The decay of a cover gas sample taken on August 12, 1959 was followed for several days yielding the results shown in Table IV-C-9.

TABLE IV-C-9

DECAY OF REACTOR COVER GAS SAMPLE

Date	Activity ($\mu c/cm$)
August 14, 1959	0.87
August 28, 1959	0.15
September 3, 1959	0.08
September 14, 1959	0.025

A gamma scan of this sample on September 14, u ng the 256-channel analyzer, indicated 0.010 $\mu c/cm^3$ of Xe^{133} and 0.016 μc. m^3 of Kr^{85}. Based on this data, the specific activity at shutdown on July 26 c. nsidering only the Kr^{85} and Xe^{133} isotopes would have been about 7.4 $\mu c/cm^3$, almost all of which would be due to 5.3 day Xe^{133}. The contribution from other (short lived) Xe and Kr isotopes, would certainly result in a value well in excess of several hundred $\mu c/cm^3$. That such an extremely high concentration did in fact exist is borne out by the off-scale readings of decay tank activity (see Figure IV-C-1).

4. Activity in Gaseous Storage Tanks

The gaseous storage tanks are an integral part of the gaseous radioactive waste handling system, receiving activity from the sodium fill tank (communicating directly with the reactor cover gas), the wash cells, and the fuel handling cask.

There are four storage tanks, each of which have a capacity at 100 psig of 2700 ft^3 at STP. When the activity in the tanks is determined to have reached a sufficiently low value, the gas may be bled from the storage tanks through a flow-rate meter and discharged out the building vent line. Activity is released only when calculations indicate that levels at the discharge point (stack) will be less than $1 \times 10^{-7} \mu c/cm^3$. If the activity can be attributed solely to xenon, a value of $1 \times 10^{-5} \mu c/cm^3$ is permitted.

Radiation measurements of the activity level in the storage tanks are accomplished by the same sampling chamber utilized in sampling the reactor cover gas. A summary of data on the activity concentration in the storage tanks is shown in Figure IV-C-1 and in Table IV-C-10.

As was the case with the reactor cover-gas activity, the activity concentration in the gaseous storage tanks provides a great deal of insight into both the magnitude of the radioactivity release and the time of the release. From Figure IV-C-1, it can be seen that, in general, the storage-tank activity levels do not exceed $1 \times 10^{-3}\ \mu c/cm^3$. Slight increases detected in early and mid-December can be attributed to fuel washing operations. The increase to $7 \times 10^{-3}\ \mu c/cm^3$ on December 19, 1958 is due to the re-startup and power operation of run 8. The increase in activity following run 11 is, again, attributable to fuel handling operations. The increases in mid and late May are most probably attributable to the operation of the reactor at full power and not to fuel damage. This may be inferred since the activity level did not rise significantly above values usually encountered during or after previous power runs. Also, following run 13, a total of 17 of the fuel elements was removed from the reactor; visual examination with the TV camera indicated that all were in good condition.

The first storage tank sample taken on July 15, 1959, after the start of run 14, indicated an extremely high activity; so high in fact that the counter had not been calibrated in that range. The sample chamber itself read several mr/hr at the surface, which can be compared with the value of 30 mr/hr from the reactor cover-gas sample taken on July 18, 1959. From the fact that the activity in the storage tanks decayed continually following July 15, it can be concluded that most of the fuel damage must have occurred just after the start of run 14 (within the first 3 days).

5. Radioactivity in High Bay Area

a. Airborne Activity

High airborne activity concentrations in the high bay area, although not a frequent occurrence, have been detected occasionally throughout the history of the SRE. These instances can be associated with different types of events; e.g., on December 12, 1958, following fuel handling operations, several drops of sodium were noted on the indexing ring over the hot cell. These drops, which