Community Window on the Hunters Point Shipyard

Hunters Point Shipyard Historical Radiological Assessment Volume II

What You Should Know About Radioactivity at Hunters Point Shipyard

The U.S. Navy and other tenants of Hunters Point Shipyard (HPS) used a variety of radioactive materials from the 1940's through the 1990's. These materials emit radioactivity that can penetrate skin, causing damage to cells that can lead to cancer. Some radioactive materials become harmless a few days after their production, and so are by now long gone from HPS; others continue to be hazardous for thousands or even tens of thousands of years. Some can be cancer-causing agents at a distance of several feet; others must be ingested or inhaled to cause harm. Radionuclides, or radioactive atoms, can be incorporated into chemical compounds within plants and animals and in the general environment. They can also become attached to the surfaces of all sorts of materials, most dangerously, to pollution particles in water and air.

Although radioactive materials were regulated by the federal Atomic Energy Commission (AEC) from 1946-1974, and by other federal agencies more recently, early environmental standards were not nearly as strict as those in place today. In the early days of activities, protection of the San Francisco Bay environment was not the Navy's top priority. Particularly during the early activities at HPS, scientists had little experience with many of the radioactive materials and were less aware of the potential long-term harm of low doses caused by radioactive pollution in the environment.

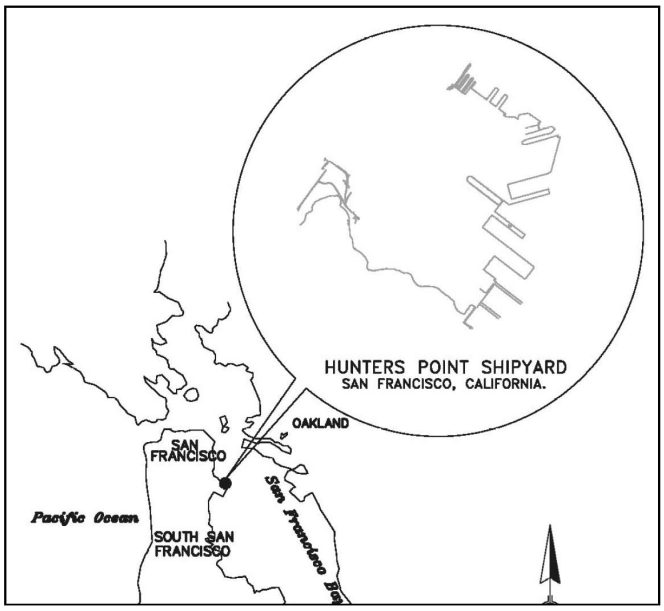


Figure showing location of Hunters Point Shipyard. From U.S. Navy's "Hunters Point Shipyard Historical Radiological Assessment Fact Sheet No. 4."

The Historical Radiological Assessment (HRA) describes a long and complicated history of the studies that have been made of radioactivity at HPS from 1946 to the present. Many of these studies have found contamination that was subsequently removed. However, the HRA concludes that many sites are either still contaminated and/or insufficiently studied. Contamination has been found in soils in many locations, and is suspected to exist in some unstudied buildings and in the drainage and sewage systems.

Radioactive Materials Used at Hunters Point Shipyard

The HRA provides a site-by-site inventory of where radioactive materials were used at HPS and when, according to U.S. Navy historical documents. It also provides an overview of the history of the use of general radioactive materials (GRAM) at HPS. (See page 4 for a description of some of the radionuclides used at HPS.) According to the HRA, some of the main uses of GRAM were as follows:

Luminescent Devices

These were painted with "glow-in-the-dark" paint, made primarily from radium-226 (Ra-226) in the 1940's, but also made from strontium-90 (Sr-90), tritium (H-3), and promethium-147 (Pm-147) in the 1950's. The use and disposal of these materials was not highly regulated at the time—they were buried in ordinary landfills and washed into drains. Ra-226 has an extremely long half-life; Sr-90 has a half life of about 30 years.

Gamma Radiography

This is a process similar to the familiar x-ray, except that penetrating radiation is produced by gamma-emitting radioactive material instead of through electrical means. It was used for checking the soundness of ship components during repairs. Ra-226 was initially used as a gamma emitter, followed by cobalt-60 (Co-60), cesium-137 (Cs-137), and iridium-192 (Ir-192). Canisters containing these materials were shipped to HPS from a manufacturer. Sources of the gamma-emitters were occasionally found to leak, and

although the canisters would have then been returned to the manufacturer, it is not known if the spills would have been cleaned. However, these materials were tightly controlled by the AEC and

Aerial photo of Hunters Point Shipyard. From U.S. Navy HRA.

should not have been disposed of at HPS. An independent shipbuilder used a portion of HPS from 1976 to 1987 and may have used gamma radiography sources and disposed of them on site.

Instrument Calibration

Containers of radioactive materials were also used to calibrate radiation detectors. Like the gamma radiography sources, these may have leaked at the site but their disposal was controlled by the AEC. Smaller containers used in field studies could be thrown out with ordinary garbage.

Operation Crossroads Decontamination

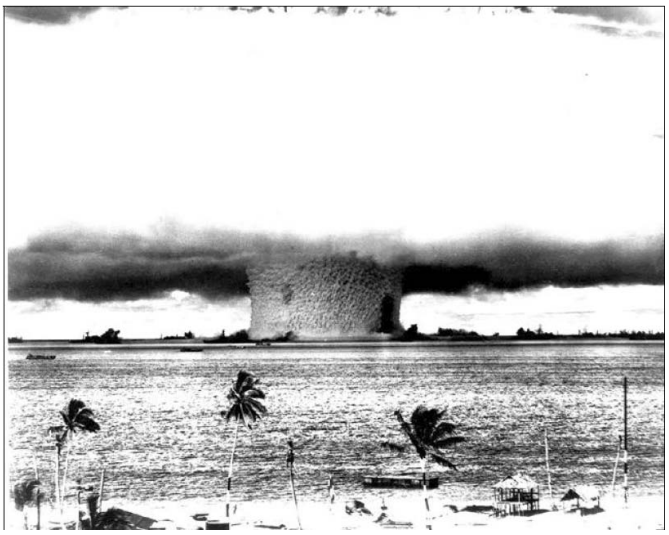
The US military tested two nuclear bombs underwater at Bikini Atoll in the Pacific in July 1946, a project referred to as Operation Crossroads. All ships involved in the operation were very heavily contaminated with fission products, including Sr-90 and Cs-137, as well as residual plutonium from the bombs. The most severely contaminated ships were eventually transferred to HPS for decontamination. Radioactively contaminated marine growth attached to ship hulls was removed with sandblasting. The contaminated sand from these operations was generally dumped offshore. The fuel oil of some ships was contaminated with plutonium and fission products and was burned on site, releasing the radioactivity into the air. A variety of contaminated materials were removed from the ships and stored or disposed of at HPS.

RSS/NRDL Operations

This organization (first named RSS (Radiation Safety Section), later the Naval Radiological Defense Laboratory (NRDL)) was involved in a wide variety of research using radioactive materials as well as further decontamination of ships from Operations Crossroads and other nuclear tests. They produced radioactive sources such as those described above, which involved manipulation of open containers of radioactive materials that were occasionally spilled. The NRDL also organized shipping of its own and others' radioactive waste from HPS to be dumped offshore near the Farallon Islands, involving storage of large quantities of these wastes at HPS. It built particle accelerators for research, which generated radioactive hydrogen (tritium). It collected and analyzed samples of fallout materials from nuclear test sites. It also tested the effects of radioactivity on animals. Throughout its existence, most activities of NRDL were regulated by the AEC.

Nuclear-Powered Ships

The Mare Island Naval Shipyard used berths and drydocks at HPS for the repair of nuclear-powered ships from 1985 to 1989. This was discussed in the HRA Volume I.



Operation Crossroads Bomb Test, Bikini Atoll, July 1, 1946. From U.S. Navy, http://www.chinfo.navy.mil/navpalib/ships/carriers/cv-hist3.html

Conclusions of the HRA

The HRA identifies 90 sites that were impacted by the use of radioactive materials. It concludes that 60 of these sites still need additional study and/or removal of radioactive contamination. Some of these sites are known to be significantly contaminated, although none are contaminated enough to be dangerous to humans in the short term. Most sites are contaminated primarily by radionuclides with medium-term hazardous lives, particularly by Cs-137 and Sr-90 from bomb

testing. However, some sites are also contaminated with long-lived radionuclides, such as Ra-226, and so require a very long-term assessment of the potential risk caused by the radioactivity.

According to the HRA, the other 30 sites either have already been released as non-hazardous or can be released pending review of final radiation surveys, which are already complete. Since these final surveys are not yet available to the public, it is difficult to assess whether the Navy has made correct assessments about the safety of these sites.

In addition to providing recommendations for future actions to be taken at impacted sites, the HRA assesses the overall likelihood of contamination at each site, the potential for contamination of various media—air, soil, surface water, etc.—and the potential for contaminant migration through each of these media. These assessments are fairly meaningless. For some sites it is clearly stated that studies have found them to be contaminated, yet their contamination potential is judged to be "unlikely". Even in cases where a specific media contains contamination, the contamination potential of that media is found to be "low" or "medium". There is no explanation in the document of how contamination potential is assessed, and even contaminated sites bordering the Bay are found to have low migration potential.

The public should not take the HRA as an assurance that "contamination is expected to be at low levels within the confines of HPS," nor that "potential pathways for contamination migration remain within the impacted site areas," as the HRA itself concludes. There has been little study of what it reports are some of the most problematic areas of potential contamination: the drainage and sewage systems. There has also been far too little study of underwater contamination at and near the site. It is also unfortunate that the final site status surveys from all 30 sites judged to be sufficiently studied and remediated are not available to the public. However, there is nothing in the report itself to suggest that there is cause for public alarm over radioactive contamination at HPS, nor does the report give evidence of any negligence on the part of the Navy in its work to study and clean up the Hunters Point area.

The information in this factsheet was prepared for Arc Ecology by Radioactive Waste Management Associates.

Information Sources:

U.S. Navy, 2004, Draft Final Historical Radiological Assessment (HRA), Volume II, Use of General Radioactive Materials (G-RAM), 1939 – 2003. February 27. http://www.efdsw.navfac.navy.mil/Environmental/Pages/hpHRA-Final.htm (last accessed 27 April 2004).

U.S. Navy, 2004, "Hunters Point Shipyard Historical Radiological Assessment Fact Sheet No. 4." http://www.efdsw.navfac.navy.mil/Environmental/pdf/hpfs1003.pdf (last accessed 27 April 2004).

U.S. Navy Office of Information, "A Brief History of U.S. Navy Aircraft Carriers, Part III — Post War (1945-1949)." http://www.chinfo.navy.mil/navpalib/ships/carriers/cv-hist3.html (last accessed 27 April 2004).

For More Information, Contact:

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Selected Radionuclides of Concern at Hunters Point Shipyard

Radionuclide	Half-Life*	Use or Origin	Specific Hazards
Cobolt-60 (Co-60)	5.27 years	Radioactivity source for radiography and instrument calibration	Harmful at long range as well as in inhalation or ingestion.
Cesium-137 (Cs-137)	30.1 years	Product of nuclear fission of uranium or plutonium during bomb testing	Harmful at long range as well as in inhalation or ingestion.
Tritium (H-3)	12.3 years	Produced as waste by nuclear reactors or particle accelerators	Harmful in inhalation or ingestion. As it is generally incorporated in water (H_2O), inhalation as water vapor and migration as a liquid are particular concerns.
Potassium-40 (K-40)	1,270,000,000 years	Naturally occurring as a very small percentage (0.012%) of total potassium in the environment. Not used specifically as radionuclide but is present in all potassium, which has a wide range of uses in industrial chemistry.	Harmful at long range as well as in inhalation or ingestion. Likely to be accumulated by plants and animals and transmitted through the food chain.
Plutonium-238 (Pu-238)	87.7 years	Produced in nuclear reactors/particle accelerators primarily for use in research. A minor component of fission bombs.	Harmful in inhalation or ingestion.
Plutonium-239 (Pu-239)	24,100 years	Produced in nuclear reactors/particle accelerators for use in fission bombs.	Somewhat harmful at long range but primarily dangerous in inhalation or ingestion.
Radium-226 (Ra-226)	1,599 years	Naturally occurring. Generated from the radioactive decay of Uranium-238.	Harmful at long range as well as in inhalation or ingestion. Decays into other radioactive radionuclides, so small amounts can be associated with high levels of radioactivity.
Strontium-90 (Sr-90)	28.78 years	Product of nuclear fission of uranium or plutonium during bomb testing	Particularly harmful in ingestion, as it mimics calcium in human, animal, and plant biochemistry and can accumulate in bones and teeth, causing life-long doses of radiation.
Uranium-235 (U-235)	704,000,000 years	Naturally occurring. Used as the power source for nuclear submarines and fission bombs.	Harmful at long range as well as in inhalation or ingestion.

* The half-life is the amount of time it takes for one-half of the radioactive material originally present to decay to a harmless state. After two half-lives, one-quarter of the original radioactivity will remain; after three half-lives, one-eighth will remain, etc.