

Site Summary – Building 4009

Site Identification:

Building 4009
Organic Moderated Reactor (OMR)
Sodium Graphite Reactor (SGR)
Includes Buildings 4709, Substation

Operational Use/History:

- Constructed in 1958.
- Originally constructed to house the OMR Critical Facility and the SGR Critical Facility.
- The OMR was a low-power critical experiment facility for testing reactor geometries and fuel elements in a reactor moderated and cooled by organic liquids.¹
- The SGR was a low-power critical experiment facility for testing fuel and sodium configurations in a reactor cooled by sodium and moderated by graphite.¹
- Both OMR and SGR operated from 1958 to 1967.¹
- In 1967, all equipment associated with the OMR and SGR was removed.¹
- In the 1980s and early 1990s the facility was used for storage and testing of Rocketdyne's In-Service Inspection (ISI) equipment.¹
- In the late 1980s, the west high bay was used for high-energy rate forging (HERF) that included handling of high-enriched uranium. Eight hundred pounds of depleted uranium was stored in the facility and shipped off site in the early 1990s.¹
- The California Department of Health Services (DHS) released the facility for unrestricted use in January 1999.²

Site Description:

- Building 4009 housed two different reactors. The SGR side consisted of a concrete high bay building 70 feet long by 40 feet wide with a 37-foot high concrete roof and housed the critical assembly cell and a fuel-and-graphite storage area. A concrete block penthouse containing the critical assembly control rod drive mechanisms sat above the critical assembly cell and was serviced by a 5-ton crane that sat above the facility. A contaminated waste holdup tank was buried to the northeast of the SGR side. The adjoining low bay area was a steel frame structure covered with insulated sheet metal and a tar/gravel roof. The low bay supported both sides of the facility housing control rooms, offices and miscellaneous supporting laboratories. The OMR side consisted of a concrete shielded high bay containing the critical assembly area and fuel storage. It was approximately 35 x 63 feet with shield thickness ranging from 1 to 4 feet (depending on height and location) with a built up roof (no shielding). A 45-foot

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stack was used to discharge exhaust and a leach field is located to the north of the facility as a whole.³

- Serviced by Substation 4709.

Relevant Site Information:

- There have been two incidents associated with Building 4009 that could have resulted in a release to the environment.
 - On July 5, 1961, employees noticed two 1-gallon containers of uranium carbide fuel were bulging at the tops and bottoms. The containers were transferred to the Hot Lab hood where the first lid was pried off, causing a violent reaction due to the release of gasses. When air reached the uranium powder on the slugs, the powder ignited. The resulting fires were smothered with G-1 powder and placed in cutting oil. The opening of the second can occurred in the same way, but no explosion resulted. All contamination was contained in the Hot Lab and there was no damage to equipment or personnel (A0378).
 - On June 11, 1964, three to four Ci of tritium target material for the accelerator was changed without monitoring (A0372).

Radiological Surveys:

- In 1985, Rockwell International performed a radiological survey to clarify and identify those areas needing further radiological inspection and/or decontamination. The report was issued in 1988. The survey covered the OMR side of the facility, the exterior of the facility to the northwest (including the leach field), and the SGR holdup tank through swipe sampling, an ambient gamma exposure survey, and gamma spectrometry of various samples.³
 - Total-average alpha: -3.7 dpm/100cm² average and 92.0 dpm/100cm² maximum (limit is 5,000 dpm/100cm²).
 - Total-average beta: 300 dpm/100cm² average and 745 dpm/100cm² maximum (limit is 5,000 dpm/100cm²).
 - Removable alpha: 0.2 dpm/100cm² average and 15.4 dpm/100cm² maximum (limit is 1,000 dpm/100cm²).
 - Removable beta: 3.4 dpm/100cm² average and 12.5 dpm/100cm² maximum (limit is 1,000 dpm/100cm²).
 - Ambient gamma exposure rates adjusted for background: -0.03 μ R/h average and 2.8 μ R/h maximum (limit is 5 μ R/h above background).
 - Samples of various substances were collected from the facility: grease and sludge were collected from catch pans, sink drains, holdup tank and shower drains. Only the sludge sample from the SGR holdup tank showed any gamma peaks or detectable beta activity. An analysis of the sludge from the holdup tank showed U-238, U-235, Th-232, and Cs-137 decay chains. All isotope concentrations were below hazard levels and acceptable limits for unrestricted use.

- The survey results concluded that, while there was some measurable contamination, it was all below the acceptable limits and therefore did not warrant further investigation.
- Rockwell International performed a radiological survey of the drain system excavation in 1989 to determine if any contamination had escaped the system and remained in the soil. The survey included the drain line excavation by taking soil samples.⁴
 - The survey concluded that no residual contamination was present in the soil surrounding the drain lines.
 - Only man-made radionuclides were found in the soil and they were all below the background levels measured during the Area IV survey from July to October 1988:
 - U-238, 0.64 pCi/g (background is 1.1 pCi/g).
 - U-235, 0.02 pCi/g (background is 0.04 pCi/g).
 - Th-232 0.97 pCi/g (background is 1.7 pCi/g).
 - K-40, 15.3 pCi/g (background is 22 pCi/g).
- Rockwell International performed a radiological survey in 1995 to ensure that there was no residual contamination that would pose any threats to the Advanced Programs personnel working in the building. The survey covered the facility through direct radiation level measurements, smear samples, ambient gamma radiation survey and concrete samples. Direct and removable contamination results are given as above or below acceptance limits.⁵
 - The survey concluded that the facility was not contaminated and was a safe working environment.
 - All direct radiation readings for contamination showed <500 dpm/100cm² alpha and <5,000 dpm/100cm² beta gamma.
 - All smear samples for removable contamination showed <20 dpm/100cm² alpha and <100 dpm/100cm² beta gamma.
 - Net ambient gamma exposure rates were measured at 4.0 µR/hr (limit is 5.0 µR/hr above background).
 - Concrete samples contained:
 - Co-60, 0.03 pCi/g (limit is 1.9 pCi/g).
 - Eu-152, 0.06 pCi/g (limit is 4.5 pCi/g).
 - Eu-154, 0.04 pCi/g (limit is 4.1 pCi/g).
- DHS performed a confirmatory survey in 1995 to support the 1995 Rockwell survey. The survey covered the same area as the Rockwell survey.⁶
 - The survey concluded that the facility was suitable for occupancy/use by Rockwell and their contractors.
 - No report was provided.
- Rockwell International performed a radiological survey of the roof in 1995 to determine if contamination was present before removal of the roof for new construction.⁷

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- The survey concluded that there was no contamination and the roof could be removed.
- During the 1996 Area IV Radiological Characterization Survey, soil samples were taken at two different locations in the vicinity of Building 4009. None of the measurements were distinguishable from background and all the measurements were below the acceptable concentration levels established by Boeing and presented in document N001SRR140131.⁸
- DHS performed a final release survey in September 1998 for the entire facility.²
 - The survey concluded that the facility met unrestricted release criteria.
 - No report was provided.
- Boeing performed a radiological survey on the facility septic system in 2002. The survey covered the septic system components through swipe samples and a direct frisk survey.⁹
 - All samples showed that contamination was below the acceptable removable contamination limits of 20 dpm/100cm² alpha, 100 dpm/100cm² beta.
 - No detectable beta gamma activity was discovered in any samples.
 - No gamma exposure rates above background were detected.

Status:

- DHS released Building 4009 for unrestricted use in January 1999.²
- Currently, the building is used for non-nuclear research and development.

References:

- 1- Phil Rutherford Website, <http://rdweb/shearadiationsafety/>, accessed August 2003.
- 2- DHS, Untitled Letter, from D. Wesley (DHS) to J. Barnes, January 20, 1999.
- 3- ETEC Document, GEN-ZR-0014, "Radiological Survey of Building T009," August 26, 1988.
- 4- Rockwell International Report, N704SRR990032, "Final Decontamination and Radiological Survey of Portions of Building T009," December 1990.
- 5- Rockwell International, Letter, "Building 009 Use by Advanced Programs Personnel," from P. Rutherford (Rockwell International) to C. Butler, March 1, 1995.
- 6- DHS, Letter, "Radioactive Material License Number 0015-70," from P. Baldenweg (DHS) to P. Rutherford, February 24, 1995.
- 7- Rockwell International, Letter, "B/009 Roof Survey," from P. Rutherford (Rockwell International) to C. Butler, May 4, 1995.
- 8- Rocketdyne Document, A4CM-ZR-0011, Rev. A, "Area IV Radiological Characterization Survey," August 15, 1996.
- 9- Boeing Radiation Safety Records Management System (File Drawer 133-B, "Building T009 Field (Septic System)," July 10, 2002.
- 10- Historical Site Photographs from Boeing Database.
- 11- SSFL Area IV, ETEC Industrial Planning Maps, 1962-1992.

Photograph – Building 4009



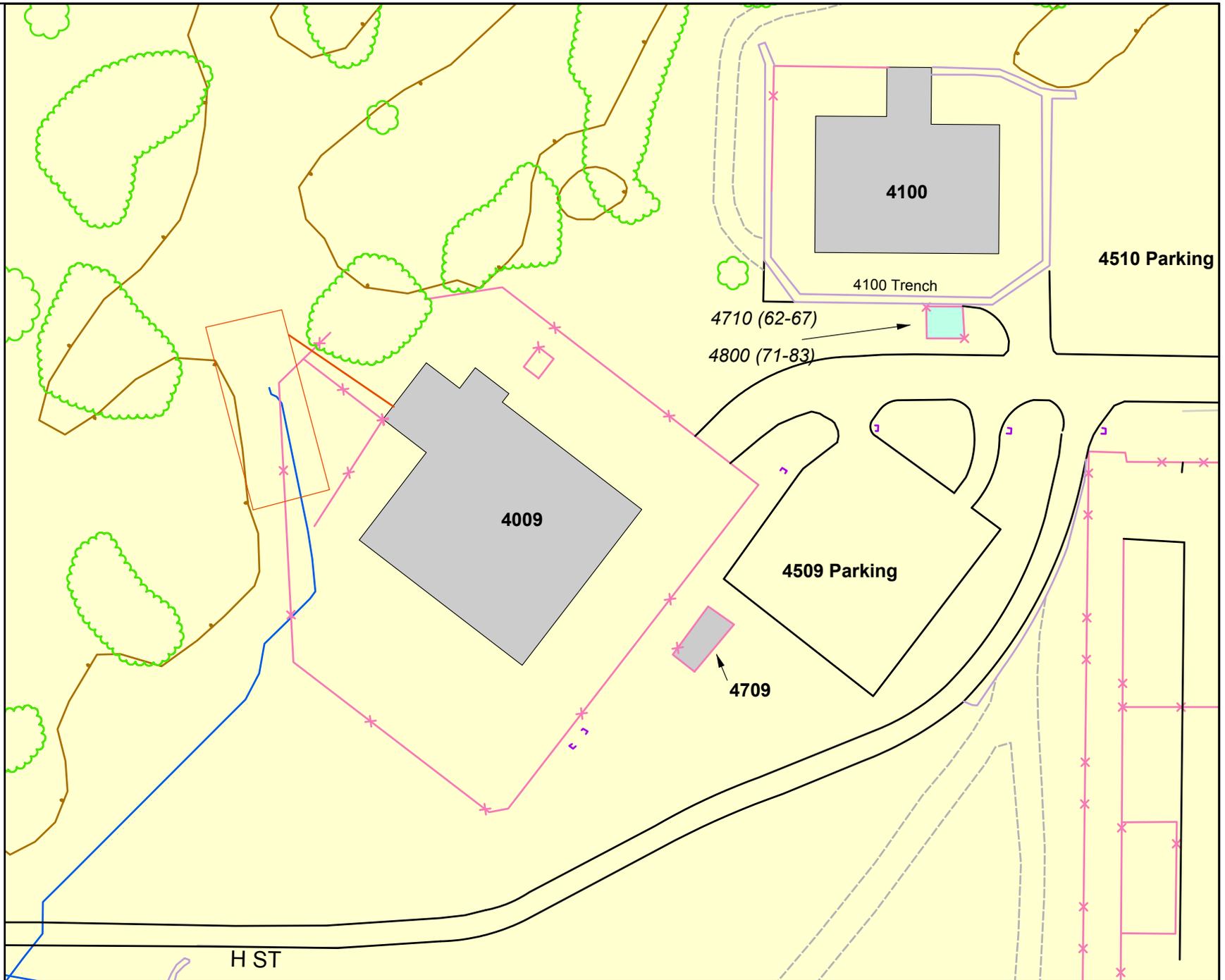
Legend

Labeled Features:
(Based on SSFL Documents
as of October 2004)

-  Buildings/Sites:
"Current"
-  Buildings/Sites:
"Demolished"

Unlabeled Features:

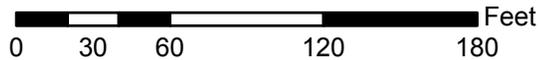
-  Leachfield
(Removed)
-  Tree
-  Rock
-  Concrete Curb
-  Gutter
-  Asphalt/Concrete
Berm & Paving
-  Sidewalk
-  Dirt Road
-  Fence
-  Stream/Pond
-  Drain
-  Area IV Boundary



DRAWN BY:



1 inch equals 75 feet



DATE:

May 2005

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AREA IV
Santa Susana Field Laboratory, CA