The historic record of tsunami activity shows that the tsunami hazard for Honolulu, Hawaii, is small. Although the tsunami hazard is a significant threat to the Hawaiian Islands in general, especially the big island of Hawaii, large tsunamis are not considered a significant threat to Honolulu. Teleseismic tsunamis on record in the Pacific basin did not produce runups that would significantly affect the proposed irradiator. As stated in a May 2005 letter from the State of Hawaii's Transportation Department, "the south shore of Oahu has never sustained more than a 3 [foot] wave from any tsunami since 1837."[2] The letter goes on to state that tsunami hazards are not considered a significant threat to the safe operation of Honolulu International Airport.

To further constrain the potential for tsunami-generated runups to lead to a loss of control of radioactive material, a stylized fluid dynamic calculation was conducted. This calculation was made to determine the wave velocity necessary to pull a radioactive Co-60 source assembly out of the pool. This wave velocity was then evaluated with respect to potential tsunami-generated waves. The calculations are considered to place reasonable limits on velocity because they assumed a pool in which the accident caused the irradiator plenum and source holder structure to fail. Radioactive Co-60 source assemblies were thus released as single bodies inside the pool.

In the calculations, the irradiator pool was modeled as a two-dimensional cavity with an intact Co-60 source assembly resting on the bottom of the pool. The model assumed a wave of water will induce a shear force that will create a vortex inside the pool. This vortex will exert forces on the Co-60 source assembly and cause it to be displaced in the water. Under limiting conditions, the weight of a source assembly must be the same as the drag induced by the rotating fluid to be displaced. This drag force depends on a number of factors, including the effective area and orientation of the source assembly with respect to the fluid. Calculations were performed on a cylindrical source with an outer diameter of 1.27 cm [0.5 in], a length of 45.5 cm [17.9 in], and a mass equal to the mass of an intact capsule. The source was oriented as lying lengthwise on the bottom of the pool.

The calculations showed that a vertical velocity of 1.6 m/s [3.6 mph] is required to induce a drag force sufficient to lift the source assembly. This vertical velocity would be generated by a shear velocity of at least 160 m/s [360 mph]. The drag coefficient for the sphere was determined from standard drag curves (Fox, et al., 2006), and the correlation between the shear velocity and critical drag velocity were obtained from accepted published values (Bouffanais, et al., 2005).

At the shore, tsunami waves up to 10 m [32.8 ft] can reach velocities of 13 m/s [42.6 ft/s] (Chen, et al., 2003; National Aeronautics and Space Administration, 2006). This velocity is significantly less than that necessary to remove the source assembly from the bottom of the pool. Water velocities for smaller tsunami waves more typical for the southern shore of Oahu would be substantially slower than for the large waves and would likely not even reach the southern shore of the facility. The Oahu Civil Defense Agency flood maps (2006) for evacuation zones in the event of a tsunami show that Honolulu International Airport is above the evacuation zone. These calculations show that there is a negligible potential for tsunami waves to have sufficient velocities to remove the Co-60 source assemblies from the irradiator pool.

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[2]Schlapak, B.R. "Response to Fax Dated May 4, 2005, Asking Whether Lots #011109 and 011108 Are in a Tsunami Flood Evacuation Zone." Letter (May10) to M. Kohn, Equipment Team Hawaii, Honolulu, Hawaii. Honolulu, Hawaii: State of Hawaii Department of Transportation, Airports Division. 2005.

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