

Site Summary – Building 4024

Site Identification:

Building 4024
Development Test Laboratory
Systems for Nuclear Auxiliary Power (SNAP) Environmental Test Facility (SETF)
Includes Building 4928, Cooling Tower
Includes Building 4725, Substation

Operational Use/History:

- Constructed in 1960.
- Building 4024 was used for testing SNAP reactors in a simulated operational environment. It was enlarged in 1962 to provide a second control room and increased operating equipment area.¹
- Prototype reactor SNAP 2 Demonstration Reactor (S2DR) operated for 5,000 hours at 30 and 50 kWt in the east cell between April 1961 and December 1962.¹
- Prototype SNAP 10 Flight System (S10FS-3) reactor operated for 10,000 hours at about 40 kWt in the west cell between January 1965 and March 1966.¹
- SNAP Critical Assembly 4B, operated in the east cell for a short time at low power.¹
- SNAP Transient Test (SNAPTRAN-1) support reactor, also critical, operated in the east cell for a short time. Typically SNAPTRAN-1 was operated at low power, except for some pulsed operation. This reactor last operated in 1971. It was the last reactor to be tested in Building 4024.¹

Site Description:

- Building 4024 consists of two levels, one at ground level and a sub-grade basement.²
 - The areas within (and associated with) Building 4024 included: a high bay, including cell complex and operating gallery, a general support and operating area, a mechanical/electrical support area, and a yard.
- Building 4024 is constructed of aluminum siding, steel framing, some flooring and concrete.²
- The basement consists of a cell complex with two power test cells and a cell-transfer lock. This complex is constructed of shielded concrete walls ranging from two feet to nine feet thick, penetrated by various through-tubes, conduits and cooling pipes.¹
- Below-ground radioactive waste storage facilities are located under asphalt in the yard.¹ The buried tanks include:
 - Three radioactive gas holdup tanks 6 feet in diameter and 40 feet long.
 - Eight solid radioactive waste storage vaults 3 feet in diameter and 4 feet deep.

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- Two 500-gallon liquid radioactive waste holdup tanks.
 - The tanks were placed on top of a concrete box filled with gravel designed to contain any accidental leakage.
- All non-radioactive sewage wastes are collected by a sanitary sewer system.¹
- All wash-down water and emergency releases from the cooling systems are routed to the underground liquid waste holdup tanks via floor sinks and buried drain lines.¹
- Serviced by Substation 4725.
- Serviced by Cooling Tower 4928.

Relevant Site Information:

- Potential radiological hazards are limited to the high bay area (including cell complex), electrical/mechanical support and yard areas.¹
 - Two general areas of concern in the high bay are the cells and the S10FS-3 reactor support equipment room.
 - The electrical/mechanical support area contains systems for gas and exhaust filtering, shield cooling water and a vacuum cleaner, all of which are potentially contaminated.
- As a result of exposure to neutrons escaping from the two operating reactors, the walls, ceiling, floor and remote handling equipment of the test cells were activated.¹
- There have been several incidents associated with Building 4024 that could have resulted in a release to the environment.
 - On March 6, 1962, a welder was burned with NaK in the high bay (A0535).
 - On February 19, 1970, maintenance workers unknowingly worked on contaminated general mills (A0634).

Radiological Surveys:

- In September 1978, prior to partial unrestricted release, surveys were conducted to ensure that the facility met unrestricted release criteria.³
 - No contamination in excess of 50 dpm/100 cm² was found.
 - No alpha activity was detected anywhere in Building 4024.
 - Beta-gamma surface contamination limits were 0.1 mrad/hr, and the maximum beta-gamma surface contamination detected outside of the power vaults was 0.07 mrad/hr with an average background of 0.05 mrad/hr.
 - Inside the power vaults, beta-gamma surface contamination was found to range from 0.5 mrad/hr to 2.5 mrad/hr.
 - Inside the corridor to the power vaults, beta-gamma surface contamination ranged from 0.02 mrad/hr to 1.8 mrad/hr.
 - Soil samples were collected in the yard and all samples were less than 30 pCi/g. Background is 20-30 pCi/g.
 - Concrete cores drilled in the power vault walls and corridor were found to have a maximum specific activity of 818 pCi/g. The average specific activity was 103 pCi/g.

- All water samples from the drain pipe in the operating gallery, the hot waste storage vault, cooling system water waste holdup tanks, ground water during the removal of waste tanks and the vacuum cleaning line to the west power vault were below 2.2×10^{-7} $\mu\text{Ci/ml}$, which is below the limit of 3×10^{-7} $\mu\text{Ci/ml}$ for Sr-90.
- On March 26, 1981, additional concrete sampling in the power vaults began to determine the amount of concrete they needed to remove to meet unrestricted release criteria.¹
 - The survey indicated that 12 to 22 inches of concrete would need to be removed for surface radiation to meet the acceptable dose rate of 0.1 mrad/hr.
 - Only two radionuclides, Co-60 and Eu-152, were found to contribute significantly to radiation greater than background.
- In September 1995, ORISE Conducted an independent verification survey.²
 - Surface scans were performed over 50 to 100% of accessible floors and lower walls (up to 2 meters) for alpha, beta and gamma activity.
 - In the fan room, elevated direct beta radiation was identified.
 - In all other areas, alpha, beta and gamma radiation were within the range of ambient site background.
 - Surface activity measurements were conducted at 76 floor and wall locations.
 - Excluding the power vaults, surface activity levels were less than 55 dpm/100 cm² for alpha and ranged from less than 1,400 to 33,000 dpm/100 cm² for beta.
 - Removable alpha: less than 12 dpm/100 cm².
 - Removable beta: less than 16 dpm/100 cm².
 - Maximum beta-gamma total surface activity guideline (15,000 dpm/100 cm²) was exceeded in the hot gas compression room of Building 4024.
 - Exposure rate measurements were made at four locations in Building 4024, but none were made in the power vaults.
 - Excluding the power vaults, exposure rates ranged from 11 to 13 $\mu\text{R/hr}$. Background was 8 $\mu\text{R/hr}$.
 - Interior exposure rates satisfy Department of Energy (DOE) and Nuclear Regulatory Commission (NRC) exposure rate guidelines.
 - ORISE determined that existing documentation for Building 4024 was inadequate to support the determination that DOE guidelines for unrestricted release were met.
- Additional concrete core data taken in 2003 indicates activation with a maximum of 9.3 pCi/g of Co-60 and a maximum of 105 pCi/g of Eu-152. Measurable activation exists only within the inner 16 inches of concrete of the two power test cells.⁴

Status:

- Decontamination and disposition (D&D) of Building 4024 began on August 27, 1977, and concluded sometime before September 1, 1978.³

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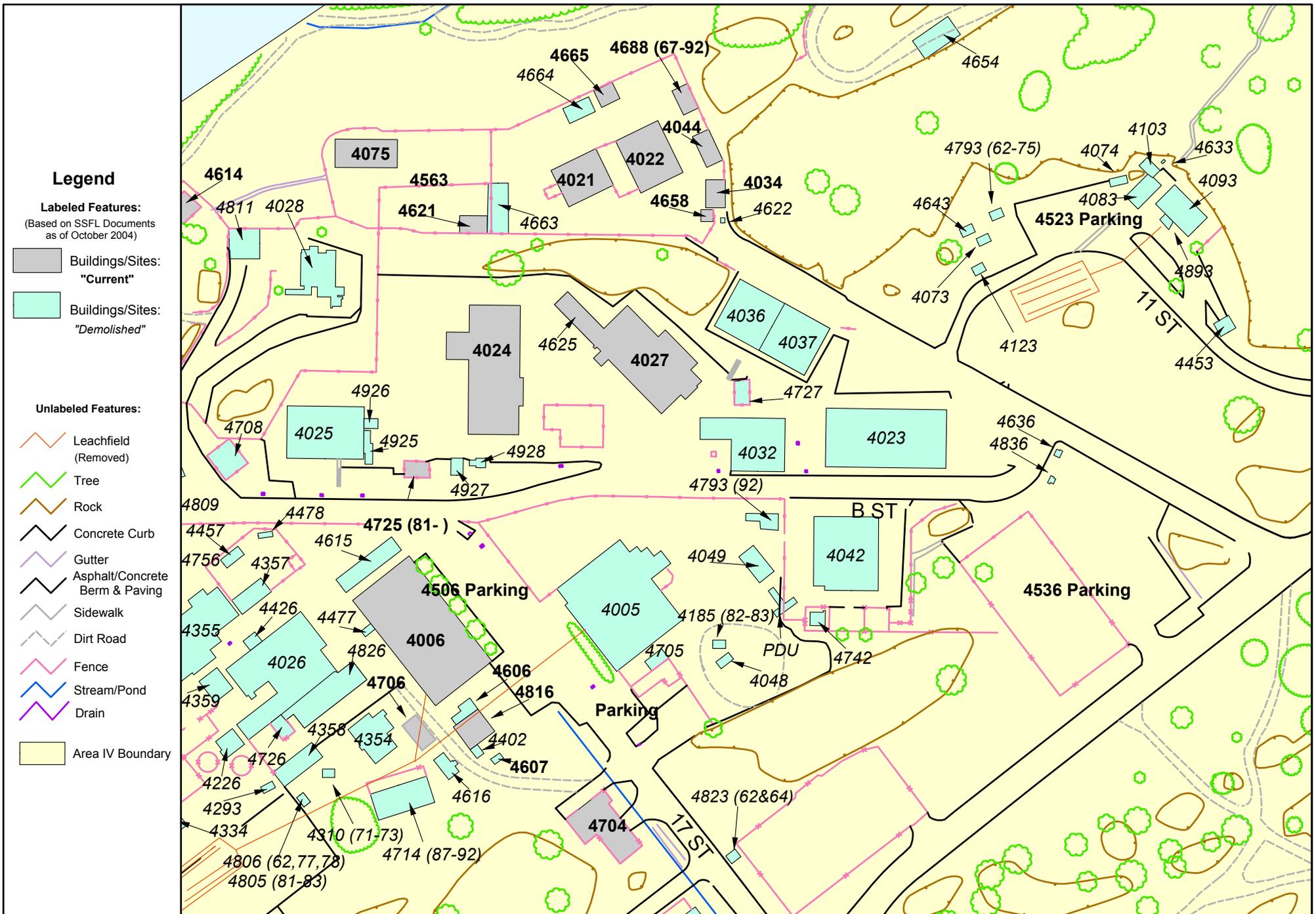
- Within the vaults, all components such as rails, fixtures, surface mounted conduits and all wires in through-tubes were removed between August 1977 and September 1978.
- The vacuum system, piping and tanks, and concrete seal door with an 18-inch diameter gas exhauster pipe were removed.
- The liquid and gas waste holdup tanks and associated piping were removed.
- All contaminated or activated components throughout the facility were packaged for offsite burial or decontaminated to meet applicable limits.
- All areas of Building 4024 except the two power test vaults were determined by survey to be suitable for release for unrestricted use.³
- The power test vaults are restricted and have remained in surveillance and maintenance mode since September 1, 1978.²
- Additional decontamination of Building 4024 is planned for FY 2004.

References:

- 1- Atomics International Document, N704FDP990006 Rev. A., "Building T024 (SETF) Facilities Dismantling Plan," July 31, 1981.
- 2- ORISE Report, 96/C-5, "Verification Survey of Buildings T019 and T024, Santa Susana Field Laboratory, Rockwell International, Ventura County, California," February 1996.
- 3- Rockwell International Document, N704TI990044, "Radiological Survey Results—Release to Unrestricted Use, Building 024, SSFL," November 28, 1978.
- 4- Personnel Interview, Phil Rutherford, September 18, 2003.
- 5- Historical Site Photographs from Boeing Database.
- 6- SSFL Area IV, ETEC Industrial Planning Maps, 1962-1992.

Photograph – Building 4024

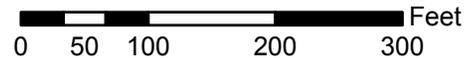




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1 inch equals 150 feet



DATE:

May 2005

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 AREA IV
 Santa Susana Field Laboratory, CA