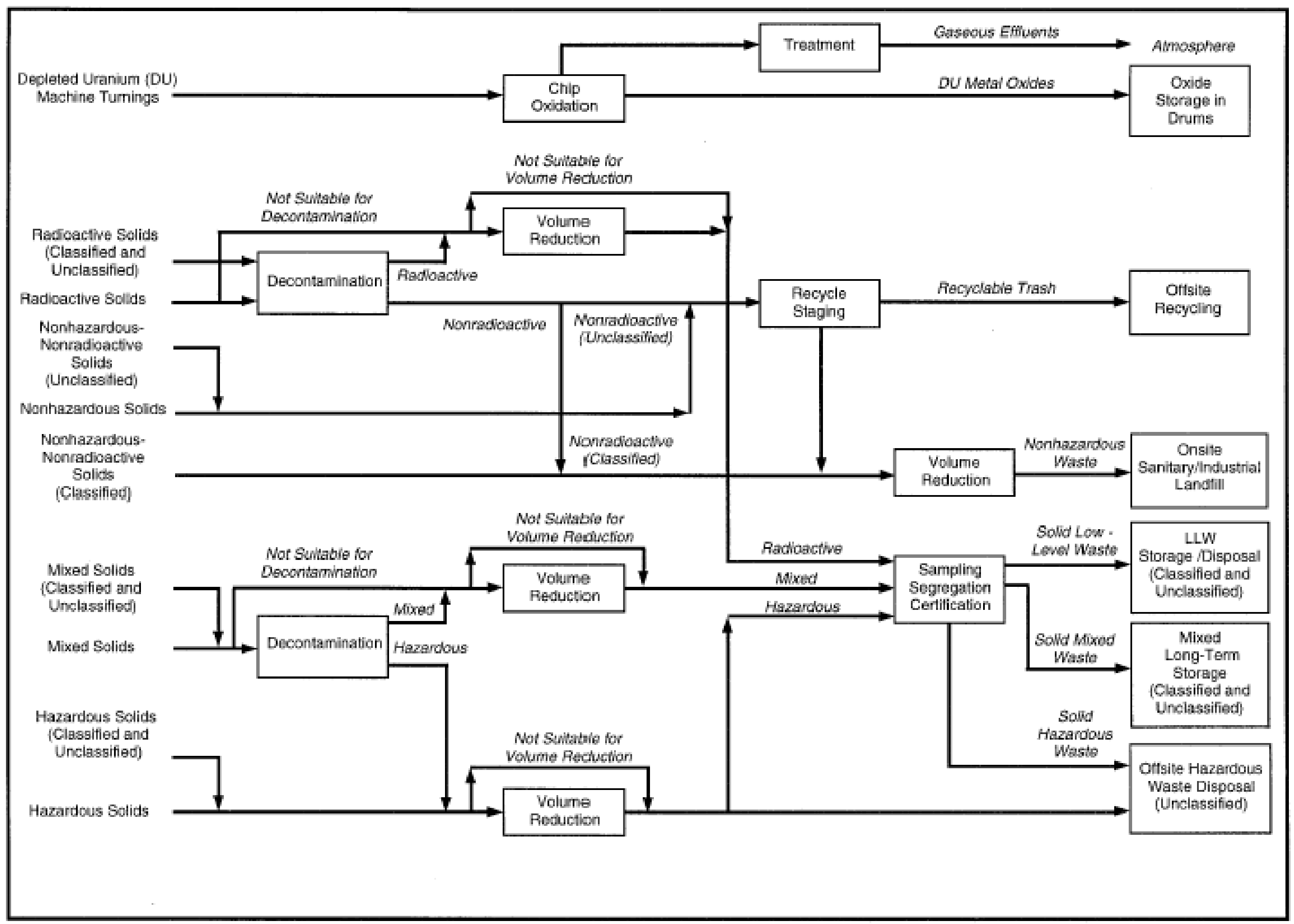

Figure A.2.1.4-1. Waste Management Process – Solid Waste Treatment.

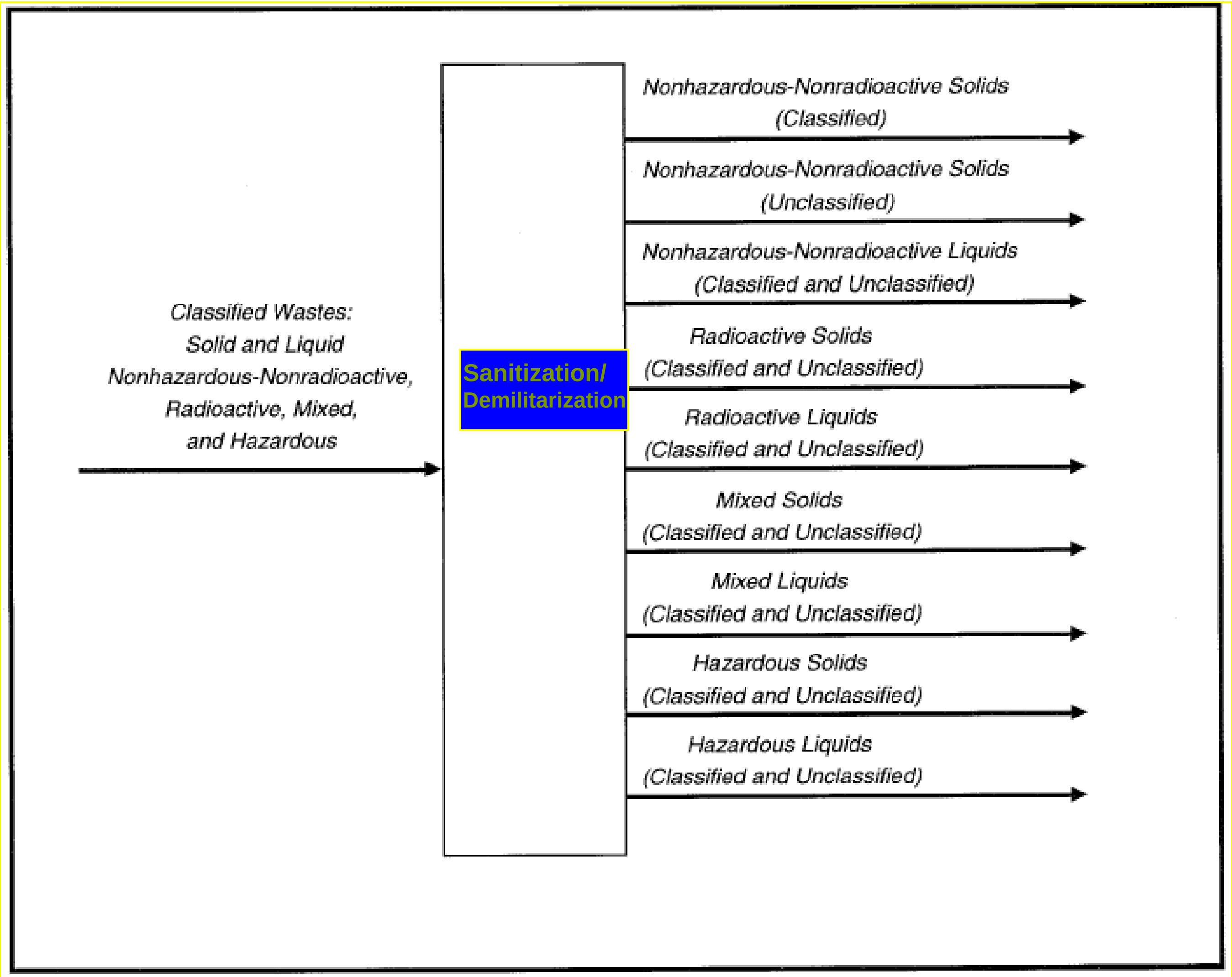

Figure A.2.1.4-2. Waste Management Process – Clearance for Release.

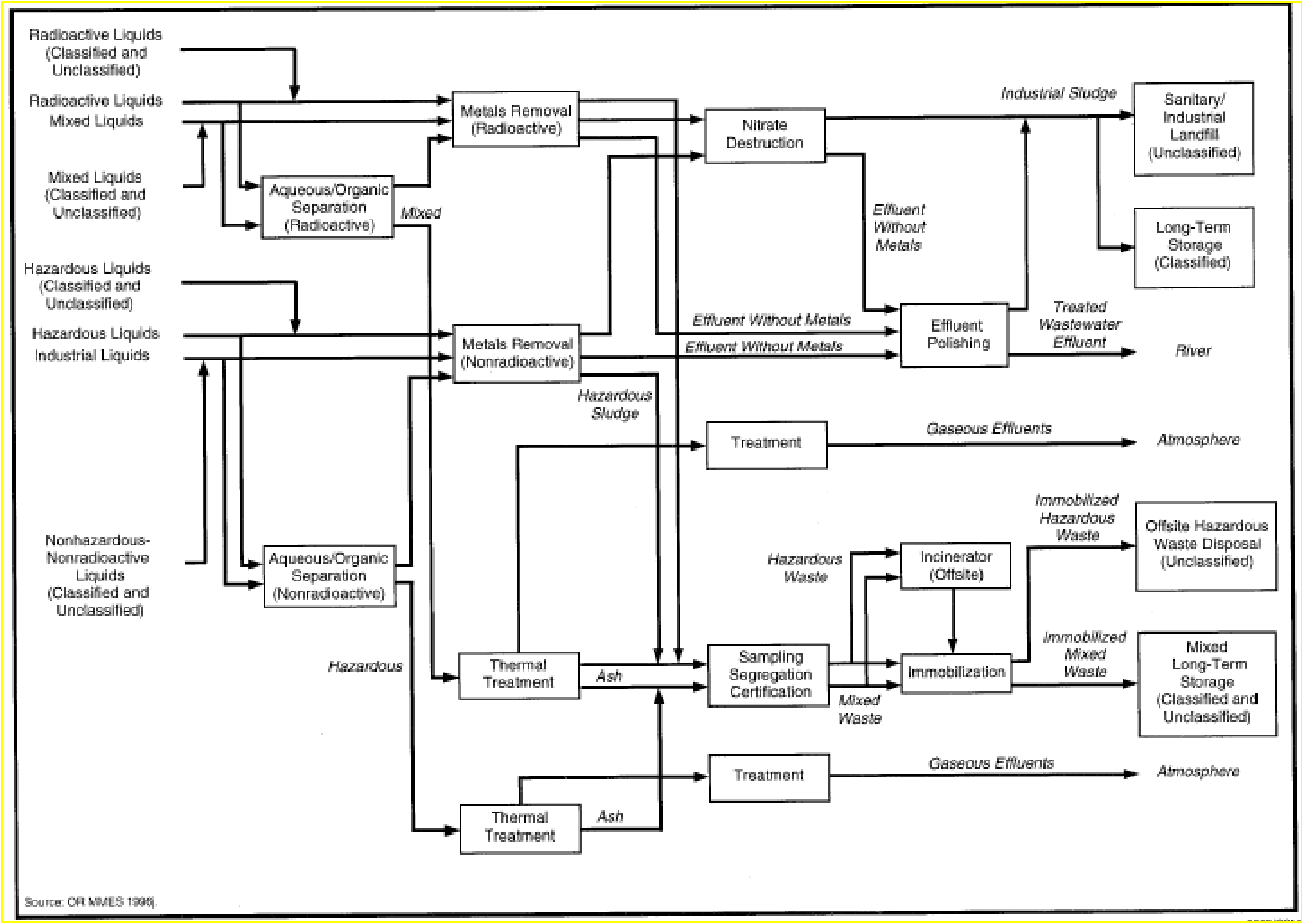

Figure A.2.1.4-3. Waste Management Process – Process Wastewater Treatment and Waste Thermal Treatment.

A.3.1 Enriched Uranium Facilities Complex

Over 100 operations or processes have been or can now be performed within the Enriched Uranium Facilities Complex. The primary missions performed in this Complex include the following:

- Casting of EU metal
- Accountability of EU from Y-12 activities
- Recovery and processing of EU to a form suitable for storage and/or future designation (from Y-12 activities and commercial scrap)
- Packaging EU for off-site transport
- Preparation of special uranium compounds and metal for research reactor fuel

The largest building is a multistory facility constructed in the early 1940s. It was built in stages over a period of years. In 1948, new structures were added. Finally, a single-story structure was added in 1951. Other less extensive modifications or additions have since been added.

The Complex houses two major process areas: (1) the Uranium Recovery Operations (also called Chemical Recovery Operations); and (2) the Metallurgical Operations.

The EU materials located in the Complex are in various chemical forms, both liquids and solids, and are in more than 6,000 separate containers. All this material is considered "in process." Material awaiting processing, including solid process residues, fluorides, low-equity residues, and aqueous and organic solutions of many kinds, is stored throughout the building. Solids are typically stored in cans made from ordinary carbon steel or stainless steel. Liquids are stored in plastic criticality-safe bottles.

There are no floor areas where solutions may collect to greater than 4 inches in depth. Nearly all vessels in the solvent extractions operation are of safe geometry. Solid oxides and residues are stored in cans of limited volume and controlled mass. The casting operation, which involves the use of large amounts of uranium metal, is closely controlled, and each operation is subjected to criticality safety analysis and control.

Large quantities of combustible organics can be in-process in the complex. In the past, there have been some minor explosions in the chemical recovery operations that involve Nitric Acid Dissolvers, Muffle Furnaces, and Destructive Distillation Unit Operations.

The Complex is currently in operation. Table A.3.1-1 summarizes the Uranium Recovery Operations and Metallurgical Operations.

Table A.3.1-1. Y-12 Defense Program Major Facility Overview.

Facility	Function	Mission	Current Status
EU Building	• Uranium Recovery Operations • Metallurgical Operations • In-Process Storage • X-ray density	• Recovery of EU to a form suitable for storage • Casting EU metal (for weapons, storage, reactors, or other uses) • EU down-blending • Accountability of EU from Y-12 activities • Nondestructive evaluation of parts	Operating
Intermediate Assay Building	• Chemical recovery of intermediate enrichments of EU (20% to 85% ^{235}U) • In-Process Storage	• Recovery of EU to a form suitable for storage	Not Operating-EU materials will be transferred other areas for processing or to a storage location. Operations in this building will not resume
EU By Products Storage Building	• Storage of combustibles, residues and other solid by-product material contaminated by EU	• Storage of combustibles, residues, and other solid materials awaiting chemical recovery of EU	In use as a storage facility
Metalworking Building	• Storage • Fabrication (rolling, heat treating, forming, shearing, machining, inspection, etc.) of parts	• Storage and handling of EU and DU • Fabrication and inspection of metal parts	Operating
EU Storage Building	• Storage of EU • Receiving • Shipping • SNM vehicle material transfers	• Warehouse for shipping and receiving EU from other sites • Transient, interim, and long-term storage of EU • In-Plant material transfers in SNM vehicle	Operating

Table A.3.1-1. Y-12 Defense Program Major Facility Overview *(continued)*.

Facility	Function	Mission	Current Status
Assembly and Special Materials Process Buildings	• Assembly • Product Certification • Disassembly • Storage • Quality Evaluation	• Assembly of new or replacement weapons components and assemblies • Quality operations for certification • Disassembly of retired weapons components and assemblies and part recovery • Storage of retired weapon assemblies, subassemblies, and components • LiH/LiD production • Shelf Life Program – Medium and Long Term Evaluations	Operating
Quality Evaluation Building	• Quality Evaluation/Disassembly • DU Metalworking • Testing	• Quality Evaluation/Disassembly is conducted	No longer Operating QE function now being performed in the Assembly Bldg. and DU metalworking performed in the Metalworking facility complex
Plant Laboratory Building	• Analytical Chemistry Organization	• Provides analytical support services for Y-12 and regulatory compliance	Operating
Special Materials Machining	• Metal machining	• Machining of metal parts	Not operating
DU Metalworking Building	• Machining • Dimensional Inspection • Electroplating (currently not operating) • X-ray density	• Depleted uranium and stainless-steel machining • Dimensional inspection of parts • Electroplating of parts • Nondestructive evaluation of parts	Operating

Table A.3.1-1. Y-12 Defense Program Major Facility Overview *(continued)*.

Facility	Function	Mission	Current Status
Development Buildings	• Process Development • Beryllium Operations	• Development and refinement of manufacturing processes employed at Y-12 • Technology transfer support	Operating
Tooling Storage Building	• Storage	• Tooling and material storage	Active
General Manufacturing Building	• Metal and graphite machining	• General machine shop • Machining and tooling • Work for others • Technology transfer	Operating
DU Processing Building	• Machining processes • Dimensional Inspection • Nondestructive Evaluation (x-ray density)	• DU operations • Dimensional inspection of parts • Nondestructive evaluation of parts	Operating
HEUMF	• Storage of EU • Receiving • Shipping • SNM vehicle material transfers	• Warehouse for shipping and receiving EU from other sites • Transient, interim, and long-term storage of EU • In-Plant material transfers in SNM vehicle	Construction completed. Operational in 2010.
Purification Facility	• Chemical Processing	• Special Material production	Operating

Note: SNM - special nuclear material, EU – enriched uranium, DU – depleted uranium, LiH – lithium hydride, LiD – lithium deuteride.
Source: B&W 2005b.

A.3.1.1 *Uranium Recovery Operations*

Uranium recovery operations include recovery/purification of EU-bearing scrap into forms suitable for reuse and accountability of the EU contained therein. The majority of this scrap and waste was generated by Y-12's weapon production or disassembly operations and by the recovery processes themselves. Some scrap and waste were generated through nuclear materials production; additional scrap is received from other sites for recovery or for accountability of the EU it contains. The nature of these EU-bearing materials varies from combustible and noncombustible solids to aqueous and organic solutions. Concentrations of EU vary in these materials from pure uranium compounds and alloys to trace quantities (parts per million levels) in combustibles and solutions. The recovery and purification process can be divided into the following general groupings:

- Head End Operations
  - Bulk reduction of scrap (mostly burning)
  - Dissolution of scrap into uranyl nitrate solution
  - Separation of uranyl nitrate from non-uranium materials
  - Continuous Recovery and Purification Operations
  - Organic solvent extraction
  - Evaporation
  - Conversion of uranyl nitrate to UO_3
  - Conversion of UO_3 to UF_4

- Reduction
  - Blending of UFB4B
  - Calcium reduction of UF_4 powder to uranium metal

- Special Processing
  - Special materials production
  - Accountability of scrap
  - Scrap dissolution
  - Packaging of materials for transport

- Waste Streams and Materials Recovery
  - Nitrate recycling
  - Materials storage and handling
  - Chemical makeup

Liquid mixed low-level waste (MLLW), such as nitrate solutions from enriched uranium recovery, is transported from the complex for disposition or disposal.

A.3.1.2 *Metallurgical Operations*

Casting of enriched uranium metal and alloys occurs in vacuum induction furnaces. Cast components are transported via the intra-site SNM Vehicle to be machined. Machine turnings are washed in water and a solvent to remove machine coolant and boron, dried, and pressed into briquettes for reuse in the casting operation. A number of presses and shears are used to condition recycled weapons components and other metal parts for casting. Recycled metal may be washed with nitric acid to remove surface oxide prior to casting. Waste from the casting operations is sent to the chemical recovery operations for accountability and recovery.

Metallurgical Operations can be described in the following general groupings of activities:

- Casting
  - Preparation of metal feed
  - Casting metal into parts or cylinders
  - Packaging of materials for shipment
  - Machine turning recycling

A.3.2 Intermediate Assay Complex

The Intermediate Assay Complex is a multi-story facility constructed in the early 1940s. The building contains an incinerator which is not currently operational.

The building has generally been reserved for intermediate enrichments (20 to 85 percent) of EU. Its original design mission was to recover EU from the electromagnetic separation process. After World War II, the building received intermediate enrichments of uranium from the gaseous diffusion plants as uranium hexafluoride. An ammonia gas reduction and hydrofluorination was used to convert the uranium hexafluoride (UF_6) to uranium tetrafluoride (UF_4). In the mid-1950s, a UF_6 to UF_4 conversion facility using fluorine and hydrogen gas was installed to perform the same function. In either case, the UF_4 was reduced with calcium metal to purified uranium metal. To support the conversion processes, recovery processes were installed to recover and purify uranium contained in the increasing waste processes. Many of these processes were patterned after the recovery process equipment that was installed in the EU Building.

In the late 1960s, the building underwent modifications to install denitration and fluid bed systems for the conversion of uranyl nitrate to UF_4. The mission to convert recovered uranyl nitrate from the Savannah River back into metal was transferred to the building in 1973. The machining-turning-cleaning process was installed in the mid-1980s to recycle intermediate enrichments of uranium turnings. In 1988, shipments of uranyl nitrate from the Savannah River were discontinued. A year later the weapon production rate was severely decreased. In 1993, decommissioning of the Building began. Since that time, most of the processes have been shut down and some processes have been removed from the facility.

The *Building Complex Phaseout/Deactivation Program Management Plan* describes the activities to transition the existing chemical recovery capabilities from this Building to the EU Building and the deactivation of this Complex. The project is expected to last about 5 years. The phaseout and deactivation will reduce the risk of existing hazards and place the building in a positive, safe, and environmentally secure configuration. Some in-process material still remains in the facility tanks and process lines.

There are no plans to resume operations in this Building, except as necessary to support decontamination and decommissioning (D&D) activities. The Building has five permitted *Resource Conservation and Recovery Act* (RCRA) waste storage locations. The locations are used for storage of both hazardous waste, as defined by RCRA, and non-hazardous waste mixed with EU awaiting recovery or disposal. The hazardous wastes include characteristic and listed wastes. Hazardous materials include several strong and weak acids and various organic materials.

Material transfers that occur within the Building Complex are performed through several methods. Dollies designed to provide safe spacing of fissile material containers are used to perform the majority of the container transfers. Personnel are also permitted to carry transfer single fissile material containers. Process material transfers are accomplished with pumps and airlifts.

A.3.3 Enriched Uranium By-Products Storage Building

The EU By-Products Storage Building is a warehouse facility. The mission of the building is to provide storage for items and materials that have been removed from the Material Access Areas. A portion of the facility is used for storage of combustibles that contain uranium. The storage area is also used for other hazardous materials including RCRA storage, polychlorinated biphenyls (PCBs), and beryllium. Combustible material storage containers include cans, plastic bags, and carbon-steel 55-gal drums. Drums that contain combustible materials are stored on wooden pallets and are collocated with other combustible materials that are also in drums on wooden pallets.

A.3.4 Depleted Uranium Processing Building

The DU Processing Building is a multi-story structure that was constructed in the early 1940s. The building is a large production and processing facility that was previously used for depleted uranium and non-uranium processing. The building includes storage areas for enriched uranium combustibles and lithium hydride. Sprinkler systems are provided in storage areas; a manual fire suppression capability is provided on-site 24 hours a day; and materials are stored in sealed drums.

A.3.5 Metalworking Complex

The Metalworking Building Complex consists of two buildings. Both are multi-story buildings. One building was constructed in the early 1940s, and the other building was added shortly thereafter. Both buildings have been expanded and modified over the years. Included is an area where EU parts and scraps are packaged and shipped. The area was constructed in the 1970s.

The mission of the Complex is to provide for storage of EU inventories, to provide fabricated metal shapes as needed for the nuclear weapons stockpile maintenance, and to support nuclear programs at other U.S. and foreign facilities. Materials stored in the Complex are considered to be part of the backlog waiting for processing.

EU parts are rolled, formed, and machined in the Metalworking Complex. The complex also includes an EU storage vault. Operations include salt-bath heat treating, rolling, shearing, and plate cutting of depleted uranium, depleted uranium alloys, and non-radiological materials. Other operations include sawing, casting, and vacuum arc re-melting of depleted uranium and depleted uranium alloys. Other operations include forming, heat treating, and rolling of depleted uranium, depleted uranium alloys, and non-radiological materials.

Part of the complex contains inspection, machining, and storage areas; a foundry (casting of depleted uranium, depleted uranium alloys, and non-radiological materials using induced melting and arc melting processes); and a R&D area. Operations in both areas include the handling, packaging, and transporting of EU materials and parts. The Area allows collection, packaging, receipt, and shipment of outgoing EU metal parts, chips, metal scrap, and contaminated combustibles. Additional operations include metal forming, heat treating, and arc melting of depleted uranium, depleted uranium alloys, and non-radiological materials. For safety, machine turnings are packed in a coolant to prevent dry-out and spontaneous combustion, and vented transport dollies are used to prevent pressurization due to hydrogen generation. The complex is currently in operation.

A.3.6 Enriched Uranium Storage Building

The EU Storage Building historically has been used as a warehouse for weapons-related materials and reactor fuel. The facility was built in 1944 and has since been renovated. The current mission is to serve as a warehouse for short-term and long-term storage of materials, including high-equity uranium, weapons assemblies, reactor fuel, and low-equity materials that are waiting for recycle.

The facility is a single-story building; air is exhausted unfiltered through roof-mounted fans. Dock areas serve the transfer of SNM and non-SNM materials to and from approved transport vehicles.

To address safety concerns, the partitioned area is covered by wet-pipe sprinkler systems, portable fire extinguishers, and fire alarms; forklift trucks are required to be electrically operated; surfaces are periodically painted with fire retardant paint; and all hot work operations (i.e., cutting, welding, etc.) are controlled by special permit. Use of combustible and flammable liquids in the facility is very limited.

A.3.7 Assembly and Special Materials Buildings

The Special Materials Building was constructed in 1943 and has been used to support nuclear weapons production since that time. As a result of a major upgrade program, some of the major processes and equipment were upgraded in the early 1990s. In addition, a portion of building was modified for storage of EU materials.

The Assembly Building is a multi-story facility built in 1971 to house weapon assemblies. Major assembly and disassembly facilities are located in the building. Current EU activities at the Assembly Building include:

- Assembly of new or replacement weapon assemblies
- Quality certification of components and assemblies
- Disassembly of retired weapon assemblies and part recovery
- Storage of assemblies, subassemblies, and components
- Quality Evaluation Shelf Life Program for Medium and Long Term Evaluations

Assembly and disassembly operations areas, vault-type rooms, and vaults are located in the building. Most of the EU is composed of metal pieces or weapons components. Significant quantities of various hazardous materials are collocated with EU in the operations areas.

Barriers to exposure of workers or the public to radiation or chemical hazards or to releases of radioactive materials to the environment include packages and containers, and vault and room walls; and some operations employ gloveboxes, hoods, and ventilation systems with high-efficiency particulate air (HEPA) filters. Both the Special Materials Building and the Assembly Building are protected by smoke and heat detectors, sprinklers, and alarm systems. Operations and storage activities are conducted by procedure in accordance with criticality safety approvals that incorporate double contingency. At least two independent criticality alarm systems cover each EU area to annunciate a criticality accident.

A.3.8 Quality Evaluation Building

The Quality Evaluation Building was built in 1943. The building has complete fire detection and fire suppression coverage.

Areas within the building can be functionally classified as follows: (1) quality evaluation of current weapons production programs and disassembly of obsolete weapons (these operations are being re-located to another facility); (2) metal-working operations (forging, forming, heat treating) and grit blast cleaning of depleted uranium, depleted uranium alloys, and metals such as steel and aluminum; (3) a Storage Area and vault-type room for storage of SNM; (4) radiography, ultrasonic, and other nondestructive testing (NDT); and (5) a plating area. The only active operational areas that involve EU within the building are quality evaluation, assembly, and storage in the vault-type room and the Storage Area. The plating area, while shut down, contains residual materials. The Storage Area and the vault-type room are set aside for storage of EU in drums.

Key safety features of the building include a criticality alarm system and detectors. Two criticality detectors are located in the building: one in the quality evaluation area (on the second floor) and the other adjacent to the Storage Area. The building is equipped with a fire detection and fire suppression system that consists of wet-pipe sprinklers. The ventilation exhaust system is HEPA-filtered. Additionally, the quality evaluation and disassembly areas are equipped with a HEPA-filtered glovebox to perform a several operations.

EU is normally stored within specially designed packages and containers except when quality evaluations or disassembly operations are performed. A variety of package configurations for EU-bearing materials is used. Polyethylene bags contain paper, plastic, mop heads, and other miscellaneous combustible materials used in the process areas. Storage of EU in the process areas is minimal due to criticality safety approval limitations.

Storage configurations range from drum arrays in vaults to cans and dollies within vault-type cages. Polyethylene bags are stored within the process areas or consolidated into 55-gallon drums prior to transport from the facility.

Building press operations include the forming of depleted uranium, depleted uranium alloys, and non-radiological materials using 7,500-ton, 1,500-ton, and 1,000-ton presses.

A.3.9 Plant Laboratory Building

The Plant Laboratory Building, which is part of the Analytical Chemistry Organization (ACO), is a multistory facility that was constructed in 1952. The building has had two major expansions since it was originally constructed. The south addition was added in 1969. Another area was added in 1981. In 2004, a new roof was installed for the Plant Laboratory Building. The primary operations area is divided between first-floor and basement levels. Two service elevators connect the various floors of the building, although one of the elevators is not currently operational.

The building is equipped with about 150 chemical fume hoods with heating, ventilation, and air conditioning (HVAC) support systems that form the primary engineered safety feature. Most chemical fume hoods in the building are original equipment. Limited hood upgrades have been performed and about 20 hoods were replaced in the mid-1980s with additional units added or replaced at various times during laboratory alteration projects. There are about 52 separate supply and exhaust systems; however, most air is supplied by seven major air handling units that provide conditioned, filtered air to the various rooms in the building. Nineteen exhaust fans support hoods, and each hood is fitted with a continuous flow monitor indicator to allow convenient confirmation of hood flow before use. The majority of the ventilation system in the building is a zoned, once-through system that provides more than six air exchanges per hour.

The facility was designed for, and is currently used as, an analytical chemistry laboratory to provide support for DP, Work-for-Others, the operation and maintenance (O&M) contractor, and regulatory compliance programs. Analyses associated with EU include impurities by inductively coupled plasma (ICP), inductively coupled plasma mass spectrometry (ICP-MS), emission spectroscopy, x-ray fluorescence spectrometry, carbon analysis by LECO carbon analyzer, and isotopic analysis by thermal ionization mass spectrometry. Weight limitations of enriched uranium are controlled by administrative procedures. EU samples are bar-coded to track and control the mass of material within the facility. Most work is completed in hoods. The area is provided with sprinklers in the event of a fire.

Special facilities located in the building include the Lithium Preparation Room, argon-purged gloveboxes, and a gas-mixing laboratory. The Lithium Preparation Room has an independent roof-mounted HVAC system that can maintain 10 percent relative humidity in the winter and 15 percent in the summer to limit hydrolysis of reactive lithium or lithium compounds. Argon-purged gloveboxes are provided in several laboratories to handle materials that require dry inert atmospheres. These are self-contained systems, and mostly include filters and desiccant systems to maintain and dry the re-circulated argon while others are once-through argon-purge types. A gas-mixing laboratory is located in the building; ACO personnel mix gases in cylinders for use by various Y-12 operations.

Fire protection for the building is provided by the Y-12 Fire Department. The building is also protected by a sprinkler system, an alarm system and by departmental procedures. An alarm system responds to the sprinkler trip alarm, pull box, and other heat and smoke detectors located in the building. In the event of a fire, it is expected to be restricted to a limited area and, because of the small amount of enriched uranium present, is not expected to have large radiological consequences. Chemical reactions that result from the mixing of incompatible chemicals are expected to be minimal because the sample sizes are limited and operations are performed according to procedures. Safety showers and eyewash fountains are readily available throughout the laboratory.

A.3.10 Enriched Uranium Calibration Standards and Test Facilities

The EU Calibration Standards and Test Facilities are located in three buildings. One building is an office building built of noncombustible materials. The office building supports a variety of DP-related organizations. EU sources are stored in this building in a Nuclear Materials Control and Accountability Vault. The sources are used for the calibration of nondestructive assay (NDA) equipment. Another building is a small wooden frame storage building. Radiological control instrument calibrations are performed in this building, and sources that await disposal are stored here. The third building is an office building constructed of noncombustible materials used to store sources used to test other systems at Y-12.

EU sources in the first building are stored in fireproof safes with combination locks. The Y-12 personnel store the sources in a cabinet in the second building. Both buildings are protected with automatic sprinkler systems. Personnel lock the sources in the third building in a file cabinet; that building is also protected by an automatic sprinkler.

A.3.11 Special Materials Machining Building

The Special Materials Machining Building is a single-story structure built in 1967. The major portion of the building is a large machine shop area containing machining equipment and controls with nominal storage for in-process parts and materials. Offices for shop supervision are provided. The building is used as a machine shop and performs machining, plating, and support operations (including NDT and dimensional inspections) of depleted uranium, depleted uranium alloys, and non-radiological materials. Currently, the facility is not in operation.

A.3.12 Depleted Uranium Machining Building

The DU Machining Building is a one-story building that was built in 1972. The building is protected by smoke and heat detectors, sprinklers, and an alarm system. Activities conducted in the Building include:

- Electroplating of parts
- Machining of depleted uranium and stainless steel parts
- Dimensional inspection of parts
- Nondestructive evaluation (x-ray and density) of parts

Barriers to exposure of workers or the public to radiation or chemical hazards or to releases of radioactive or toxic materials to the environment include gloveboxes, hoods, and ventilation systems with HEPA filters. Ventilation exhaust stacks are monitored for radiological materials as appropriate.

A.3.13 Development Buildings

The three Technology Development Buildings were built in the 1940's with additions in the 1950's and 1970's. The facilities are categorized as chemically hazardous. A foundry and a weld laboratory along with development of material and metallurgical synthesis, forming, and evaluation techniques and processes represent some of the activities. A second building conducts research and development in the areas of material characterization as well as measurements, instrumentation and control. The third building houses activities associated with material purification processes.

A.3.14 Tooling Storage Building

The Tooling Storage Building was built in 1955. The building is used as a tooling and material storage facility to support operations in the EU and DU Buildings.

A.3.15 General Manufacturing Building

The General Manufacturing Building was built in 1944. The building is a large, general machine shop with several areas that contain machining equipment and controls. Nominal storage for in-process parts and materials and offices for supervision are also provided. The building is used as a general machine shop for non-uranium metal and graphite parts.

A.3.16 Purification Facility

The new Purification Facility was approved for production operations in 2005. The Facility is rated as a chemically hazardous facility. It will produce Special Materials using a highly controlled and monitored process that has undergone multiple rigorous start-up safety reviews.

A.3.17 Highly Enriched Uranium Materials Facility Storage Building

The Highly Enriched Uranium Materials Facility (HEUMF) has completed construction. The new facility, once operational in 2010 will provide:

- Assurance of a viable EU storage capability to support the enduring nuclear weapons stockpile and strategic reserve for the foreseeable future.

- Modernized security concepts to enhance the protection of stored material and ensure the implementation of special safeguards and security requirements.
- Improved operational efficiency and reliability.
- Provision to consolidate strategic EU inventories into a state-of-the-art facility. This will address nuclear material control and accountability inventory validation issues, as well as eliminate further costly conversion of excess production areas into the long-term storage space required for increasing EU inventory levels.
- Compliance with modern codes, standards, and environmental safety and health (ES&H) regulations.

A.4 WASTE MANAGEMENT ACTIVITIES

This section summarizes information for facilities used to manage the various waste streams generated at Y-12; including low-level waste (LLW), MLLW, RCRA-hazardous waste, *Toxic Substances and Control Act* (TSCA) regulated waste, and non-hazardous waste. Other waste includes sanitary and industrial wastewater, PCB's, asbestos, construction debris, general refuse and medical waste. There are many waste management facilities at Y-12. The disposal facilities and landfills are operated by the EM Program. The majority of the waste management, treatment and storage facilities are operated by NNSA. Waste management facilities are located in buildings or on the sites where they are needed, or are collocated with other waste management facilities or operations.

DOE is authorized to manage radioactive waste that it generates under the *Atomic Energy Act* of 1954. LLW is generated during many plant operations, including machining operations that use stock materials such as steel, stainless steel, aluminum, depleted uranium, and other materials. DOE stores, treats, and repackages, but does not dispose of LLW at Y-12. The majority of the LLW generated at Y-12 is otherwise uncontaminated scrap metal and machine turnings and fines. Waste treatment provides controlled conversion of waste streams generated from operations to an environmentally acceptable (or more efficiently handled or stored) form. This activity includes continued O&M of facilities that treat wastewater and solid waste generated from production and production support activities. LLW at Y-12 is managed in accordance with DOE Orders, policy, and guidance related to management of radioactive waste. Management of this waste is not directly regulated by EPA or the Tennessee Department of Environmental Compliance (TDEC). Waste minimization and planned treatment facilities are expected to continue to reduce the volume of wastes.

The TDEC Division of Solid Waste Management (DSWM) regulates the management of waste streams under the *Tennessee Solid Waste Management Act* (TSWMA). Onsite waste disposal facilities in operation at Y-12 include industrial, construction/demolition landfills, and a *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) waste landfill. The major sources of hazardous waste are plating rinsewaters, waste oil, and solvents from machining and cleaning operations; contaminated soil, soil solutions, and soil materials from RCRA closure activities; and waste contaminated with hazardous constituents from construction/demolition activities. Facilities used to store or treat RCRA-hazardous waste at Y-12 are regulated by the DSWM as authorized by the EPA. These facilities may also be used to manage mixed waste (waste that is RCRA-hazardous and radioactive). Mixed waste is generated from site development, sample collection, metal preparation, fabrication, enriched and depleted uranium operations, assembly, and industrial engineering functions at Y-12. Mixed waste is either placed in storage to await treatment or disposal, treated at Y-12, or sent to another ORR facility for treatment and disposal. There are no facilities for the disposal of RCRA-hazardous or mixed waste currently in operation at Y-12. Some disposal of RCRA-hazardous and mixed wastes is done at a permitted off-site commercial facility.

Major activities that generate non-hazardous waste include construction and demolition activities that produce large volumes of non-contaminated wastes, including lumber, concrete, metal objects, and soil and roofing materials. Industrial trash is generated by daily operations throughout the Plant. These operations include janitorial services, floor sweepings from production areas, and production activities. Storage and physical treatment (e.g., shredding, compaction) of non-hazardous waste does not generally require a permit under RCRA. There are three landfills in operation for disposal of non-hazardous waste at Y-12. These disposal facilities are regulated by the TDEC DSWM.

PCB-contaminated waste is generated at Y-12 during spill cleanup and stabilization activities as part of ongoing O&M actions. TSCA-regulated waste that contains PCBs is managed at Y-12 in accordance with EPA regulations and with a Federal Facilities Compliance Agreement (FFCA) for management of PCBs on ORR (EPA 1997). Per the FFCA between the U.S. Environmental Protection Agency (EPA) and DOE, ORR waste that contains PCBs may be stored in TSCA-compliant facilities. Provisions in 40 CFR 761.65 allow storage of PCB-contaminated materials in RCRA-compliant storage facilities under certain circumstances. Therefore, TSCA-regulated waste is often collocated with RCRA-hazardous waste at Y-12.

A.5 TRAFFIC AND TRANSPORTATION

This section supports the results of the transportation analyses presented in Section 5.4 of this SWEIS. For this SWEIS, DOE evaluated the transportation impacts associated with two material types (radioactive wastes/radioactive materials and non-radiological materials) transported to and from multiple off-site locations. The assumptions and methodology used in the transportation analysis are described in the following section.

Since the 1940s, NNSA and its predecessor agencies have moved nuclear weapons, nuclear weapons components, and SNM by a variety of commercial and Government transportation modes. In the late 1960s, worldwide terrorism and acts of violence prompted a review of procedures for safeguarding these materials. As a result, a comprehensive new series of regulations and equipment was developed to enhance the safety and security of these materials in transit.

The Transportation Safeguards Division (TSD) subsequently was established in 1975 at the Albuquerque Operations Office. That office is now referred to as the Office of Secure Transportation (OST), which will be the name used here. OST modified and redesigned transport equipment to incorporate features that more effectively enhance protection and deny unauthorized access to the materials. During that time, OST curtailed the use of commercial transportation systems and moved to a total federal operation.

A.5.1 OST Management

Management, control, and direction of OST is centralized at Albuquerque, New Mexico. The federal agents who drive the transportation vehicles, as well as the escorts, are Nuclear Materials Couriers or Couriers for short. There are three federal agent operations centers located at Amarillo, Texas; Oak Ridge, Tennessee; and Albuquerque. Approximately 100 shippers and receivers of SNM and other sensitive materials are served at approximately 33 locations throughout the continental United States.

A.5.2 Transportation Safety

Since its establishment in 1975, OST has accumulated over 100 million miles of experience transporting DOE cargo with no accidents causing a fatality or release of radioactive material. This is due largely to the OST philosophy that safety and security are of equal and paramount importance in the accomplishment of DOE's transportation safeguards mission.

A.5.3 Transportation and Emergency Control Center

Transportation and Emergency Control Center (TECC) is a nationwide communications system operated by the OST and located in Albuquerque. This system provides a capability to monitor the status, location and maintain real-time communications 24 hours a day, 365 days a year, with every convoy. The control center maintains an emergency contact directory of federal, state, and local response organizations located throughout the contiguous U.S. This capability is available to OST 24 hours a day, 365 days a year.

A.5.4 Transportation Vehicles

The Safeguards Transporter (SGT) is a specially designed trailer for an 18-wheel rig that incorporates various deterrents to prevent unauthorized removal of cargo. The trailer has been designed to afford the cargo protection against damage in the event of an accident. This is accomplished through superior structural characteristics and a highly reliable cargo tie-down system similar to that used aboard aircraft. The tractors are standard production units which have been modified to provide protection against attack. The thermal characteristics of the SGT would allow the trailer to be totally engulfed in a fire without incurring damage to the cargo. These vehicles are equipped with communications, electronic, radiological monitoring, and other equipment that further enhance safety and security.

The vehicles used by OST must meet maintenance standards significantly more stringent than those for similar commercial transport equipment. All vehicles undergo an extensive maintenance check prior to every trip, as well as periodic preventative maintenance inspections. In addition, these vehicles are replaced more frequently than commercial shippers. As a result, OST experiences few en route breakdowns and has had no accidents due to equipment malfunction.

A.5.6 Travel Precautions

OST convoys do not travel during periods of inclement weather (ice, fog, etc.). Should the convoys encounter adverse weather, provisions exist for the convoys to seek secure shelter at previously identified facilities. Although OST provides sleeper berths in all vehicles, couriers accompanying OST shipments do not exceed 32 hours of continuous travel without being afforded the opportunity for eight hours of uninterrupted, stationary bed rest. OST has also imposed a maximum 65 miles per hour speed limit on its convoys, even if the posted limit is greater.

A.5.7 Law Enforcement Liaison

OST has a liaison program through which it communicates with law enforcement and public safety agencies throughout the country, making them aware of these shipments. OST has established procedures should a Safeguards Transporter be stopped by an officer. The liaison program provides law enforcement officers information to assist them in recognizing one of these vehicles should it be involved in an accident, and what actions to take in conjunction with the actions of the couriers in the rig and escort vehicles. Through the liaison program OST offers in-depth briefings at the state level.

A.5.8 Armed Couriers

Armed nuclear materials couriers accompany each shipment containing special nuclear material. They also drive the highway tractors and escort vehicles while operating the communications and other convoy equipment. Couriers are non-uniformed federal agents and are authorized by the *Atomic Energy Act* to make arrests and carry firearms in the performance of their duties. They carry both a photo identification card and a shield that certify their federal status. Couriers are required to obey all traffic laws and to cooperate with law enforcement officers.

After careful screening and selection, courier trainees undergo a 16-week basic training course, during which they receive instruction in tractor-trailer driving, electronic and communications systems operation, and firearms. Tests in operating procedures, physical fitness, driving, firearms, and other job-related subjects must be passed in order to pass the training and be certified as a courier. Following basic training, the courier spends the balance of the first year in on-the-job training. The first year of employment is probationary, which the courier must successfully complete to be retained. Couriers are given in-service training throughout their careers. These classes are designed to refresh and update the training taught during basic training, in addition to preparing couriers for demonstrations or armed attacks. Subjects such as team tactics, terrorist tactics, and new adversary technology are taught. Additionally, physical and firearm proficiencies are tested.

Couriers must continue to meet periodic qualification requirements relative to firearms, physical fitness and driving proficiency. They must also undergo and pass an annual medical examination for continued certification under the DOE Human Reliability Program. In addition, couriers are subject to the DOE's randomized drug and alcohol testing program. If a courier fails to meet any of the minimum requirements necessary for courier certification, the individual is temporarily removed from active status and provided additional training until demonstrated performance reaches an acceptable level.

OST operations are in compliance with the requirements of 49 CFR Part 177 for selecting, notifying drivers of, and adhering to preferred routes. The majority of OST travel, is over interstate highway; the remaining is over routes that meet the conditions for deviating from the preferred route. Regulations permit deviation from the preferred route when safety or security requirements dictate such deviation. Regulations permit OST deviation from the requirements regarding notification of the routes used. Routes used are classified, compartmented information that may not be disseminated except to persons with appropriate security clearance and a need to know.

All SGT couriers wear radiation dosimeters. Because of the nature of the material and the design of the containers, the transport of both nuclear explosives and plutonium/uranium weapons components has led to ionizing radiation doses to SGT couriers. SGT couriers are required to inspect the cargo within the trailer prior to shipment. This action is the primary contributor to dose for the crew.

A.5.9 Results

The major radiological transportation actions involving Category I SNM would be as follows:

- Canned subassemblies (CSAs) (assume approximately 200 units per year for the No Action Alternative, UPF Alternative, and Upgrade in-Place Alternative; and 10 to 50 units per year for the Capability-Based Alternatives) would continue to be shipped between Pantex and Y-12.

CSAs that may contain HEU and DU are shipped between Pantex and Y-12. CSAs are transported intersite by SGTs in DOT-criteria Type B packages. The actual number of CSAs shipped to and from Pantex is classified. When a shipment of CSAs is made from Pantex, the containers, staged in an approved storage facility, are loaded onto a pallet and driven by electric forklift to a loading dock. These containers are loaded and secured into an SGT that is then driven to Y-12. Arriving containers are unloaded and brought into a facility where a transfer check is performed. The transfer check confirms the identity and quantity of the shipment and verifies the integrity of the tamper-indicating devices on the containers.

Table A.5-1 presents the estimated radiological impacts of the annual transportation activities associated with the assembly/disassembly and high explosives (AD/HE) mission at Pantex and a 200 unit capacity for CSAs at Y-12. The radiological incident-free impacts provided in the following sections are an estimate of latent cancer fatalities due to exposure of radiation from the radioactive materials payloads proposed in the SPEIS alternatives. The RADTRAN 5.6 computer analyzes the exposure within a half-mile zone surrounding the transportation routes.

Table A.5-1. Annual Radiological Transportation Impacts – No Action Alternative, UPF Alternative, Upgrade in-Place Alternative.

Movement Description	Transportation Segment	Estimated Health Impacts (LCFs)		
		Accident	Incident-Free	Total
CSAs	Handling	Note 1	0.0224	0.0224
	Intersite Transportation	1.51×10^{-19}	0.00145	0.00145
	Stops		2.73×10^{-9}	2.73×10^{-9}
	MEI		1.51×10^{-9}	1.51×10^{-9}

Source: NNSA 2008.
Note 1: accident impacts associated with handling accidents are included in the accident analyses for the Y-12 No Action Alternative.
Assumptions: All materials in metal form
ES-3100 or similar container used
Release and aerosol fractions based on West Valley Demonstration Project (WVDP) Waste Management EIS (DOE 2003c) values, which were determined to bound release fractions for pits and secondaries.

With respect to accident impacts, RADTRAN calculates risks and consequences of potential accidents based a number of input parameters including:

- Probability and severity fraction of accident types;
- Deposition velocity of the material;
- Release fraction from the container;
- Aerosol and respirable factors for the material; and
- Weather conditions.

The inputs for the materials, containers, and vehicles were adopted from industry standards. The probability and severity fractions were taken from the West Valley Demonstration Project Waste Management EIS (DOE 2003c). The weather conditions were based on Pasquill weather stability classes. Analyses were conducted in Stability Class D (most frequently occurring weather conditions) and Class F (stable weather conditions). All results presented in this chapter are for the stability class, which yields the more conservative case.

The maximally-exposed individual (MEI) results represent health impacts to a theoretical person who would receive the maximum exposure due to the proposed transportation. Often the MEI represents personnel associated with the material transport, such as a vehicle escort.

Handling impacts reflect the sum total exposure impacts to crews involved in the storage, packaging, and loading/unloading of the material to be transported. The number of personnel, time spent handling the material, and distance to the material are dependant on the individual transportation campaigns.

The impact results at stops are presented for two theoretical receptor groups: the worker at the truck stop and residents that live within a half-mile radius of the truck stop. An average suburban population density is assumed for the area residents results. Table A.5-2 presents the estimated nonradiological impacts for the No Action Alternative, UPF Alternative, and Upgrade-in-Place Alternative.
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Table A.5-2. Annual Nonradiological Transportation Impacts – No Action Alternative, UPF Alternative, and Upgrade-in-Place Alternative

Origin/ Destination Pair	Material Shipped	Total Mileage	Number of Accidents	Number of Accident Fatalities	Number of Nonradiological Emissions Fatalities
Pantex/Y-12	CSAs	17,700	6.06×10^{-3}	2.93×10^{-4}	3.41×10^{-5}

Source: NNSA 2008.

The impacts of transportation for the Capability-Based Alternative would be approximately one-fourth as much as the impacts presented in Tables A.5-1 and A.5-2 for the 50 unit option, and approximately one-twentieth as much for the No Net Production/Capability-Based Alternative.