

A Radiological History of the Sodium Disposal Facility

History and Operations:

The Sodium Disposal Facility (originally called the Sodium Burn Pit) was built to clean non-radioactive metallic sodium and NaK (a mixture of sodium and potassium) from various scrap test components (pumps, valves, etc.). It was also used to treat non-radioactive waste sodium and NaK, and to burn non-radioactive combustible liquid waste (oils, etc.). The facility consisted of a large, rectangular, concrete-lined pit filled with water, surrounded by a concrete slab, plus two shallow water-filled, unlined basins or ponds, a small building (Building 4886) and steam lance cleaning equipment. The Sodium Disposal facility operated from 1956 to 1978.

Components to be cleaned were placed on the slab, opened to expose the sodium or NaK, and then washed off with water. The water reacted with the sodium to generate hydrogen, which often burned in the air (hence the name 'burn pit'). The washed items were then often placed into the pit, where the reaction with water continued, and then removed from the pit and placed into one of the basins, where they were allowed to remain until any residual sodium and/or NaK was reacted. They were then retrieved and disposed of off-site as solid waste.

The sodium-water and NaK-water reactions also generated sodium hydroxide and potassium hydroxide, which subsequently reacted with carbon dioxide in the air to form sodium carbonate and potassium carbonate, both non-hazardous materials.

Combustible non-radioactive liquids such as oils or biphenyls (an organic material used as a heat transfer fluid) were burned near the concrete-lined pit. Mercury, PCBs, dioxins and TCE have also been found at the Sodium Disposal Facility.

The Sodium Disposal Facility was never intended for use or disposal of radioactive materials, however it is clear that controls in place at the time were not adequate to prevent some contaminated equipment from being taken to the facility and treated as described above. Subsequent pre-excavation surveys and soil sampling (see below) showed that the Sodium Disposal Facility was not only contaminated with a variety of chemicals but also radioactively contaminated.

Radiological Sampling and Remediation:

Following termination of operations at the Sodium Disposal Facility in 1978, limited cleanup and removal of equipment and debris was performed in the late 1970s and 1980s. Periodic radiation surveys and soil sampling performed during 1978-1983 indicated low levels of radioactive contamination, principally in the lower pond, and principally cesium-137. Limited removal of debris and contamination was done during this period. No contamination was identified in the areas outside the ponds.

A chemical survey (CERCLA Phase II) was conducted in March 1987 (Reference 1). Known areas of radiological contamination were avoided during this survey.

Following the CERCLA survey, a comprehensive radiological survey was performed in 1987-88, in areas surrounding the two open pits (Reference 2). No evidence of radiological contamination was found in surrounding areas or drainage channels.

In 1991 the California Regional Water Quality Control Board (RWQCB) issued an order under the California Toxic Pit Cleanup Act (TPCA) to remove all contaminated material from the lower pond.

Prior to excavation Rocketdyne conducted a comprehensive baseline radiation exposure survey of the entire Sodium Disposal Facility area including the upper and lower ponds, the western area and northern drainage areas (Reference 3). Elevated radiation levels were found in only the lower pond, the highest being 27.5 $\mu\text{R/hr}$, or approximately twice natural background levels.

All soil from the lower pond was excavated down to bedrock in 1992. Soil and debris was segregated into four waste streams; (1) clean, (2) hazardous waste, (3) radioactive waste and (4) mixed waste (hazardous and radioactive).

Following the lower pond excavation in 1992, the RWQCB sampled the lower pond on March 24, 1993 to confirm that all contamination had been removed. All radioactive sample analyses indicated only background levels of radioisotopes remained (Reference 4).

Following the lower pond excavation, Rocketdyne then performed limited excavation in the upper pond and western areas where buried debris had been identified. Most of the debris and soil removed was clean. However some soil and debris from the upper pond was identified as contaminated and disposed of as radioactive waste.

Upon completion of all excavation, over 9,000 cubic yards (9,000 metric tons) of soil had been excavated. This work was done under the oversight of the California Department of Health Services (DHS) and the Department of Toxic Substances Control (DTSC).

On June 10, 1993, the California Department of Health Services (DHS) took additional soil samples from the lower pond and recently excavated upper pond (References 5 and 6). Again, no contamination above background was found.

In all, only about 700 cubic yards (or 8% of the soil) was either radioactive or mixed waste. All radioactive soil was sampled and analyzed for radiological constituents. The total quantity of contamination in the soil was 6 millicuries of cesium-137 and 1 millicurie of strontium-90. Quantities of all other isotopes including uranium and thorium and their decay products were equal or less than that expected in clean soil. Although the soil was shipped to an NRC licensed low-level radioactive waste disposal

facility, the level of contamination in the soil was so low that Department of Transportation (DOT) regulations did not require the shipment to be classified as a radioactive waste shipment, and did not require the shipping trucks to be placarded with "radioactive material" signs.

In 1994, following completion of all excavation, Rocketdyne performed a radiation exposure survey of the entire SDF area including all the drainage channels. This survey was documented and submitted to the California DHS (Reference 7). Again no radiation anomalies were detected.

In 1995, an independent contractor (ICF Kaiser) took 78 soil and bedrock samples in the upper pond, lower pond, western area and both drainage channels. The samples were taken both on the surface and at depth, including bedrock. These samples were analyzed for radioisotopes by the Oak Ridge Institute of Science and Education (ORISE). The majority of samples were at or below background levels. Three samples identified cesium-137 at 0.3, 0.3, and 0.57 pCi/g and four samples identified strontium -90 up to 0.57 pCi/g. These levels are slightly above what is found naturally in soil locally, however the concentrations found were well within the range of levels found in soil across the United States, and well below regulatory agency approved residential cleanup standards. The USEPA has reported that the typical US background concentration of cesium-137 and strontium-90 is 0.7 pCi/g (Reference 8). A soil sample report (Reference 9) was prepared and submitted to the California DHS, with a request to release the facility for (radiologically) unrestricted use.

On July 29, 1996, the California DHS visited SSFL and took soil samples from the Sodium Disposal Facility lower pond and drainage channels. Results from this round of sampling again showed no radiological contamination above background (Reference 10).

In August 1996, Rocketdyne published a factsheet on the, then current, status of the Sodium Disposal Facility remediation. The factsheet was titled "Speaking of The Santa Susana Field Laboratory - The Former Sodium Disposal Facility" and was mailed to a large number of the neighboring community.

On September 16, 1997, the California DHS visited SSFL and took soil samples from the Sodium Disposal Facility upper pond and western area. Both surface and sub-surface core samples down to bedrock were taken. Results from this round of sampling again showed no radiological contamination above background (Reference 11 and 12).

Based on six independent rounds of surveys and soil sample investigations, the Sodium Disposal Facility has been found to be free of radioactive contamination that could result in any exposure or risk to any current or future user. The facility is therefore suitable for (radiological) unrestricted use.

On May 6, 1998, the DHS removed the Sodium Disposal Facility from California Radioactive Materials License 0015-19 (Reference 13), and formally released the facility for (radiological) unrestricted use (Reference 14).

Summary:

Without doubt, the Sodium Disposal Facility has had more than the usual scrutiny by multiple agencies and been subjected to no fewer than six post-remediation radiological surveys and sampling exercises.

As a result of the findings of no contamination by every one of these surveys, the California Department of Health Services released the facility for unrestricted use (References 13 and 14). The DHS/RHB sent DTSC two letters (References 15 and 16) explaining the concept of "release for unrestricted use" and stated that this action relieved Rocketdyne of any regulatory requirement to implement any further radiological controls relative to the Sodium Disposal Facility. This includes no requirement to monitor, sample or screen any soil taken from the Sodium Disposal Facility during the upcoming excavation.

Key Milestones:

Activity	Date	Reference
Sodium Disposal Facility - Period of Operation	1956 - 1978	
Various radiological surveys	1978 - 1983	2
CERCLA Phase II - Site Characterization	1987	1
Rocketdyne radiological survey of surrounding areas	1987-88	2
SDF lower pond excavation	1992	
RWQCB soil sample investigation	March 24, 1993	4
SDF upper pond & western area excavation	1993	
1st DHS soil sample investigation	June 10, 1993	5 and 6
Rocketdyne final radiation exposure survey report issued	January 5, 1995	7
2nd DHS soil sample investigation	July 29, 1996	10
Rocketdyne final soil sampling report issued	April 8, 1997	9
3rd DHS soil sample investigation	September 16, 1997	11
DHS releases facility for unrestricted use	May 6, 1998	13 and 14

References:

1. Rocketdyne Report GEN-ZR-0002, "CERCLA Program Phase II - Site Characterization." May 29 1987.
2. Rocketdyne Report GEN-ZR-0004, "Radiological Survey of the Sodium Disposal Facility - Building T886." June 27, 1988.
3. Rocketdyne Report N704SRR990034, "Baseline Radiological Survey of the Sodium Disposal Facility (T886)." August 31, 1992.
4. Summary Table of CEP results of samples taken by RWQCB on March 24, 1993.
5. California DHS/RHB internal memorandum from Steve Hsu. "Soil Released from Lower Pond of Sodium Burn Pit at SSFL." June 17, 1993.
6. California DHS/RHB Laboratory Results. February 14, 1994.
7. Rocketdyne Report 886-ZR-0007, "Post-Remediation Ambient Gamma Radiological Survey of the Former Sodium Disposal Facility (T886)." January 5, 1995.
8. EPA Guidance Document EPA 402-R-96-011 A, "Radiation Site Cleanup Regulations - Technical Support Document for the Development of Radionuclide Cleanup Levels for Soil." September 1994.
9. Rocketdyne Report 886-ZR-0009, "Post-Remediation Soil Sampling and Analysis for the Former Sodium Disposal Facility (T886)." Revision A. April 8, 1997.
10. California DHS/RHB internal memorandum from Hank Kocol to Fred Toyoma. "Comparison of Soil Results for Sodium Burn Pit Area." December 30, 1996.
11. California DHS/RHB Survey Report. "Confirmatory Survey: Soil Samples from the Former Sodium Disposal Facility." September 16, 1997.
12. California DHS/RHB internal memorandum from Roger Lupo to Fred Toyoma. "Former Sodium Disposal Facility located at Area IV Santa Susana Field Laboratory - ETEC." May 1, 1998.
13. Amendment 98 to California Radioactive Materials License Number 0015-19. May 6, 1998.
14. Letter from Gerard Wong (DHS/RHB) to Phil Rutherford. Untitled. Confirmation of the release of the Sodium Disposal Facility for unrestricted use. May 15, 1998.
15. Rocketdyne Report A4CM-ZR-0011. "Area IV Radiological Characterization Survey." August 15, 1996.

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16. Letter from Roger Lupo (DHS/RHB) to Gerard Abrams (DTSC). Untitled. February 18, 1999.
17. Letter from Edgar Bailey (DHS/RHB) to Wade Cornwall (DTSC). Untitled. February 23, 1999.