



**Final**

## **Treasure Island Naval Station Historical Radiological Assessment**

### **FORMER NAVAL STATION TREASURE ISLAND, SAN FRANCISCO, CALIFORNIA**

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Prepared for:

**Base Realignment and Closure  
Program Management Office West  
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## LIST OF ABBREVIATIONS, ACRONYMS, AND SYMBOLS

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$\mu\text{Ci}$	microcurie
$\mu\text{Ci/cc}$	microcurie per cubic centimeter
$\mu\text{g}$	microgram
$\mu\text{rem/h}$	microrem per hour
AEA	Atomic Energy Act
AEC	Atomic Energy Commission
Am-241	americium-241
ARG	Auxiliary Internal Combustion Engine Repair Ship
ATF	Amphibious Tug Fleet
Ba-140	barium-140
Bay	San Francisco Bay
BCT	BRAC Cleanup Team
bgs	below ground surface
BEQ	bachelor enlisted quarters
BOQ	bachelor officers quarters
BPMOW	BRAC Program Management Office West
Br-82	bromine-82
BRAC	Base Realignment and Closure
BUMED	Navy Bureau of Medicine and Surgery
BUSHIPS	Navy Bureau of Ships
C-14	carbon-14
CAB	Citizens Advisory Board
CAE	Committee on Atomic Energy
Cd-109	cadmium-109
CDHS	California Department of Health Services
$\text{cm}^3$	cubic centimeter
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CERCLIS	CERCLA Information System
Ci	curie
CFR	Code of Federal Regulations
CNO	Chief of Naval Operations
CPO	Chief Petty Officer
Co-60	cobalt-60
COM	Commissioned Officers Mess
Cs-137	cesium-137
CSO	Caretaker Site Office
CWSF	Commander Western Sea Frontier



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## LIST OF ABBREVIATIONS, ACRONYMS, AND SYMBOLS

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DEA	Drug Enforcement Administration
D.C.T.C.	Damage Control Training Center
DERP	Defense Environmental Restoration Program
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
dpm	disintegration per minute
dpm/100 cm <sup>2</sup>	disintegration per minute per 100 square centimeters
DRMO	Defense Reutilization and Marketing Office
DTSC	Department of Toxic Substances Control
EFA WEST	Engineering Field Activity West, Naval Facilities Engineering Command
EPA	U.S. Environmental Protection Agency
ERDA	U.S. Energy Research and Development Administration
FFA	Federal Facility Agreement
FFSRA	Federal Facility Site Remediation Agreement
FS	feasibility study
FSS	final status survey
FTC	Fleet Training Center
G-RAM	general radioactive material
H-3	tritium
HLA	Harding Lawson Associates
HP	Hunters Point
HPNSY	Hunters Point Naval Shipyard
HPS	Hunters Point Shipyard
HRA	Historical Radiological Assessment
HRS	Hazard Ranking System
IAS	Initial Assessment Study
IR	Installation Restoration
K-40	potassium-40
K-42	potassium-42
kg	kilogram
kV	kilovolt
LLD	lower limit of detection
LST	Amphibious Tank Landing Ship
MARAD	Maritime Administration
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
mCi	millicurie
MDA	minimum detectable activity



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## LIST OF ABBREVIATIONS, ACRONYMS, AND SYMBOLS

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MeV	megaelectron volt
MI	Mare Island
MINS	Mare Island Naval Shipyard
MINSY	Mare Island Naval Shipyard
MOU	memorandum of understanding
mR/h	milliroentgen per hour
mrem	millirem
mrem/h	millirem per hour (also expressed as mR/h)
msl	mean sea level
MSTS	Military Sea Transport Service
MWR	Morale, Welfare and Recreation
N/A	not applicable
Na-24	sodium-24
NACIP	Naval Assessment and Control of Installation Pollutants
NaI	sodium iodide
NARA	National Archives and Records Administration
NARM	naturally occurring accelerator-produced radioactive material
NAS	Naval Air Station
NAVFAC	Naval Facilities Engineering Command
Navy	U.S. Department of the Navy
NAVSEA	Naval Sea Systems Command
NAVSEADET RASO	Naval Sea Systems Command Detachment, Radiological Affairs Support Office (also expressed as RASO)
NC	non-commissioned
NCDC	National Climatic Data Center
nCi	nanocurie
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NDT	non-destructive test(ing)
NDTC	Navy Training Devices Command
NEESA	Naval Energy and Environmental Support Activity
NEX	Navy Exchange
NNPP	Naval Nuclear Propulsion Program
NORM	naturally occurring radioactive material
NPL	National Priorities List
NRC	U.S. Nuclear Regulatory Commission
NRDL	Naval Radiological Defense Laboratory
NRMP	Navy Radioactive Material Permit
NRSC	Navy Radiation Safety Committee



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## LIST OF ABBREVIATIONS, ACRONYMS, AND SYMBOLS

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NTTC	Navy Technical Training Center
NUREG	Nuclear Regulatory Guide
OP	operational
PA	Preliminary Assessment
pCi/g	picocurie per gram
pCi/L	picocurie per liter
Pm-147	promethium-147
PP	proposed plan
PRG	preliminary remediation goal
Pu-Be	plutonium-beryllium
Pu-239	plutonium-239
PUC	Public Utility Commission
Ra-226	radium-226
RAB	Restoration Advisory Board
RADLAB	radiation laboratory
RADIAC	radiation detection, indication, and computation instrument
RAS	Radar Automatic System
RASO	Radiological Affairs Support Office
RASP	Radiological Affairs Support Program
RI	remedial investigation
Rn-222	radon-222
ROD	Record of Decision
RPTD	reported
RSO	radiation safety officer
RWQCB	Regional Water Quality Control Board
SAP	Security Assistance Program
SARA	Superfund Amendments and Reauthorization Act of 1986
SD	San Diego
SF	San Francisco
SFBNSY	San Francisco Bay Naval Shipyard
SFFD	San Francisco Fire Department
SFNS	San Francisco Naval Shipyard
SI	site inspection
Sr-90	strontium-90
SUPSHIP	Supervisor of Shipbuilding, Conversion, and Repair
SWDIV	Southwest Division, Naval Facilities Engineering Command
Th-232	thorium-232
TI	Treasure Island



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## LIST OF ABBREVIATIONS, ACRONYMS, AND SYMBOLS

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TIDA	Treasure Island Development Authority
U-233	uranium-233
U-235	uranium-235
U-236	uranium-236
U-238	uranium-238
USC	United States Code
USCG	United States Coast Guard
USMC	United States Marine Corps
USN	United States Navy
USS	United States Ship
YBI	Yerba Buena Island
Y-90	yttrium-90



## GLOSSARY

**AEC**—Atomic Energy Commission. Federal agency created in 1946 to manage the development, use, and control of nuclear energy for military and civilian applications. Succeeded by the Energy Research and Development Administration (now part of the U.S. Department of Energy) and the U.S. Nuclear Regulatory Commission.

**Aggregate**—A clustered mass of individual soil products varied in shape and size (such as soils, sand, and rock).

**Air**—Atmosphere that becomes a migration pathway for resuspension and disposal of radioactive contamination and contaminated media.

**Alpha particle**—A positively charged particle ejected spontaneously from the nuclei of some radioactive elements. Alpha particles can be stopped by a thin sheet of paper.

**Aquifer**—A formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs.

**Background radiation**—Naturally occurring radiation from cosmic or terrestrial sources.

**Beta particle**—A charged particle emitted from a nucleus during radioactive decay with a mass equal to 1/1837 that of a proton. Negatively charged beta particles are electrons, and positively charged particles are positrons. Beta particles can be stopped by a thin sheet of plastic.

**Base Closure and Realignment Act of 1990**—The Defense Base Closure and Realignment Act of 1990, as amended (Public Law 101-510), was enacted by the U.S. Congress to provide a fair process that will result in timely closure and realignment of military installations in the United States. Navy uses the BRAC Program to comply with this Act.

**Base Realignment and Closure (BRAC) Program**—A formal Navy program managed by the Naval Facilities Engineering Command that was created in 1993 to dispose of excess Navy and Marine Corps properties, designated for closure or realignment by the U.S. Congress, by transfer to the local communities for reuse and economic revitalization.





**BUMED**—Navy Bureau of Medicine and Surgery. BUMED is responsible for the Navy’s Radiation Health Program.

**BUSHIPS**—A former Navy bureau that was responsible for ships.

**Byproduct Material**—Any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material;

**CERCLA**—Comprehensive Environmental Response, Compensation, and Liability Act of 1980. Legislation that established the federal Superfund for response to uncontrolled releases of hazardous substances to the environment.

**CERCLIS**—Comprehensive Environmental Response, Compensation, and Liability Act Information System. U.S. Environmental Protection Agency’s computerized inventory and tracking system for potential hazardous waste sites.

**Characterization Survey**—Site assessments generally taken after radioactive contamination has been confirmed in an impacted site by a scoping survey. The survey determines the extent of contamination and identifies and defines the extent of radionuclides of concern. These surveys include in-depth surveys, sampling, monitoring, and analysis necessary to develop, analyze, and select appropriate cleanup techniques.

**Check Source**—A radioactive source that is used to check the response of radiation detection instruments. In many cases, the check source is attached to the instrument.

**Class 1 area (based on MARSSIM)**—An area that is projected to require a Class 1 final status survey.

**Class 2 area (based on MARSSIM)**—An area that is projected to require a Class 2 final status survey.

**Class 3 area (based on MARSSIM)**—An area that is projected to require a Class 3 final status survey.



**Class 1 survey**—A type of final status survey that applies to areas with the highest potential for contamination, and meet the following criteria: (1) impacted; (2) potential for delivering a dose above the release criterion; (3) potential for small areas of elevated activity; and (4) insufficient evidence to support reclassification as Class 2 or Class 3.

**Class 2 survey**—A type of final status survey that applies to areas that meet the following criteria: (1) impacted; (2) low potential for delivering a dose above the release criterion; and (3) little or no potential for small areas of elevated activity.

**Class 3 survey**—A type of final status survey that applies to areas that meet the following criteria: (1) impacted; (2) little or no potential for delivering a dose above the release criterion; and (3) little or no potential for small areas of elevated activity.

**Contaminated media**—Materials at an impacted site that contain, or are suspected of containing, radioactive contamination or to which radioactive contamination may have migrated.

**Contaminated media assessment**—A rating of the potential contamination media or migration at an impacted site.

**Contamination potential**—The possibility for residual radioactive contamination at an impacted site that has been determined through a professional evaluation of historical information, previous survey results, and site reconnaissance.

**Curie**—Abbreviated Ci. A unit of measure of the amount of radioactivity equal to  $3.7 \times 10^{10}$  disintegrations per second or  $2.22 \times 10^{12}$  disintegrations per minute (dpm).

**Decontamination**—The reduction or removal of radioactive material from a structure, object, or person. Accomplished by treating the surface to remove or decrease the contamination or by letting the material decrease as a result of radioactive decay.

**Direct measurement**—Measurement of alpha, beta, or gamma radiation. Data can be displayed as a digital rate, timed count, or integrated dose count.

**Dose**—The amount of energy absorbed by a person exposed to radiation.



**Drainage system**—Sanitary drains, facility storm drains, or septic systems and leach fields. This category can include bay sediments where drainage to the bay occurs.

**Emergency action**—Immediate remediation or containment is required because the levels of radioactive contamination or radiation exposure are such that there is a high potential for significant exposure or release of radioactive materials to the public or the environment.

**EPA**—U.S. Environmental Protection Agency. The lead federal regulatory agency under CERCLA for cleanup of hazardous waste sites on the National Priorities List (NPL).

**FFA**—Federal Facility Agreement. An agreement among the EPA, state, and site lead agency (for example, the Navy) detailing the extent and schedule of remedial actions.

**Final Status Survey:**—Also stated as FSS. Measurements and sampling performed to describe the radiological conditions of a site, following completion of decontamination activities (if any) in preparation for release. The survey verifies that an impacted site complies with applicable release criteria by taking the appropriate measurements and sampling that will define the radiological condition of a site.

**Free release**—A recommendation made after historical documentation and previous and current investigations and surveys indicate all applicable release criteria have been met and the site is ready for review by Navy and regulatory agencies for future non-radiological use.

**Gamma radiation**—High-energy, short-wave length electromagnetic radiation emitted from the nucleus of an atom. Gamma radiation frequently accompanies the emission of alpha and beta particles and always accompanies fission. Gamma rays are stopped by shielding with heavy materials such as lead.

**G-RAM**— All general radioactive materials that are not associated with the Naval Nuclear Propulsion Program (NNPP).

**Groundwater**—Waters contained in subsurface materials and aquifers.

**Half-life**—Time required for a population of atoms of a given radionuclide to decrease through radioactive decay to exactly one-half of the original number of atoms. No operation, either



chemical or physical, can change the decay rate of a radioactive substance. Half-lives range from much less than 1 microsecond to more than 1 billion years. The longer the half-life, the more stable the nuclide. After one half-life, half of the original atoms will remain; after two half-lives, one fourth (or  $1/2$  of  $1/2$ ) will remain; and so on.

**Hazardous material**—Material that possess properties of radioactivity, chemical toxicity, or other potential nuisance to cause human illness or injury.

**Hazardous substance**—Any material that poses a threat to human health and/or the environment. Typical hazardous substances are toxic, corrosive, ignitable, explosive, or chemically reactive.

**High**—Contamination assessment indicating that evidence of contamination in the media or migration pathway has been identified.

**HRA**—Historical Radiological Assessment. A detailed investigation to collect historical radiological information and data derived from environmental monitoring for a particular site and its surroundings where radioactive materials were used. The HRA is comparable to the Historical Site Assessment as defined in MARSSIM.

**HSA**—Historical Site Assessment. MARSSIM terminology for an historical radiological assessment. See HRA above.

**Impacted area**—An area that has or historically had a potential for G-RAM contamination based on the site operating history or known contamination detected during previous radiation surveys. Impacted sites include sites where radioactive materials were used or stored; sites where known spills, discharges, or other instances involving radioactive materials have occurred; or sites where radioactive materials might have been disposed of or buried. Impacted sites are ranked as Class 1, 2, or 3 based on MARSSIM guidelines.

**Investigation level**—A radionuclide-specific level based on the release criterion that, if exceeded, triggers some response such as further investigation or remediation.



**Known-Continued Access Contamination Potential**—Low levels of contamination exist, but the contamination is contained in system, fixed on building surfaces, or is in generally inaccessible areas.

**Known-Restricted Access Contamination Potential**—Radioactive contamination is known to exist at levels that could be hazardous without protective clothing, respiratory protection, or radiation monitoring.

**Likely Contamination Potential**—Residual radioactive contamination is expected but has not been confirmed.

**Low**—Assessment of contaminated media or migration pathway indicating that the contamination potential is remote.

**Media**—Types of materials at an impacted site that may contain or are suspected of containing radioactive contamination or to which radioactive contamination may migrate.

**Micro**—Abbreviated  $\mu$ . A prefix denoting one-millionth ( $10^{-6}$ ).

**Migration pathway**—Media or transport mechanisms that allow radioactive contamination to spread in the immediate vicinity of the contaminated media.

**Milli**—Abbreviated m. A prefix denoting one-thousandth ( $10^{-3}$ ).

**Moderate**—Assessment of contamination media or migration pathway that indicates the potential for contamination exists but has not been fully assessed.

**Neutron Activation**—The process of producing radioactivity in a stable isotope by bombarding the isotope with neutrons. Following the capture of a neutron by a stable isotope, the resulting product nucleus is a radioisotope that later decays to a stable state and can be detected. The energy level of the emitted gamma rays is characteristic of the specific element.

**None**—Assessment of contaminated media or migration pathway that indicates evidence of contamination has not been found or known contamination has been removed and surveys indicate that the media or migration pathway meets release criteria.



**NNPP**—Naval Nuclear Propulsion Program. A joint Navy and U.S. Department of Energy program to design, build, operate, maintain, and oversee operation of Naval nuclear-powered ships and associated support facilities.

**Non-impacted area**—An area having no reasonable possibility of residual G-RAM contamination resulting from site operations based on historical documents. Includes residential or other buildings that have or had no sealed radioactive sources other than smoke detectors or exit signs.

**No Contamination Potential (None)**—Radioactive contamination has been fully assessed and removed, if necessary, and the site has been free released by the Navy and the regulatory agencies.

**NPL**—National Priorities List. Under the Superfund program, a list of sites of releases and potential releases of hazardous substances, pollutants, and contaminants that appear to pose the greatest threat to public health, welfare, and the environment.

**NRC**—U.S. Nuclear Regulatory Commission. An organization of the federal government that oversees and authorizes the use of byproduct, source, and special nuclear materials.

**NRDL**—Naval Radiological Defense Laboratory. A Navy command based at HPS from 1948 until 1969. The mission of NRDL was the study of nuclear weapons effects and the development of countermeasures to the atomic weapon and decontamination methods for ships from OPERATION CROSSROADS.

**NRMP**—Navy Radioactive Materials Permit. Site-specific or broad-scope Navy license for the use of specified radioactive materials under specified conditions. These permits are issued by the Navy Radiation Safety Committee (NRSC) under the authority of the Master Materials License granted to the Navy by the NRC.

**NRSC**—Navy Radiation Safety Committee. Navy organization providing administrative control of all NRC-licensed radioactive material used by the Navy and U.S. Marine Corps.



**Nuclide**—Any known isotope, either stable or unstable, of any element. A single element can have isotopes, but when referring to isotopes of more than one element, the proper term is nuclide.

**NUREG**—Nuclear Regulatory Commission’s implementation guidance document.

**Pico**—Abbreviated p. A prefix denoting one-trillionth ( $10^{-12}$ ).

**RADIAC**—Radiation Detection, Indication, and Computation instruments used to measure radiation emission rate or exposure.

**Radiography**—The process of examining a person, animal, object, or structure below the surface without injury or incursion using a radioactive source or a machine source of ionizing radiation.

**Radioisotope**—An unstable isotope of an element that decays or disintegrates spontaneously, emitting radiation. These elements have the same number of protons but different numbers of neutrons in their nuclei. Approximately 3,700 natural and artificial radioisotopes have been identified.

**Radioluminescence**—Luminescence produced by the bombardment of radiant energy such as x-rays, radioactive waves, or alpha particles on a material such as phosphors.

**Radioluminescent device**—An item containing radioluminescent paint that allows the device to be seen in the dark. These devices were commonly used by the Navy and possibly contained radium-226, strontium-90, tritium, or promethium-147.

**Radioluminescent paint**—A paint containing a radioisotope that interacts with a phosphor to produce radioluminescence. The paint was commonly applied to devices that needed to be seen in areas without natural or artificial lighting.

**Radionuclide**—An unstable nuclide or isotope. See radioisotope.

**RASO**—The Naval Sea Systems Command Detachment, Radiological Affairs Support Office, located in Yorktown, Virginia. RASO provides technical support to the Navy for management and control of G-RAM.



**Release criterion**—A regulatory limit established to set a limit for decontamination of residual radioactive contamination. The term may be expressed as a quantification of radioactivity, dose, or exposure risk.

**Roentgen**—A unit of exposure for x-rays or gamma rays.

**Scoping Survey**—A survey to identify radionuclide contaminants, relative radionuclide ratios and general levels, and extent of contamination. These surveys usually include minimal surface scans, sampling, and dose rate assessments.

**Source**—A small device containing radioactive material. The device may be used in research and industrial processes and may be sealed or unsealed. Sealed sources are often part of specialized industrial devices that measure quantities such as the moisture content of soil or the density or thickness of materials (radiography or NDT). Sources are usually enclosed in a housing that prevents the escape of the radioactive materials. Often referred to as “radioactive sources” or “sealed sources.”

**Source Material**—(1) Uranium or thorium, or any combination thereof, in any physical or chemical form or (2) ores which contain by weight one-twentieth of one percent (0.05%) or more of: (i) Uranium, (ii) thorium or (iii) any combination thereof. Source material does not include special nuclear material.

**Special Nuclear Material**—(1) plutonium, uranium 233, uranium enriched in the isotope 233 or in the isotope 235, and any other material which the U.S Nuclear Regulatory Commission, pursuant to the provisions of section 51 of the Atomic Energy Act, determines to be special nuclear material, but does not include source material; or (1) any material artificially enriched by any of the foregoing but does not include source material

**Spectroscopy**—Physics that deals with the theory and interpretation of interactions of matter and radiation. Often used in the analysis of samples for quantification or qualification of radioactive content.

**Structure**—A man-made surface(s) above the surface or contained within subsurface media.





**Subsurface soil and media**—Solid materials and media found below the surface soils.

**Surface soil**—The top layer of soil (6 inches below ground surface), fill, gravel, waste piles, concrete, or asphalt that is available for direct exposure, growing plants, resuspension of particles for inhalation, and mixing from human disturbances.

**Surface water**—Waters found in streams, rivers, lakes, and oceans as well as coastal tidal waters.

**Swipe sample**—Type of sample collected to measure removable contamination on surfaces by alpha and beta particles.

**Tolerance level**—Levels used for ship and materials clearance and radiation exposure before and after ship decontamination. Term was used during the early years, mainly concerned with OPERATION CROSSROADS ships and work on those ships.

**Undifferentiated Sedimentary Deposits**—Sediments consisting of varying types of sands, clays, soils, and rocks which are either structurally indistinguishable or can not divided into finer age divisions.

**Unknown Contamination Potential**—Residual radioactive contamination potentially exists but no clear indication of possible contamination levels or contaminants has been established.

**Unlikely Contamination Potential**—Residual radioactive contamination is not expected but investigation is warranted.

**Weatherboard**—A length of timber boarding (usually elm, now pine) fixed horizontally or vertically to the exterior of a structure.

**Wetland**—A type of sensitive environment sufficiently inundated or saturated by surface water or groundwater to support vegetation adapted for life under saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.



## 1.0 EXECUTIVE SUMMARY

This document is a Historical Radiological Assessment (HRA) that provides a comprehensive history of radiological operations by the U.S. Department of the Navy (Navy) and Navy contractors at Naval Station Treasure Island (NAVSTA TI). The HRA has been prepared pursuant to the Navy's Installation Restoration (IR) Program, which encompasses the Navy's Base Realignment and Closure (BRAC) Program, and in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA). The format and content follow the guidelines for a Historical Site Assessment established in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM.)

The primary purpose of the HRA is to designate sites as impacted or non-impacted. An impacted site is one that has, or at one time had, the potential for radioactive contamination, based on historical information, in excess of natural background or fallout levels. In many instances, designation as impacted does not confirm that radioactive contamination is present; only that the possibility exists and must be investigated.

A non-impacted site is one, based on historical documentation or results of previous radiological survey information, where there is no reasonable possibility for residual radioactive contamination. If new historical information becomes available or contamination is found at a non-impacted site, the site would be redesignated as "impacted."

To designate sites as impacted or non-impacted, the HRA defines the extent of past radiological operations, assesses the likelihood of potential contamination and potential contamination migration pathways, and recommends future actions. Historical radiological operations examined at NAVSTA TI included:

- Training personnel on the calibration, maintenance, and operation of radiation monitoring instruments.
- Training personnel on radiological monitoring, and decontamination of ships and airplanes.



- Berthing of OPERATION CROSSROADS ships prior to those ships being given final radiological clearance.

The HRA assessed 542 historical and current sites (e.g., buildings, structures, and open areas) at NAVSTA TI. Eighteen sites were identified as requiring further review. Of those 18 sites, 13 were ultimately designated as non-impacted and are discussed further in this HRA to document the “non-impacted” designation. Five sites are designated as “impacted” and are recommended for further investigative actions. The impacted sites include:

- Two buildings, Building 233 and Building 344 were the locations of a documented 1950 spill of radioactive material (Building 233) and a 1988 investigation of contamination in a waste container (Building 344). In each case, the radioactive contamination was cleaned up and disposed of off the naval station. Surveys are available to demonstrate that the areas were decontaminated to meet the Navy standards at the time. A characterization survey is recommended for Building 233. A final status survey is recommended for Building 344.
- Building 343 is one of the three buildings of the radiation detection, indication, and computation instrument (RADIAC) school during the 1950s, 1960s, and 1970s. The closeout survey by the Navy in a storeroom detected two alpha wipe survey points that were above release limits and although decontaminated, they were not adequately investigated. Therefore a final status survey of the storeroom is recommended.
- Four solid waste disposal areas located within IR Site 12 although unlikely could contain radioluminescent devices. However, The disposal of such devices at NAVSTA TI is unlikely because NAVSTA TI’s mission was training and not the maintenance and repair of ships, during which such devices were removed and disposed in base landfills. Therefore, precautionary radiation surveys are recommended during remedial or removal actions at these areas.
- Scoping surveys are recommended for Building 233 internal sink drains and drain traps and the first sanitary sewer drain manhole downstream of the building to determine if wash water containing radioactive material was introduced to the building drainage system during the initial personnel decontamination in Building 233.

Potentially contaminated media include surface soils (Building 233 and solid waste disposal areas within IR Site 12), subsurface soil and media (IR Site 12), structures (Buildings 233, 343, and 344), and sanitary sewer drainage systems (Building 233).

Section 6.0 provides the history of radiological operations at NAVSTA TI. Section 8.0 provides specific details for each potentially impacted site, including site description, former uses, current uses, radionuclides of concern, previous radiological investigations, assessment of potential



contamination, identification of potential contaminated media and potential migration pathways, recommendations for future actions, and site maps. No impacted site is recommended for emergency action. No sites are identified with known contamination that requires restricted access, although Building 233 is to be surveyed to confirm the building does not contain residual radium contamination from the 1950 spill cleanup activities.

Overall the review of previous radiological activities, cleanup actions, and release surveys has not identified any imminent threat or substantial risk to human health or the environment of NAVSTA TI or the local community.



## 2.0 INTRODUCTION

This document, entitled *Historical Radiological Assessment, Use of General Radioactive Materials, 1947-2003, Naval Station Treasure Island*, presents a comprehensive history of radiological operations using radioactive materials that were conducted by the Navy and Navy contractors at the NAVSTA TI. The Navy closed NAVSTA TI in 1997. Early estimates indicated TI included approximately 397 acres. Later surveys revised that figure to approximately 403 acres. An additional 122 acres on Yerba Buena Island (YBI) are part of the Naval Station (**TI-HRA-1**).

### 2.1 SCOPE

TI and YBI are located approximately midway between San Francisco and Oakland. Over the years, NAVSTA TI has also been known as Treasure Island Naval Air Station and San Francisco Navy Technical Training Center (NTTC) (**TI-HRA-2**). For purposes of this document, NAVSTA TI refers to the Naval Station and TI or YBI refer to the discrete islands that makeup NAVSTA TI.

This document describes the history of operations involving general radioactive material (G-RAM), which is defined as any radioactive material used by the Navy or Navy contractors not associated with the Naval Nuclear Propulsion Program (NNPP). The distinction is necessary because NNPP radioactive material and G-RAM are managed by different Navy offices and have different historical controls and practices. Some other Navy installations operated under both programs. There is no indication that NAVSTA TI was associated with NNPP.

### 2.2 HRA PURPOSE

The Navy uses HRAs to document the extent of past radiological operations at a specific site and the residual effects these operations may have had on the site. HRAs meet the protocol for a Preliminary Assessment (PA), as defined by the Environmental Protection Agency's (EPA) CERCLA guidance and can be used to support removal actions within the CERCLA process.



The HRA also meets the definition of a Historical Site Assessment as defined by the MARSSIM (TI-HRA-3).

Historical G-RAM operations conducted at NAVSTA TI included:

- Calibration laboratory operations for ensuring radiological survey instrument accuracy.
- Training of personnel to calibrate, maintain, and use radiological survey instruments.
- Training of personnel to perform radiation surveys and to decontaminate navy vessels and aircraft.
- Providing berthing for some OPERATIONS CROSSROADS vessels prior to issuance of final radiological clearance.

In addition to documenting the radiological history of a site, the Navy uses an HRA as a tool to assess, if any, the residual effect radiological operations may have had on buildings, structures, and open land areas. Assessments for the potential presence of radioactive materials result in designation of buildings, structures, and open areas as “non-impacted” or “impacted” sites. Non-impacted sites are considered to have no reasonable potential for residual radioactive contamination. A designation of impacted means the history of the site indicates that radioactive materials may have been used, stored, or disposed at that location. At these sites, further investigation may be required to verify that the building or area is not contaminated, that there is no potential for residual radioactive contamination at levels exceeding natural background and current state and federal release standards. If further investigation and remediation of impacted sites are necessary, documentation of the activities will be presented in separate reports.

## **2.3 REGULATORY BACKGROUND**

The information in this HRA is being presented pursuant to the Navy’s IR Program, which encompasses the Navy’s BRAC Program. These programs function in accordance with CERCLA and SARA as directed by Executive Order 12316 of 20 August 1981, which required the U.S. Department of Defense (DoD) to comply with CERCLA.



The Navy instituted the Naval Assessment and Control of Installation Pollutants (NACIP) Program in the mid-1980s as a method of complying with CERCLA. The first step in the NACIP Program was to conduct an Initial Assessment Study (IAS) to assess potential contamination by hazardous materials, including radioactivity. The NAVSTA TI IAS was completed in 1988 (**TI-HRA-4**). NAVSTA TI was not placed on the EPA's National Priority List (NPL).

In 1993, the U.S. Congress called for the closure and release of NAVSTA TI for reuse under the Base Closure and Realignment Act of 1988. A Federal Facility Site Remediation Agreement (FFSRA) signed on September 29, 1992, by the Navy and the California Environmental Protection Agency (Cal EPA), established cleanup actions and timeframes for NAVSTA TI (**TI-HRA-5**). On July 31, 1990, a Memorandum of Understanding (MOU) was finalized between the California Department of Health Services (CDHS) and Cal EPA Water Resources Control Board, and Regional Water Quality Control Boards which specifies each agency's responsibilities in hazardous waste site cleanup.

The DoD has the authority to undertake CERCLA actions under Title 42 of the *United States Code* (USC), Section 9604; Title 10 of the USC, Section 2705; and Federal Executive Order 12580. Under the authority of CERCLA, DoD has undertaken the assessment of radioactive materials at NAVSTA TI by conforming to the requirements of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Title 40 of the *Code of Federal Regulations* (CFR), Part 300. Because CERCLA defines radionuclides as hazardous substances, radionuclides are included in the CERCLA process to investigate, characterize, and remediate contamination. Appendix B of Title 40 of the CFR, Part 302.4 lists the specific radionuclides defined as CERCLA hazardous substances. All of the radionuclides previously used at NAVSTA TI are included on this list (**TI-HRA-6**).

The MARSSIM is a consensus document of the EPA, DoD, the U.S. Department of Energy (DOE), and the U.S. Nuclear Regulatory Commission (NRC). MARSSIM provides detailed guidance for investigation of radiologically impacted sites. Developed to be consistent with CERCLA, MARSSIM uses a single-phase approach (Survey and Site Investigation Process) to address radioactive contamination issues versus CERCLA's multi-phased approach. MARSSIM is not designed to replace or conflict with existing CERCLA or RCRA guidance, it is designed to



provide supplemental guidance for specific applications of the CERCLA Remedial or Removal Process or the RCRA Corrective Action Process. Once the presence of radioactive material has been identified and remediated at impacted sites, MARSSIM recommends a Final Status Survey (FSS) for radiological release of a site for unrestricted use to fulfill the CERCLA closure and post-closure process. Section 8.0 provides the current status of each impacted site with the appropriate recommendation to comply with MARSSIM.

## **2.4 REPORT ORGANIZATION**

This HRA is organized to present the history of radiological operations at NAVSTA TI from the beginning of documented Navy radiological activities in 1947 through 2003, by providing the following information:

- Potential, likely, or known sources of G-RAM.
- Potential, likely, or known areas of G-RAM use.
- History of G-RAM operations, investigations, remediations, and surveys.
- Classification of an area as impacted or non-impacted by radiological operations.
- Identification of potentially contaminated media.
- Assessments of the likelihood of contamination migration.
- Assessment of risk to human health and the environment.
- Information useful to radiological scoping and characterization surveys.
- Recommendations for future radiological investigations and remediation processes.

The basic organization of the report is listed below. Individual tables and appendices are not included here, but are listed in the Table of Contents. Figures are presented after their first mention in the text of the HRA, tables are presented after their respective sections, and appendices are presented after Section 10.0. Section 10.0 lists the reference documents used to prepare this HRA. The actual documents are provided separately on a compact disc.



### 3.0 SITE IDENTIFICATION AND DESCRIPTION

NAVSTA TI is located on two islands in San Francisco Bay approximately midway between the City of San Francisco and the City of Oakland (Figure 3.1). TI is a man-made island of approximately 403 acres. YBI is a natural island of approximately 170 acres connected to TI via a man-made causeway (Figure 3.2). This section details the geological and physical site characteristics and the current and historical information for NAVSTA TI and immediately adjacent areas.



**Figure 3.1 San Francisco Bay Area (TI-HRA-7)**



**Figure 3.2 Treasure Island and Yerba Buena Island (TI-HRA-8)**



### 3.1 SITE DESCRIPTION

NAVSTA TI consists of approximately 945 acres, of which approximately 454 acres surrounding TI and on the northern side of YBI are submerged below the Bay. The dry land property includes all of TI (approximately 403 acres) and a portion of YBI north of the San Francisco-Oakland Bay Bridge (approximately 88 acres) (**TI-HRA-9**). Access to TI and YBI is via the east-bound (lower deck) of the bridge from San Francisco, and via the west-bound (upper deck) of the bridge from Oakland.

For purposes of CERCLA, the Naval Station is identified as:

Treasure Island Naval Station (NAVSTA TI)

San Francisco, California

EPA Region IX

CERCLA Information System (CERCLIS) Identification No. CA7170023330 (**TI-HRA-10**)

The Army Corps of Engineers constructed TI in 1936 to be the site of the 1939 Golden Gate International Exposition. The construction project, which required approximately 19 months, included the creation of a perimeter seawall using 287,000 tons of rock. The seawall was then filled with almost 30 million cubic yards of sand and gravel dredged from San Francisco Bay. The seawall was originally 13 feet above sea level. After filling the cavity, the fill material was desalinized by pumping in millions of gallons of fresh water and extracting the diluted saltwater. A six-foot layer of topsoil was used to surface the entire island. After completion of construction of TI in August 1937, the next eighteen months were devoted to constructing the exposition buildings and preparing the site for the exposition to open in February 1939 (**TI-HRA-11**).

### 3.2 GEOLOGICAL SETTING

The Bay was dry land during the ice ages when sea level dropped more than 300 feet as water accumulated in the great continental glaciers. The Sacramento River picked up several tributaries as it flowed through the coastal lowland, and then through the last mountain ridge in a deep canyon that is now the Golden Gate Strait. Coastal lowlands filled with water as sea level rose at



the end of the last ice age. The Bay assumed its present form about 10,000 years ago, when sea level returned to its present stand.

Since the rising sea level flooded the Golden Gate Strait and converted the lower part of the river valley into what is now known as San Francisco Bay, the Sacramento and San Joaquin Rivers have been filling the Bay with sediment. This is because early mining operations in the Sierra Nevada started billions of cubic yards of sediment moving down the rivers. More than a billion cubic yards of that sediment has now reached the Bay. It is estimated about 8 million cubic yards of sediment wash into the Bay every year. Recognizing the sand and gravel dredged from the bay and used to fill the island came from the gold bearing Sierra Nevada Mountains, the island was named “Treasure Island” (TI-HRA-12).

The Bay is about 55 miles long from north to south and 3 to 12 miles wide, an area of about 435 square miles. At its deepest part, the Bay is about 350 feet deep, but more than 80 percent is less than 12 feet deep. The Bay is made up of brackish water that is about 2.8 percent dissolved salts, 15 percent less than normal seawater, which flows in and out with the tides. An average cycle of rising and ebbing tide moves enough water through the Golden Gate Strait to flood about 1.25 million acres to a depth of 1 foot. Incoming currents reach speeds as great as 4 miles per hour; outgoing flow is much slower (TI-HRA-13).

### **3.3 GEOLOGY**

TI is a manmade island, measuring approximately 403 acres and consisting primarily of sand sediments dredged from San Francisco Bay and placed within a retaining wall of rock and sand dikes. Dredging and construction of the island, as directed by the U.S. Army Corps of Engineers, began in 1936 and was completed in 1937. The island was constructed on the Yerba Buena Shoals, a sand spit that extended north and northwest of naturally occurring YBI.

Subsurface materials at TI can be divided into the following four geologic units, listed from youngest (shallowest) to oldest (deepest):

- Fill and Shoal Sands (dredged sand fill and Yerba Buena shoal sands).
- Younger Bay Mud.



- Older Bay Mud.
- Franciscan Assemblage.

Dredged sediments used for construction of TI consisted primarily of fine- to coarse-grained sand with lesser amounts of silt, clay, and gravel. The dredged sand included some shell fragments and clay nodules. The clay nodules were derived from clay beds within the sediment, excavated by dredging, and rounded as they passed through the delivery pipeline. Thin beds of clay occasionally developed as finer materials in the dredged sand fill settled out during dredging operations. Of the more than 29,360,000 cubic yards of material dredged from a variety of locations in San Francisco Bay, approximately 21 million cubic yards was retained behind the sea wall of TI. The remainder of the dredged material was lost during construction as a result of tidal current erosion and flotation of fine-grained material.

Underlying the Yerba Buena Shoal sands are Younger Bay Mud sediments of marine origin that consist of soft to stiff, olive gray silty clay and clay with interbedded sand and silt layers in some areas. Younger Bay Mud sediments range in thickness from approximately 10 to 120 feet; these sediments are thinnest on the eastern portion of the island and thicken toward the northwestern portion of the island (**TI-HRA-14**), (**TI-HRA-15**).

Underlying the Younger Bay Mud sediments are the Older Bay Mud sediments, which consist of stiff to very stiff, sandy, silty, and peaty clays that extend to the Franciscan bedrock. The Older Bay Mud sediments, which range in thickness from approximately 20 to 170 feet, are thinnest on the southern portion of the island and thicken toward the northern portion of the island (**TI-HRA-14**), (**TI-HRA-15**).

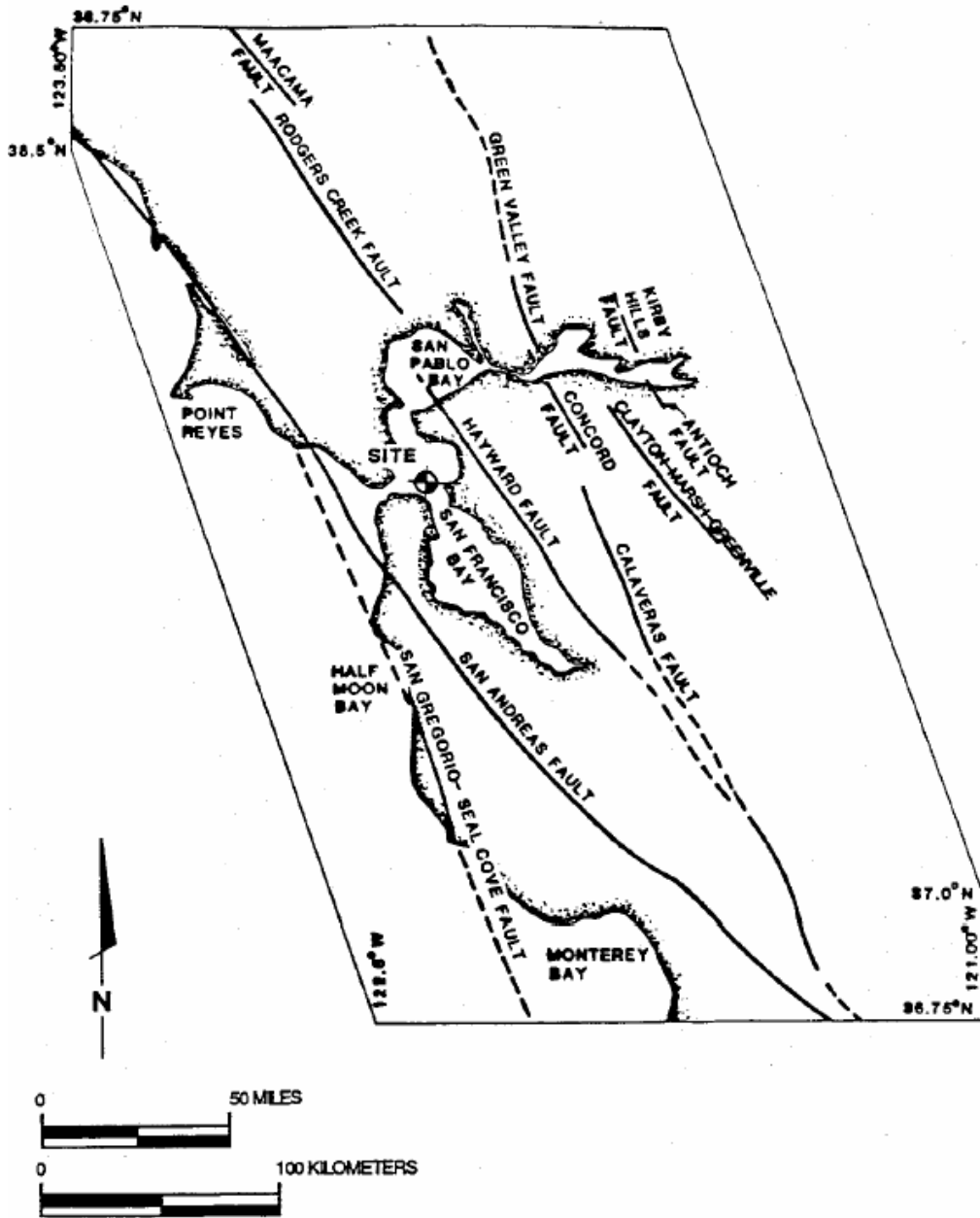
Underlying the Older Bay Mud sediments is bedrock of the Franciscan Assemblage, which consists of interbedded shales and sandstone. Based on logs for borings on the northwestern portion of TI that penetrated bedrock, the estimated depth to the Franciscan Assemblage ranges from 150 to 320 feet below ground surface, depths are shallowest on the southern portion of the island and deepest toward the northern portion of the island (**TI-HRA-14**), (**TI-HRA-15**).

YBI is a natural island that has been mapped by Blake and others (1974) to consist of four geologic units: landslide debris, artificial fill, sand of the Colma Formation, and sandstone and



shale bedrock of the Franciscan assemblage. The most recent geologic unit at YBI is the landslide debris which results from the clayey silty sand that has moved downslope. An area of significant landslide debris is located on the north side of the Island although smaller areas of landsliding are found at other locations. The next unit, artificial fill, has been placed along the eastern shoreline of the Island. The Colma Formation, a fine to medium grained sand with minor amounts of interbedded sandy silt, clay, and gravel, is exposed over approximately 70 percent of the island. It unconformably overlies the bedrock below and is variable in thickness, extending from a few inches to several feet. It blankets the ravines and slopes and in places even forms relatively flat benches. Underlying these deposits is the Franciscan Assemblage which is the oldest geologic unit on the island consisting of resistant sandstone and shale. It tends to be highly variable in compositions and structure in the San Francisco Bay region; however, surficially at YBI it appears very consistent in structure and composition. The Franciscan units exposed on YBI generally dip to the northeast and have a northwest to south east trend (**TI-HRA-4**).

The major active faults in the TI vicinity are all part of the San Andreas fault system. Figure 3.3 shows the location of active fault systems surrounding the area. TI lies between two major faults: the San Andreas fault, 9 miles to the west, and the Hayward fault, 3 miles to the east. Both of these fault systems are considered active and likely to experience a major event (Richter of magnitude 6.7 or greater) within the next 200 years. Other significant faults include the Calaveras fault approximately 50 miles to the southeast, the San Gregorio-Seal Cove fault 24 miles to the west, the Rodgers Creek fault approximately 40 miles to the north, and the Maacama fault approximately 100 miles to the north. There are several lesser-known faults within approximately 60 miles (**TI-HRA-4**).



**Figure 3.3 Major Earthquake Fault Systems Surrounding TI (TI-HRA-4)**

During the Loma Prieta Earthquake on 17 October 1989, some lateral spreading and liquefaction were experienced on TI. (See Figure 3.4)



**Figure 3.4 Liquefaction on Treasure Island after Loma Prieta Earthquake (TI-HRA-16)**

### **3.4 HYDROLOGY**

#### **3.4.1 Groundwater**

TI and YBI are surrounded by the waters of the San Francisco Bay. Any surface drainage off the two islands flows into the Bay.

Ground water at TI is generally present at depths of 2.5 to 6 feet below ground surface (bgs). Subsurface water at TI has no beneficial use and is not used.

The primary source of drinking water, industrial water, and landscape irrigation, at both TI and YBI, is the water provided by the San Francisco Water Department. This water is piped in from San Francisco across the Bay Bridge. A secondary source of water is from the East Bay Municipal Utility District piped in from Emeryville across the Bay Bridge (TI-HRA-4).

#### **3.4.2 Climate and Meteorology**

In general, the climate of the area is marine and characterized by very little change in temperature. The average annual precipitation is about 25 to 30 inches. Most precipitation falls between October and April. Localized showers are infrequent and storms are moderate in



duration and intensity. The average annual air temperature is 56 to 58 degrees F., and the average frost-free period is 300 to 330 days. The relative humidity in winter is about 80 to 90 percent at night and 60 to 70 percent in the afternoon. It is less in spring, but increases at night in summer. Humidity is lowest in fall. It ranges from 50 percent during the day to 70 percent at night. Frequent morning and evening fog occurs during the summer. Throughout the year the wind direction for the area is predominately from the west-northwest. The average wind speed ranges from 8 miles per hour to 14 miles per hour and annually averages 11 miles per hour. (TI-HRA-17). The strongest winds are usually associated with winter storms. Winds from the north and east are sometimes accompanied by cold temperatures in winter and spring. Westerly winds in summer are generated by the cool marine air flowing to the warmer interior. These winds are strongest early in summer, mainly late in the afternoon and in the evening (TI-HRA-4).

### **3.5 ADJACENT POPULATION**

The 2000 Census reported 33,871,648 people in California, with almost 9 million residing in counties at least partially within a 50-mile radius of NAVSTA TI. The metropolitan areas of San Francisco, Alameda, and Santa Clara Counties contain most of this population. The distribution of this population is shown in Table 3-1 (TI-HRA-18). The population in cities within a 10-mile radius of NAVSTA TI is shown in Table 3-2.

Current approximate population on TI and YBI is 3,500 (TI-HRA-19).

### **3.6 PAST, CURRENT AND FUTURE NAVSTA TI USAGE**

As early as 1968, the Navy has leased some NAVSTA TI buildings to private tenants and Navy-related entities for various uses. For example, the Bureau of Alcohol, Tobacco, and Firearms operated a laboratory in Building 233 beginning in about 1976; the California Conservation Corps leased Building 109 for their operations; and the San Francisco Unified School District operated a school on NAVSTA TI. Many non-navy and even non-military tenants occupied space on NAVSTA TI including the American Red Cross, the Environmental Protection Agency, the National Maritime Union Job Corps, and the Treasure Island Yacht Club. Table 3-3 summarizes the identified buildings, structures, and open areas currently and formerly located on

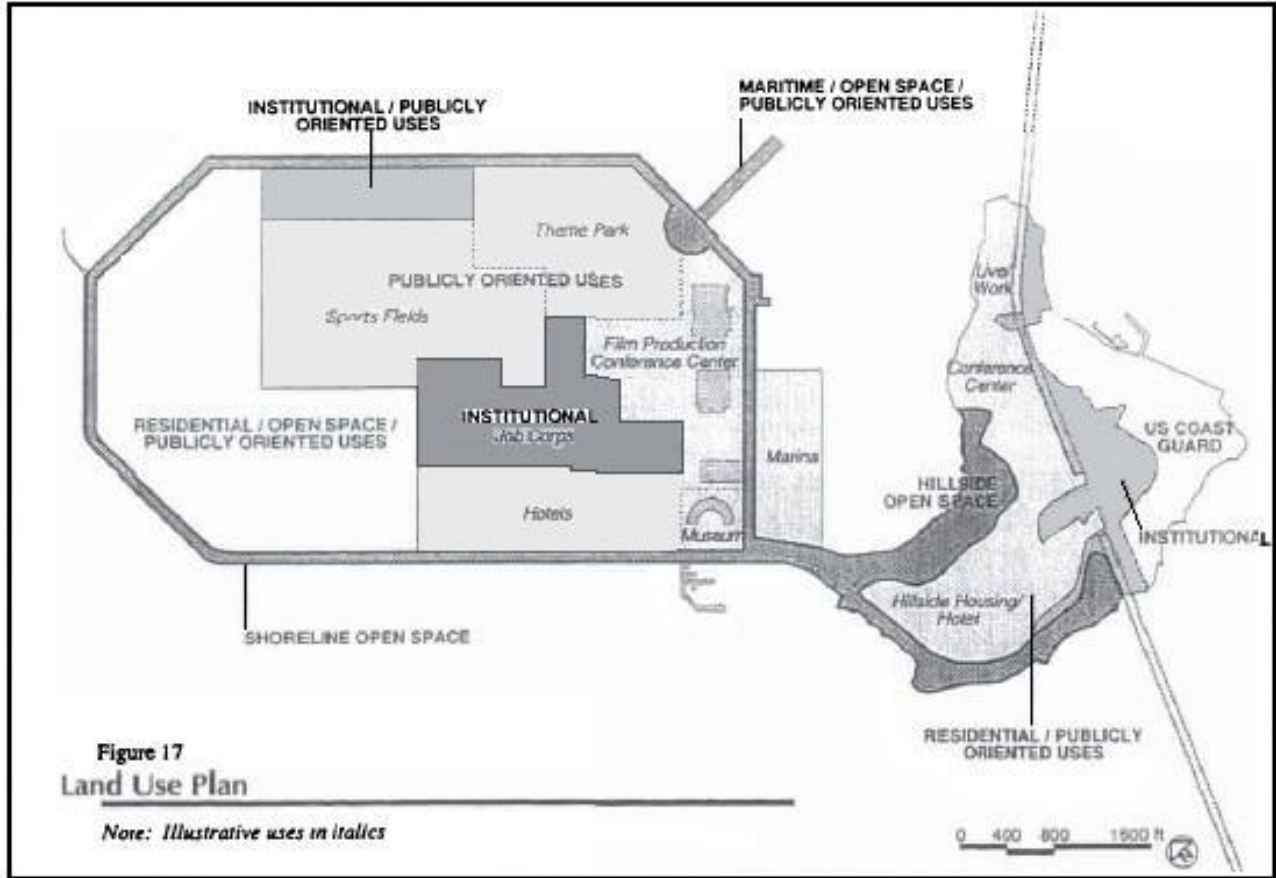




TI, their former and current uses, and current tenants. There is no indication that any of the buildings on Yerba Buena Island were utilized in support of the radiological activities of the various training schools on NAVSTA TI. A pier on Yerba Buena Island was used for a few days to provide accommodation berthing for an OPERATION CROSSROADS ship after it was decontaminated at Hunters Point Shipyard but before the ship was given final radiological clearance. Therefore Tables 3-3 and 3-4 list TI only buildings. Many of the buildings had multiple uses over the life of the naval station. Table 3-4 shows the chronological history of use of NAVSTA TI buildings and locations.

Several alternative scenarios are under review for development of the former Naval Station. All scenarios include some combination of residential, open space, publicly oriented, and institutional and community uses. Figure 3.5 shows one proposed future reuse of NAVSTA TI **(TI-HRA-20)**.

There are no known current uses of licensed or unlicensed radioactive materials on Treasure Island.



**Figure 3.5 Land Use Plan (TI-HRA-21)**



### 3.7 ENVIRONMENTALLY SENSITIVE AREAS

Terrestrial and aquatic ecosystems occur on or near TI and YBI. Wetland ecosystems are present throughout the Bay Area, but are not located on or near TI or YBI. However, both islands are highly influenced by the surrounding marine habitat of San Francisco Bay. Additionally, a wetlands area has been proposed as part of the future redevelopment plan for one or more locations on TI and YBI.

TI is intensively developed, maintained and landscaped with trees, shrubs, and lawns, landscaping and maintained areas. The vegetation consists of grasses, shrubs, herbaceous perennials, and trees: most of which have been cultivated in landscaped areas as the island was developed. Some of the more dominant species include perennial ryegrass, Kentucky bluegrass, Star acacia, bottle brush, boxwood, oleander, English ivy, ice plant, blue gum, Monterey pine, coast live oak, bishop pine, sycamore, and white fir (**TI-HRA-4**).

YBI is a rugged, steeply sloping heavily wooded island which contrasts greatly with the flat urban industrial character of the man-made TI. The majority of the island is undeveloped. However, there are approximately 55 acres of developed urban terrestrial habitat consisting mostly of residential housing areas on the northern side of the island. Vegetation in these areas is similar to the cultivated landscaping described for TI. The majority of YBI consists of undeveloped land. The undeveloped areas consist of grasslands, woodlands, and brushlands. Some of the typical species include brome, California oatgrass, blue gum, coyote bush, coastal sage, poison oak, California buckeye, and blackberry.

Wildlife known and expected to occur on TI and YBI consist mostly of species adapted to urban environments and landscape plantings. Terrestrial habitat of TI is of poor quality for wildlife species because the island is predominately covered with urbanized areas (**TI-HRA-4**). Buildings, pavement, lawns, and other landscaped sections provide poor quality habitat because of the large proportion of the island that is sealed beneath buildings, streets, and parking lots. As described below, the vegetated parts of TI are made up of lawns and landscaped areas. Birds typically associated with urban or residential environments and adapted to human disturbance are found on TI and YBI. These include house finch, stellar jay, English sparrow, Savannah sparrow,



and robin. Large areas of shrubs interspersed with grasslands and extensive eucalyptus woodlands occur on YBI. These areas provide cover for birds such as quail, woodpecker, horned lark, cedar waxwing, and white-breasted nuthatch. The shoreline areas of YBI are used by terns and pelicans for foraging and by herring gulls for roosting. The mammals of both TI and YBI consist primarily of California ground squirrel and pocket mice. A small group of harbor seals uses the southwest shoreline of YBI (**TI-HRA-4**).

Several Federal and California threatened and endangered species have been observed at or near NAVSTA TI. In particular, the following species have been observed: chinook salmon, steelhead trout, coho salmon, American peregrine falcon, peregrine falcon, California brown pelican, California clapper rail, California least tern, western snowy plover, southern sea otter, and stellar sea lion. All of the above species are listed as endangered or threatened by the federal government or by the State of California or both (**TI-HRA-22**).

Treasure Island Elementary School located at 13<sup>th</sup> and E Streets on Treasure Island is operated by the San Francisco Unified School District and in 2004 served approximately 450 students in grades K through 8 (**TI-HRA-23**). The reported 2005 enrollment is about 350 students with 130 living on TI and the other 220 students bussed in from various locations in San Francisco (**TI-HRA-24**). No other elementary schools are within a one-mile radius of TI or YBI. There is a daycare center just across the street from the Treasure Island Elementary School. The Kidango Treasure Island Center serves ages from birth to Kindergarten entry with a capacity of 100 children (**TI-HRA-25**).



## **SECTION 3**

### **TABLES**

**Table 3-1**  
**Population Of Counties “All” or “Partially” within a 50-Mile Radius**  
**of Naval Station Treasure Island**

<b>COUNTY</b>	<b>1990 POPULATION</b>	<b>2000 POPULATION</b>
Alameda	1,279,182	1,443,741
Contra Costa	803,732	948,816
Marin	230,096	247,289
Napa	110,765	124,279
Sacramento	1,041,219	1,223,499
San Francisco	723,759	776,733
San Joaquin	480,628	563,598
San Mateo	649,623	707,161
Santa Clara	1,497,577	1,682,585
Santa Cruz	229,734	255,602
Solano	340,421	394,542
Sonoma	388,222	458,614
Yolo	141,092	168,660

Source – (TI-HRA-18)



**Table 3-2**  
**Population of Cities within**  
**a 10-Mile Radius of Naval Station Treasure Island**  
**(Greater Than 10,000 Population)**

<b>CITY</b>	<b>1990 POPULATION</b>	<b>2000 POPULATION</b>
Alameda	76,459	72,259
Albany	16,327	16,444
Berkeley	102,724	102,743
Daly City	92,311	103,621
El Cerrito	22,869	23,171
Hercules	16,829	19,488
Larkspur	11,070	12,014
Mill Valley	13,038	13,600
Oakland	372,242	399,484
Orinda	16,642	17,599
Piedmont	10,602	10,952
Pinole	17,460	19,039
Richmond	87,425	99,216
San Francisco	723,959	776,733
San Pablo	25,158	30,215
San Rafael	48,404	56,063
South San Francisco	54,312	60,552

Source – (TI-HRA-18)



**Table 3-3 Current and Former Sites at Treasure Island by Building Number**

<b>Building/Site No.</b>	<b>Former Uses</b>	<b>Current Status</b>
1	China Clipper terminal, Navy Headquarters offices, museum, SWDIV offices	Police station, TIDA office, John Stewart Co. rental agency office, BRAC Caretaker offices
2	Aviation exhibits, airplane hanger, Reserve center, general use	Leased to City of San Francisco
3	Palace of Fine and Liberal arts, Port Control Office, Ship repair shops, training and equipment repair	Leased to City of San Francisco
4-6	Diesel oil and gasoline storage tanks (8 total)	Scheduled to be demolished
7	Federal Building, various navy schools, Naval Reserve Center	Closed
8	Exposition building, Federal Building, General mess, Administration and training	Demolished
9	Exposition building, Coast Guard barracks, Administrative offices	Demolished
10	Exposition building, Barracks	Demolished
11	Exposition building, Galley and mess, Barracks, Administrative offices	Demolished
12	Exposition building, Administrative offices	Demolished
12A	Derrick house, Port Operations Office, Ships pilot office, storage	In place
12B	Shed for building 12A	In place
12C	Shed for building 12A	Demolished
13	Exposition building, Main barracks	Demolished
14	Heating plant	Demolished
15	Exposition building, Dispensary	Demolished
16	Barracks (Schools Command)	Demolished
17	Barracks (Schools Command)	Demolished
18	Barracks (Schools Command)	Demolished
19	Barracks (Schools Command)	Demolished
20	General Barracks	Demolished
21	General Barracks	Demolished
22	General Barracks	Demolished
23	Barracks (Schools Command)	Demolished
24	Barracks (Schools Command)	Demolished
25	Barracks (Schools Command)	Demolished
26	Heating plant #2	Demolished
27	Radio Material School, Classrooms (Schools Command)	Demolished
28	Radio Material School, Administration (Schools Command)	Demolished
29	Mess hall, Radio Material School, Administration building	Layup
30	Surgical Operations, Barracks, Administration	Demolished
31	Surgical Ward, Barracks, Storage	Demolished





**Table 3-3 Current and Former Sites at Treasure Island by Building Number**

<b>Building/Site No.</b>	<b>Former Uses</b>	<b>Current Status</b>
32	Surgical Ward, Barracks, Administration, Storage	Demolished
33	Isolation Ward, Administration	Demolished
34	Subsistence, Commissary	Layup
35	Medical (Eye, Ear Nose, and Throat), Barracks	Demolished
36	General Medical Ward, Barracks	Demolished
37	General Medical Ward, Barracks, Storage	Demolished
38	Urological Ward, Barracks, Classrooms (Schools Command)	Demolished
39	Urological Ward, Barracks	Demolished
40	Isolation Ward, Barracks and supply	Layup
41	Small Arms building, Forge and Foundry, Paint shop, Port Operations	Layup
42	Inert Ammunition Storage, Storage	Demolished
43	High Explosives Magazine, Inert Ammunition Storage, Storage	Demolished
44	High Explosives Magazine, Inert Ammunition Storage, Storage	Demolished
45	High Explosives Magazine, Inert Ammunition Storage, Storage	Demolished
46	High Explosives Magazine, Inert Ammunition Storage, Storage	Demolished
47	High Explosives Magazine, Inert Ammunition Storage, Storage	Demolished
48	High Explosives Magazine	Demolished
49	High Explosives Magazine, Inert Ammunition Storage, Storage	Demolished
50	Inert Ammunition Storage	Demolished
51	Y-Gun Storage, Inert Ammunition Storage, Storage	Demolished
52	Fuse and Detonator Magazine	Demolished
53	Fuse and Detonator Magazine, Inert Ammunition Storage, Storage	Demolished
54	Ammunition Magazine	Demolished
55	Inert Ammunition Storage, Storage	Demolished
56	Storage	Demolished
57	Storage	Demolished
58	Incinerator and Refuse Building, Paint Shop	Demolished
59	Office, Work Improvement Program	Demolished
60	Machine shop, Shop, Storage	Demolished
61	Carpenters Shop, Paint Spray Shop, Storage	Demolished
62	Exposition Warehouse, First Lieutenant's Warehouse, Naval Reserve, Training Center	Layup
63	Signal Tower at Pier 21	Demolished
64	Dock Master's Office, Fuel Detail Office	Layup
65	Slip Shed, Shelter and Rifle Range	Demolished



**Table 3-3 Current and Former Sites at Treasure Island by Building Number**

<b>Building/Site No.</b>	<b>Former Uses</b>	<b>Current Status</b>
66	Number not used	NA
67	Bleachers and Gear Locker, Storage, Recreation	Demolished
68	Athletic Fields, Shops, Recreation	Demolished
69	Engineers and Shipfitters shop, Hobby shop, garage, storage, public toilets	Layup
70	Gear locker and storage	In place
71	Scrub House, Launderette	Demolished
72	Sterilizer building, Storage, Paper Disintegrator	Demolished
73	Storage and Dock Master's Office	Demolished
74	Office	Demolished
75	Signal Tower	Demolished
76	Dock Crew's Quarters, Wharf Builders Shop	Demolished
77	DC Generator House	Demolished
78	Garbage House	Demolished
79	Gun Shed, Training	Demolished
80	Damage Control School, Training	Demolished
81	Gasoline Station, Fireboat Storage, Storage	Demolished
82	Gasoline Station	Demolished
83	Gasoline Storage and Lubrication Station, Road Striping Detail, Paint Shop Annex, Garage, film Exchange	Demolished
84	Unknown (may have been small office)	Demolished
85	Diesel Oil Clarifier and Pump Station	Demolished
86	Unknown (may have been small office)	Demolished
87	Incinerator	Demolished
88	Storage or Repair	Demolished
89	Hospital storehouse, Communications storage, Office and storage	Demolished
90	Garbage house	Demolished
91	Toilets and self-serve laundry	Layup
92	General Medical Ward, Barracks and Classrooms, Fire Department Inspection Division	Layup
93	Waiting station, Weather shelter	Demolished
94	Number not used	N A
95	Number not used	NA
96	Storage, Reserve training, Printing plant	CSO
97	Number not used	NA
98	Storage	Demolished



**Table 3-3 Current and Former Sites at Treasure Island by Building Number**

<b>Building/Site No.</b>	<b>Former Uses</b>	<b>Current Status</b>
99	Laundry, Cobbler shop, Tailor, Dry cleaners, Meat Processing facility, Government Printing shop	Undergoing remediation
100	Gun Loading trainer, Portable Office	Demolished
101	Oil pump house	Demolished
102	Heating plant	Demolished
103	Fuel Oil Tank	Cleaned and Abandoned
104	Fuel Oil Tank	Cleaned and Abandoned
105	Oil Pump House	Layup
106	Water Softener Building	Demolished
107	CPO Barracks and Offices, Police station	Layup
108	Waiting station	Demolished
109	Pharmacy and Reception, Barracks	Demolished
110	Linen, bag and miscellaneous storage, Rod and Gun Locker	Demolished
111	Fire House, Fire Station, Port Operations Storage	Layup
112	Derrick House, Port Operations Main Office, Ship's Pilot Office, port Control Storage. Note: Original Building 112 was subdivided and renumbered to Buildings 12A, 12B and 12C	Layup
113	Lumber shed, Port Operations storage	Demolished
114	Storage, Reserve Training shops	Leased to City
115	Garage and shop, Storage, Officer's Wives Mess Storage, Wives Club	Demolished
116	Garage, Storage	Demolished
117	Exposition Building – Palace N, Barracks	Demolished
118	Exposition Building – Palace K-1, Barracks	Demolished
119	Barracks	Demolished
120	Storage, Office	Demolished
121	Electric Shop, Classrooms	Demolished
122	Greenhouse	Demolished
123	Office, Storage and Tool Shed (Nursery)	Demolished
124	Bus Stop Shelter	Demolished
125	Garage, Storage	Demolished
126	Storage, Paint Locker	Demolished
127	Radio Materiel School, Laboratory	Demolished
128	Scrub house, Storage	Leased to City



**Table 3-3 Current and Former Sites at Treasure Island by Building Number**

<b>Building/Site No.</b>	<b>Former Uses</b>	<b>Current Status</b>
129	Scrub house, Jeep Garage, Storage	Layup
130	Scrub house, Storage	Layup
131	Scrub house, Medical/Dental Storage	Layup
132	Storage	Demolished
133	Fuel Oil Tank	Demolished
134	Fuel Oil Tank	Demolished
135	Garbage house, Launderette, Sunday School	Transferred to Department of Labor
136	Storage, Garbage house, Storage	Demolished
137	Exposition Building Palace - K, Subsistence	Demolished
138	Number not used	NA
139	Exposition Building – Palace – C 2, Gymnasium	Demolished
140	Basalt House, Officer’s Mess, Conference Center	Leased to City
141	Explosives office, Carpenter Shop and storage	Layup
142	Oil Storage Building, Paint Locker	Demolished
143	Gasoline pump house, Hazardous Material Locker	Vacant
144	Gasoline storage, Salt Water Pumping Station	Demolished
145	Underground Gasoline Storage Tank	Demolished
146	Control and dispatch, Security, Main Gate	Layup
147	Exposition Building (Home and Garden), Aquacade, Barracks	Demolished
148	Exposition Building (Aquacade), Swimming Pool	Demolished
149	Exposition Building (Hall of Science), Bakery	Demolished
150	Exposition Building (Hall of Science), Barracks	Demolished
151	Exposition Building (Vacationland), Barracks, Paint Locker	Demolished
152	Exposition Building (Vacationland), Ship services	Demolished
153	Garbage house	Demolished
154	Storage	Demolished
155	Exposition Building (Ford Motor Company Building), School	Demolished
156	Gun Shed, Classrooms	Demolished
157	Fire House, Fire Station	In use by SFFD
158	Air Compressor Building, Storage	Demolished
159	Plotting Room, Storage	Demolished
160	Ship Mockup, Classrooms	Demolished
161	Ship Mockup, Classrooms	Demolished
162	Acetylene Generator, Storage	Demolished
163	Diving Tank and Building, Classrooms	Demolished



**Table 3-3 Current and Former Sites at Treasure Island by Building Number**

<b>Building/Site No.</b>	<b>Former Uses</b>	<b>Current Status</b>
164	Night Lookout Training Building, Storage, School, Community Center	Demolished
165	Storage, Navy Exchange Auto Accessory Sales	Demolished
166	Exposition Building (General Motors Building), School	Demolished
167	Number not used	NA
168	Exposition Building (General Motors Building), Gyro Compass Shop	Demolished
169	Storage	Demolished
170	Exposition Building (Hall of Science), Theatre Office	Demolished
171	Exposition Building (Hall of Science), Theatre	Demolished
172	Exposition Building (Hall of Science), Barracks	Demolished
173	Exposition Building (Electricity and Communications), Barracks	Demolished
174	Exposition Building (Electricity and Communications), Offices	Demolished
175	Exposition Building (Electricity and Communication), Offices	Demolished
176	Tower of the Sun, Band Stand	Demolished
177	Exposition Building (Mines, Metals, and Machinery Exhibit), Reception	Demolished
178	Exposition Building (Mines, Metals, and Machinery Exhibit), Offices, Training Building	Demolished
179	Exposition Building (Mines, Metals, and Machinery Exhibit), Barracks	Demolished
180	Hanger, PWC Transportation Shop	Leased to City
181	PAN AM Gasoline Storage Tanks	Demolished
182	PAN AM Gasoline Pump House	Demolished
183	Office, Traffic Control Office, Yacht Club MWR	Leased to City
184	Sentry house and Bus Stop	Part of Building 146
185	Waiting station	Demolished
186	Waiting station	Demolished
187	Chapel	Leased to City
188	Barracks, Administration	Demolished
189	Barracks, Administration and Barracks	Demolished
190	Barracks, Storage, Dependent Public School	Demolished
191	Barracks, Dependent Public School	Demolished
192	Magnet Channel Range, Degaussing Range, Radar Bomb Scoring Unit	Demolished
193	Magnet Channel Range Garage, Radar Bomb Scoring Unit	Demolished
194	Transportation Building	Demolished
195	Brig Overflow	Demolished
196	Barracks, Public School	Demolished
197	Barracks, Electronics Materiel School	Demolished



**Table 3-3 Current and Former Sites at Treasure Island by Building Number**

<b>Building/Site No.</b>	<b>Former Uses</b>	<b>Current Status</b>
198	Barracks, Electronics Materiel School	Demolished
199	Barracks, Electronics Materiel School	Demolished
200	Barracks, Electronics Materiel School	Demolished
201	Subsistence, Galley and Mess Hall, Retail Store, MWR tickets and warehouse	Layup
202	Ships Service, Stores and Cafeteria, Retail Store and restaurant, Credit union, Laundromat, NEX Storage, Credit Union ATM	Layup
203	Barracks	Demolished
204	Barracks	Demolished
205	Barracks	Demolished
206	Barracks	Demolished
207	Barracks	Demolished
208	Barracks	Demolished
209	Barracks	Demolished
210	Barracks	Demolished
211	Barracks	Demolished
212	Barracks	Demolished
213	Barracks	Demolished
214	Barracks	Demolished
215	Administration, Storage, Hobby shop, Chapel, Special Services	Layup
216	Assembly shed, Bus pool storage, Draft shed, Recreational Vehicle storage	In use by PUC
217	Bachelor Officers' Quarters, Storage, Post Office, NTTC Training, Cable TV	Leased to City
218	Storehouse, Administration	Demolished
219	Transformer and Storage	Demolished
220	Shop, Classrooms	Demolished
221	Administration, Office and Storage	Demolished
222	Brigade Guard House, Correctional facility	Demolished
223	Paint Shop, Bus Washing Shed	Demolished
224	Garage and Checking Station	Demolished
225	Gun Shed, Storage, Auto Hobby Shop Storage	In use by Department of Public Works
226	Bachelor Officers' Quarters	Demolished
227	Officer's Subsistence Building, Fog Watch Club	Leased to TIDA



**Table 3-3 Current and Former Sites at Treasure Island by Building Number**

<b>Building/Site No.</b>	<b>Former Uses</b>	<b>Current Status</b>
228	Bachelor Officers Quarters	Demolished
229	Chief Petty Officer's Club, teen or Youth Center, Pizza restaurant	Leased to City
230	WAVES Subsistence Building, Storage, Shop (Mobile ordnance Technical Unit)	Layup
231	Wave Officers' Quarters, Religious Education building	Demolished
232	Wave Barracks (enlisted)	Demolished
233	Classrooms and Administration, RADIAC Calibration training, ATF Laboratory, California National Guard	Layup
234	Nurses Quarters, CPO Quarters	Demolished
235	Ward, Blood Bank and Laboratory, Waves Barracks, Jewish Chaplain	Demolished
236	Administration, Classrooms DCTC	Demolished
237	Oil Storage tank	Demolished
238	Shop and Boiler house, Repair Shop	Demolished
239	Oil Separating Pit and Suction Pump	Demolished
240	Forecastle Mock Up	Demolished
241	Boiler Room Mock Up	Demolished
242	Engine Room Mock Up	Demolished
243	Flight Deck Mock Up	Demolished
244	Diving Tank and OBA Storage and Repair	Demolished
245	Oil Separating Pit	Demolished
246	Smothering Pit	Demolished
247	Oil Storage	Demolished
248	Pump house	Demolished
249	Gasoline Storage	Demolished
250	Suction tank	Demolished
251	Foam tank	Demolished
252	Training tank	Demolished
253	Christmas Tree Training tank	Demolished
254	Christmas Tree Training tank	Demolished
255	Tank (Open)	Demolished
256	Gasoline tank	Demolished
257	Skeet range (prior to construction), dispensary and ward, Family services, Red Cross, Youth Center, Child Care Center	Layup
258	Administration, US Post Office, Bank, Officers' Wives Club and Thrift Shop, Drug Testing Facility	Layup



**Table 3-3 Current and Former Sites at Treasure Island by Building Number**

<b>Building/Site No.</b>	<b>Former Uses</b>	<b>Current Status</b>
259	Gun Mount, Classrooms	Demolished
260	Supply offices, Warehouse, Servmart	CSO
261	Gym, Pool and Bowling Alley	vacant
262	Theatre	Demolished
263	Welfare Building, Recreation, EM Club and Library	Demolished
264	Refrigerated Storehouse, shops	In use by PUC
265	Hostess House, MWR Offices, Library	Leased to City
266	Sonar School building	
267	Transportation storage, Barracks, Training building, Teen Club	Demolished
268	Gun Loading Shed, Classrooms	Demolished
269	Chemical Warfare Office	Demolished
270	Paint and Oil Storage	Demolished
271	Officer's Recreation Building, Community Facility	Leased to City
272	Electrical and Mechanical Storage, Air Compressor Station	Demolished
273	Decontamination Building, Classrooms	Demolished
274	Dynamometer Shop, Fallout Shelter	Demolished
275	Waves Barracks, Navy Band Barracks	Demolished
276	Office, Film Exchange, Storage	Demolished
277	Ammunition Magazine, Storage	Demolished
278	Ammunition Magazine, Storage	Demolished
279	Ammunition Magazine, Small Craft, Storage	Demolished
280	Ammunition Magazine, Medical Storage	Demolished
281	Ammunition Magazine, Film Storage, Storage	Demolished
282	Ammunition Magazine, Storage	Demolished
283	Ammunition Magazine, Storage	Demolished
284	Ammunition Magazine, Electronic Storage, Storage	Demolished
285	Ammunition Magazine, Storage	Demolished
286	Ammunition Magazine, Tear Gas Storage, Storage	Demolished
287	Ammunition Magazine, Film Storage, Storage	Demolished
288	Gas Chamber (Training)	Demolished
289	Storage, Shop, Paint Storage	Layup
290	Port Operations Storage	Layup
291	Gun Mount	Demolished
292	Pest Control shop	In use by Department of Public Works
293	Shed (NTTC training, damage control)	Layup





**Table 3-3 Current and Former Sites at Treasure Island by Building Number**

<b>Building/Site No.</b>	<b>Former Uses</b>	<b>Current Status</b>
294	Gear Locker	Demolished
295	Generator building, Training Unit Mock Up	Demolished
296	Water Taxi Pier Shelter and Office	Demolished
297	Transformer house, Storage	Demolished
298	Marina loading shed	Leased to City
299	Loading shed	Demolished
300	Army Barracks, Office, storage	Demolished
301	Subsistence, Storage	Demolished
302	Subsistence, Storage	Demolished
303	Subsistence, Storage	Demolished
304	Toilets	Demolished
305	Toilets	Demolished
306	Supply Office, Storage	Demolished
307	Barracks, Storage	Demolished
308	Barracks, Storage	Demolished
309	Barracks, Shops, Film Exchange	Demolished
310	Barracks, Shops, Film Exchange	Demolished
311	Barracks, Shops, Film Exchange, Storage	Demolished
312	Barracks, Shops, Film Exchange, Storage	Demolished
313	POW Subsistence Storage, Storage	Demolished
314	Gun Mount	Demolished
315	School	Demolished
316	School	Demolished
317	School	Demolished
318	Service Station, Gun Mount, Classrooms	Demolished
319	School (mock-up)	Demolished
320	School (mock-up)	Demolished
321	School (mock-up)	Demolished
322	Gun Mount	Demolished
323	Gun Trainer, Classrooms	Demolished
324	Assembly Shed	Demolished
325	Battery shop and Storage, Pest Control shop	Layup
326	Gun shed	Demolished
327	Salvage building	Demolished
328	Transformer house	



**Table 3-3 Current and Former Sites at Treasure Island by Building Number**

<b>Building/Site No.</b>	<b>Former Uses</b>	<b>Current Status</b>
329	Storehouse, Office and Storehouse	Demolished
330	Lucky Bag, Navy Exchange Gas Station, Grounds Maintenance Shop	Layup
331	Greenhouse	Demolished
332	POW Brig, Storage	Demolished
333	Recreation Building	Demolished
334	Paint Locker	Demolished
335	Lucky Bag, Paint Shop, Grounds Maintenance	In use as landscaping shop
336	Linoleum Shop, Storage	Demolished
337	Masons Locker, Storage	Demolished
338	Duty Barracks	Demolished
339	Duty Barracks	Demolished
340	Dock Master's Office	Demolished
341	USS Buttercup (Damage Control Trainer)	Layup
342	RADIAC Instruction	Layup
343	RADIAC Instruction	Layup
344	Radium Vault	Layup
345	Incinerator	Demolished
346	Radio Transmitting Station, Offices	Leased to City
347	Gun Mount	Layup
348	Issue Room, Classroom (Chemical Warfare)	Demolished
349	Field Work shop, Classroom (Chemical Warfare)	Demolished
350	Repair shop, Classroom (Chemical Warfare)	Demolished
351	Repair shop, Classroom (Chemical Warfare)	Demolished
352	NTTC Training	Demolished
353	NTTC Training	Demolished
354	Riggers shed, Storage	Demolished
355	Port Operations Storage, Sandblast shed	Demolished
356	Steam Clean and Car Wash	Demolished
357	Bus Wash	Demolished
358	Resistor Bank building, Storage	Leased to City
359	Mobile Decontamination, Classrooms	Demolished
360	Boat house – Pier 24	Demolished
361	Hot water tank building	Layup
362	Port Operations storage shed	Layup
363	Civilian Barracks, Maritime Cooking School	Transferred to Department of Labor



**Table 3-3 Current and Former Sites at Treasure Island by Building Number**

<b>Building/Site No.</b>	<b>Former Uses</b>	<b>Current Status</b>
364	Barracks	Transferred to Department of Labor
365	Barracks and Offices	Transferred to Department of Labor
366	Barracks and Offices	Transferred to Department of Labor
367	Transient Personnel Unit Administration, Personnel Support Detachment, Barracks	Transferred to Department of Labor
368	Enlisted Men's Dining Hall	Transferred to Department of Labor
369	BOQ, Officers Club	Transferred to Department of Labor
370	Gasoline filling station	Demolished
371	USS Pandemonium (mock-up trainer)	Demolished
372	Training Facility- Antenna Tower	Demolished
373	Training Facility- Antenna Tower	Demolished
374	Sump house	In place
375	Training Facility- Antenna Tower	Demolished
376	Training Facility- Antenna Tower	Demolished
377	Sump house	In place
378	Sump house	In place
379	Paint and Hazmat Locker	Layup
380	Sump house	In place
381	MWR Baseball Field Storage	Layup
382	Sump house	In place
383	Radio tower	In place
384	Garage, Training Tanks, Naval Reserve Storage	Leased to City
385	Skeet Range building	Layup
386	Storage	Demolished
387	Storage	Demolished
388	Storage	Demolished
389	Storage	Demolished
390	Sump house	In place
391	Number not used	NA
392	Number not used	NA
393	Sump house	In place
394	Sump house	In place
395	Sump house	In place
396	Sump house	In place
397	Tennis Courts	NA



**Table 3-3 Current and Former Sites at Treasure Island by Building Number**

<b>Building/Site No.</b>	<b>Former Uses</b>	<b>Current Status</b>
398	Tennis Courts	NA
399	Training facility- Antenna Tower	Demolished
400	Training facility- Antenna Tower	Demolished
401	Theatre	Layup
402	Gymnasium	Leased to City
403	Incinerator	Demolished
404	Incinerator	Demolished
405	Flag Pole (Building 1)	Demolished
406	Number not used	NA
407	Athletic field	Demolished
408	Number not used	NA
409	Number not used	NA
410	Mechanical Equipment	Demolished
411	Number not used	NA
412	Storage	Demolished
413	Storage	Layup
414	Transformer house	Demolished
415	Wastewater Treatment Facility	Waste Treatment system
416	Wastewater Treatment Facility- Digester tank	Waste Treatment system
417	Wastewater Treatment Facility-Sedimentation tank	Waste Treatment system
418	Airship Field, Athletic Fields	Demolished
419	Number not used	NA
420	Number not used	NA
421	Storage (Fire Department)	In place
422	Number not used	NA
423	Number not used	NA
424	Switchgear house	Demolished
425	Switchgear house	Demolished
426	Switchgear house	Demolished
427	Switchgear house	Demolished
428	Switchgear house	Demolished
429	Switchgear house	Demolished
430	Number not used	NA
431	Number not used	NA
432	Number not used	NA



**Table 3-3 Current and Former Sites at Treasure Island by Building Number**

<b>Building/Site No.</b>	<b>Former Uses</b>	<b>Current Status</b>
433	Number not used	NA
434	Number not used	NA
435	Number not used	NA
436	Number not used	NA
437	Police Station (located on Clay Street in San Francisco)	Demolished
438	Number not used	NA
439	Number not used	NA
440	Sump house	In place
441	Sump house	Demolished
442	Medical- Dental Clinic	Transferred to Department of Labor
443	Sump house	In place
444	Sump house	In place
445	Storage and Vehicle Maintenance Shop	Layup
446	Storage	Demolished
447	Weather shelter	Demolished
448	Storage	Layup
449	Administration and storage, Reserve Training Center	CSO
450	12ND Headquarters, Offices	Layup
451	Number not used	NA
452	BEQ	Layup
453	BEQ	Layup
454	Storage, Storage for Armory	Layup
455	Boiler plant	Layup
456	Gasoline storage tanks	Demolished
457	Storage shed	Demolished
458	Pyrotechnics Storage, Paint Storage	Layup
459	Skeet range	Layup
460	Microwave tower	Demolished
461	Damage Control School Classrooms, NTTC Headquarters, Fire Training	Leased to City
462	Decontamination Building, Fire Training	Leased to City
463	Gas Chamber	Leased to City
464	Smoke Elimination structure	Demolished
465	Trickling Filter	Waste Treatment system
466	Secondary Sedimentation	Waste Treatment system
467	Digester #2	Waste Treatment system



**Table 3-3 Current and Former Sites at Treasure Island by Building Number**

<b>Building/Site No.</b>	<b>Former Uses</b>	<b>Current Status</b>
468	Sludge Dewatering Structure	Waste Treatment system
469	No Break Generator Building	Layup
470	Saluting Battery Gun Mount	Removed
471	Smoke Elimination Facility Control Building	Demolished
472	Flag pole	Demolished
473	Flag pole	Demolished
474	Flag pole	In place
475	Flag pole	In place
476	West Guard tower	Demolished
477	East Guard tower	Demolished
478	Basketball court	Transferred to Department of Labor
479	Basketball courts (16)	Demolished
480	Public toilets	Layup
481	Incinerator	Layup
482	Antenna tower	Demolished
483	Refreshment stand	Layup
484	Dewater tower	Demolished
485	Little League field	Layup
486	Barge shelter	Demolished
487	CPO Barracks and Administration	Transferred to Department of Labor
488	CPO Barracks	Transferred to Department of Labor
489	CPO Barracks	Transferred to Department of Labor
490	Number not used	NA
491	Separating pit	Demolished
492	Recreation grounds	In place
493	Stormwater pump	In place
494	Number not used	NA
495	Sentry booth	Demolished
496	Harbormaster Office and Boathouse	Leased to City
497	Fitness Center	Leased to City
498	Wind Generator tower on Building 260	Demolished
499	Number not used	NA
500	Number not used	NA
501	Armory	Layup
502	Child Care Center	Layup



**Table 3-3 Current and Former Sites at Treasure Island by Building Number**

<b>Building/Site No.</b>	<b>Former Uses</b>	<b>Current Status</b>
503	Number not used	NA
504	Number not used	NA
505	Training mockup (Does not appear on any map)	NA
506	Training mockup (Does not appear on any map)	NA
507	Number not used	NA
508	Training mockup (Does not appear on any map)	NA
509	Training mockup (Does not appear on any map)	NA
510-519	Number not used	NA
520	Steam heat building	Layup
521-529	Number not used	NA
530	Pier steam plant	Layup
531-539	Number not used	NA
540	Steam heat building	Layup
541-549	Number not used	NA
550	Steam heat building	Layup
551-564	Number not used	NA
565	Battle Simulator Trainer	Demolished
566-569	Number not used	NA
570	Operational Trainer Facility	CSO
571	Collimation tower	Removed
572	RAS Operations tower	Layup
573	Collimation tower	Removed
574	Electrical substation	Unknown
575-579	Number not used	NA
580	NTTC Elevator Trainer	Removed
581-599	Number not used	NA
600	Administration/Academic Building for Fire Fighting School	Leased to City
601-604	Number not used	NA
605	P-250 Pump Trainer Firefighting	Leased to City
606	Advanced Shipboard Firefighting	Leased to City
607	OBA locker	Leased to City
608	General Shipboard Firefighting	Leased to City
609	General Shipboard Firefighting	Leased to City
610	Equalization tank (Firefighting)	Leased to City
611	Equalization tank (Firefighting)	Leased to City



**Table 3-3 Current and Former Sites at Treasure Island by Building Number**

<b>Building/Site No.</b>	<b>Former Uses</b>	<b>Current Status</b>
612	Aviation Firefighting	Leased to City
613	General Shipboard Firefighting	Leased to City
614	General Shipboard Firefighting	Leased to City
615	Utility building	Leased to City
616	Aviation tower	Leased to City
617	P-250 tower (Firefighting)	Leased to City
618	Propane farm	Leased to City
619-669	Number not used	NA
670	Brig	Leased to City
671	Brig carpenter shop	Leased to City
672-679	Number not used	NA
680	Sewage processing	Unknown
681	Industrial Waste Treatment	Waste treatment facility
682	Number not used	NA
683	Number not used	NA
684	Number not used	NA
685	Number not used	NA
686	Number not used	NA
687	Number not used	NA
688	Number not used	NA
689	Number not used	NA
690	Electronic Sign	Demolished and replaced with a non-electric sign
691-1099	Number not used	NA
1100-1449	Married Enlisted Men's Quarters. (These buildings are complexes of 240 units each over several areas of Treasure Island. Building numbers 1130, 1132, 1134, 1136, 1138, 1140, 1142, 1144, 1146, 1148, 1150 through 1200, 1255 through 1300, 1320, 1322, 1324, 1326 through 1399, 1407, 1414 through 1417, 1421 through 1429, 1446, and 1448 were not used.)	
Pier 1	Fueling Pier, General purpose pier	Original Pier 1 (Fueling Pier) demolished NLT 1961
Pier 2	Small boat berthing	Marina
Pier 3	Pier and floats	Demolished
Pier 4	Pier and floats	Demolished
Pier 5	Marine railway	Demolished
Pier 6	Pier and floats	Demolished





**Table 3-3 Current and Former Sites at Treasure Island by Building Number**

<b>Building/Site No.</b>	<b>Former Uses</b>	<b>Current Status</b>
Pier 7	Pier and floats	Demolished
Pier 8	Pier and floats	Demolished
Pier 9	Marine railway	Demolished
Pier 9A	Marine railway – 50 Ton	Demolished
Pier 10	Fuel pier	Demolished
Pier 11	Ship’s Berthing and Floating Dry Dock pier, Ship’s Berthing Pier	
Pier 12	Repair pier, Small Boat pier	Small Craft Pier
Pier 13	Maintenance pier	Demolished
Pier 14	Maintenance pier	Demolished
Pier 15	Maintenance pier	Demolished
Pier 16	Maintenance pier	Demolished
Pier 17	South pier	Demolished
Pier 18	Short pier	Demolished
Pier 19	Repair pier, Marine Railway	Demolished
Pier 20	Ferry slip (Oakland Landing)	Demolished
Pier 21	North pier, Berthing pier, Fuel pier	
Pier 22	Ammunition pier	Demolished
Pier 23	Small boat landing, Recreational, fishing pier	Fishing Pier
Pier 24	Small Boat pier	Demolished
Pier (Unnumbered)	Recreational marina	
Shed (Unnumbered)	Bottled gas storage	

Source – (TI-HRA-11)



**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
Table 3-4 summarizes the uses of the buildings at NAVSTA TI from 1939 (International Exposition) through 1994. The information is taken from the referenced documents. Most of the references are maps of the U.S. Naval Station showing conditions on particular dates. Many buildings were demolished during the life of the naval station. After being identified as demolished once, the following year blocks are greyed out. Not all buildings are listed on each of the maps referenced. These are identified as Not Listed.								
1	China Clipper Terminal,	Administration Building	Com. Western Sea Frontier	Administration	Administration	Admin CWSF	Admin Com 12	Naval Station, Treasure Island
2	Aviation exhibits, airplane hanger	Hangar	Navy and MC Training Center	Naval and Marine Res Training Ctr	Naval and Marine Res. Training Ctr.	USNR and Mar Trng. Center	USNR and Mar Trng. Center	General Use (Movie set)
3	Palace of Fine and Liberal arts.	Ship Repair Shops	Public Works	Public Works Shop	Public Works Shop	Public Works	Public Works	Training School, equipment repair
4-6	Not listed	Diesel oil Storage, Gasoline Storage	Diesel oil Storage, Gasoline Storage	Diesel oil Storage, Gasoline Storage	Diesel oil Storage, Gasoline Storage	Diesel oil Storage, Gasoline Storage	Diesel oil Storage, Gasoline Storage	Diesel oil Storage, Gasoline Storage
7	Federal Building south half.	Schools	Director of Training	Admin and Training	Administration	NIS, CCPO,	NIS, CCPO, Navy Rel.	Director of Training Facilities
8	Exposition building.	Galley and Recreation	Gen Mess CPO	Admin and Training	Demolished			
9	Exposition building	Barracks	Office	Administration	Demolished			



**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
10	Exposition building,	Barracks	Barracks	Barracks	Demolished			
11	Exposition building,	Barracks	Offices	Galley	Demolished			
12	Exposition building,	Office	Offices	Barracks	Demolished			
12A 12B, 12C	Original Bldg 112 was subdivided and renumbered 12A,B,C. Date unknown.							Port Control Storage
13	Exposition building,	Barracks	Demolished					
14	Not listed	Heating Plant	Heating Plant No. 1	Heating Plant No. 1	Demolished			
15	Exposition building,	Dispensary	Demolished					
16	Not listed	Barracks (Hospital Corps)	Barracks	Barracks	Barracks	Barracks (Vacant)	Barracks (Vacant)	Demolished



**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
17	Not listed	Barracks (Hospital Corps)	Barracks	Barracks	Barracks	Demolished		
18	Not listed	Barracks (Hospital Corps)	Barracks	Barracks	Barracks	Demolished		
19	Not listed	Barracks (Hospital Corps)	Barracks	Barracks	Barracks	Demolished		
20	Not listed	Barracks (Hospital Corps)	Barracks	Barracks	Demolished			
21	Not listed	Barracks (Hospital Corps)	Barracks	Barracks	Demolished			
22	Not listed	Barracks (Hospital Corps)	Barracks	Barracks	Demolished			
23	Not listed	Barracks (Hospital Corps)	Barracks	Barracks	Barracks and Post Office	Demolished		
24	Not listed	Barracks (Hospital Corps)	Barracks	Barracks	Administration	Admin and Post Office	Admin	Demolished
25	Not listed	Barracks (Hospital Corps)	Barracks	Barracks	Barracks	Not Listed	Not Listed	Demolished
26	Not listed	Heating Plant	Heating Plant No. 2	Heating Plant No. 2	Heating Plant No. 2	Not Listed	Not Listed	Demolished



**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
27	Not listed	Radio Material School A	Classrooms	Classrooms	Classrooms	Classrooms	Classrooms	Demolished
28	Not listed	Radio Material School B	Classrooms	Classrooms	Administration	Administration	Administration	Demolished
29	Not listed	Radio Material School D	Classrooms	Classrooms	Administration	Administration and Instruction	Administration Schools Com.	Admin.
30	Not listed	Surgical Operation	Barracks	Storage	Administration	Administration	Administration	Demolished
31	Not listed	Surgical Ward	Barracks	Storage	Housing Office, 12 ND Band Barracks	12 ND Band, Storage	12 ND Band Pers. Center	Demolished
32	Not listed	Surgical Ward	Barracks	Administration	Administration, Band Practice	Admin and Storage	Admin and Storage	Demolished
33	Not listed	Admin. & Sick Officers	Adm Offices	Administration	Administration	Barracks (Women)	Barracks (Women)	Demolished
34	Not listed	Subsistence	Commissary Store	Commissary Store	Commissary	Commissary	Commissary	Commissary
35	Not Listed	Eye, Ear, Nose, and Throat	Barracks	Barracks	Storage	Storage	Storage	Demolished
36	Not Listed	General Medical Ward	Barracks	Barracks	Demolished			



**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
37	Not Listed	General medical Ward	Barracks	Barracks	Storage	Demolished		
38	Not Listed	Urological Ward	Barracks	Classrooms	Classrooms	Demolished		
39	Not Listed	Urological Ward	Barracks	Barracks	Demolished			
40	Not Listed	Isolation Ward	Barracks	Barracks	Classrooms	Classrooms	Classrooms	Barracks and Supply
41	Not Listed	Forge and Foundry Building	Forge and Foundry	Paint Shop	Paint Shop	Paint Shop	Paint Shop	Port Ops
42	Not Listed	Small Arms	Storage	Storage	Storage	Demolished		
43	Not Listed	Inert Ammunition Storage	Storage	Storage	Not Listed	Demolished		
44	Not Listed	Inert Ammunition Storage	Storage	Storage	Not Listed	Demolished		
45	Not Listed	Inert Ammunition Storage	Storage	Storage	Not Listed	Demolished		
46	Not Listed	Inert Ammunition Storage	Storage	Storage	Not Listed	Demolished		
47	Not Listed	Inert Ammunition Storage	Storage	Storage	Not Listed	Demolished		



**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
48	Not Listed	Demolished	Demolished	Demolished				
49	Not Listed	Inert Ammunition Storage	Storage	Storage	Not Listed	Demolished		
50	Not Listed	Inert Ammunition Storage	Storage	Storage	Not Listed	Demolished		
51	Not Listed	Inert Ammunition Storage	Storage	Storage	Not Listed	Demolished		
52	Not Listed	Not listed	Storage	Storage	Not Listed	Demolished		
53	Not Listed	Inert Ammunition Storage	Storage	Storage	Not Listed	Demolished		
54	Not Listed	Demolished	Demolished	Demolished				
55	Not Listed	Inert Ammunition Storage	Storage	Storage	Vacant	Demolished		
56	Not Listed	Shop and storage	Storage	Storage	Not Listed	Demolished		
57	Not Listed	Shop and storage	Storage	Storage	Storage	Demolished		
58	Not Listed	Incinerator and Refuse Building	Paint shop	Storage	Demolished			
59	Not Listed	Office	Office	Office	Demolished			
60	Machine shop	Shop	Storage	Storage	Demolished			



**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
61	Not Listed	Carpenter Shop	Carpenter Shop	Storage	Demolished			
62	Exposition Warehouse	Warehouse and shop	West Coast Training Aid	Training	Training Aids Center	Naval Edu. and Trng Support Det.	Reserves and CB Mobile Battalion	Reserves and CB Mobile Battalion
63	Not Listed	Signal Tower	Signal Tower	Signal Tower	Signal Tower	Signal Tower	Signal Tower	Signal Tower
64	Not Listed	Dock Master's Office	Fuel Detailing Office	Fuel Receiving Office	Fuel Detailing Office	Fuel Detailing Office	Fuel Detailing Office	Fuel Detailing Office
65	Not Listed	Shelter and Rifle Range	Rifle Range and Storage	Surveyed	Demolished			
66	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>
67	Bleachers and Gear Locker	Bleachers and Gear locker	Storage	Recreation	Bleachers and Storage	Bleachers	Not Listed	Demolished
68	Athletic Fields	Shops	Shop and Grounds Office	Recreation	Demolished			
69	Not Listed	Engineers and Shipfitters Shops	Garage	Hobby Shop Garage	Storage	Storage, Public Toilets	Storage, Public Toilets	Storage, Public Toilets
70	Not Listed	Gear Locker	Gear Locker	Fire Station Gear Locker	Gear locker	Storage	Storage	Storage
71	Not Listed	Scrub House	Scrub House	Laundryette	Laundryette (secured)	Demolished		
72	Not Listed	Sterilizer Building	Sterilizer Bldg	Sterilizer Bldg	Disintegrator Building	Disintegrator	Storage	Demolished





**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
73	Not Listed	Storage and Dock Master's Office	Storage	Administration	Demolished			
74	Not Listed	Office	Office	Administration	Demolished			
75	Not Listed	Signal Tower	Signal Tower	Signal Tower	Demolished			
76	Not Listed	Dock Crew Quarters	Dock Crews Qtrs	Wharf Builders Shop	Demolished			
77	Not Listed	D.C. Generator House	Aux Power House P-10	Generator House	Demolished			
78	Not Listed	Garbage House	Garbage House	Garbage Storage	Demolished			
79	Not Listed	Gun Shed	Gun Shed	Training	Demolished			
80	Not Listed	Damage Control School	Instruction Bldg	Training	Demolished			
81	Not Listed	Gasoline Station	Fireboat Storage	Storage	Demolished			
82	Not Listed	Gasoline Station	Gas Station	Gasoline Service Sta.	Demolished			
83	Not Listed	Lubrication Station	Road Striping Detail	Paint Shop Annex	Film Exchange	Film Exchange	Film Exchange	Demolished
84	Not Listed	Demolished						



**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
85	Not Listed	Diesel Oil Clarifier and Pump Station	Diesel Oil Clarifier	Diesel Oil Clarifier	Diesel Oil Clarifier	Diesel Oil Pumping Station	Diesel Oil Pumping Station	Diesel Oil Pumping Station
86	Not Listed	Demolished						
87	Not Listed	Incinerator	Incinerator	Incinerator	Demolished			
88	Not Listed	Storage	Demolished					
89	Not Listed	Storehouse	Storehouse	Storage	Storage and Acct. Office	Office and Storage	Office and Storage	Demolished
90	Not Listed	Garbage house	Garbage House	Garbage Storage	Garbage house	Garbage House	Not Listed	Demolished
91	Not Listed	Toilets	Toilets	Toilets	Toilets	Toilets	Toilets	Toilets and self-serve laundry
92	Not Listed	General Medical Ward No.13	Barracks	Barracks	Classrooms	Classrooms	Classrooms	Fire Dept. Insp. Division
93	Not Listed	Waiting Station	Waiting Station	Waiting Station	Waiting Station	Waiting Station	Waiting Station	Weather Shelter
94	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>
95	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>
96	Not Listed	Storage	Storage	Storage	Storage, NPPSO	Storage, NPPSO	Storage, NPPSO	Printing Plant
97	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>
98	Not Listed	Storage	Storage	Not Listed	Demolished			



**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
99	Not Listed	Laundry	Laundry, tailor, cobbler shop	Laundry	Laundry and Dry Cleaning	Cobbler Shop, Dry Cleaning	Cobbler Shop, Dry Cleaning	Disaster preparation storage
100	Not Listed	Gun Loading Trainer	Office – Portable	Office – Portable	Demolished			
101	Not Listed	Oil pump House	Oil pump House	Oil Pumping Station	Not Listed	Demolished		
102	Not Listed	Heating Plant No. 3	Heating Plant No. 3	Heating Plant No. 3	Heating Plant No. 3	Demolished		
103	Not Listed	Fuel Oil Tank	Fuel Oil Tank	Fuel Oil Storage	Fuel Oil Tank (Standby)	Fuel Oil Tank (Standby)	Fuel Oil Tank (Standby)	Fuel Oil Tank (Standby)
104	Not Listed	Fuel Oil Tank	Fuel Oil Tank	Fuel Oil Storage	Fuel Oil Tank (Standby)	Fuel Oil Tank (Standby)	Fuel Oil Tank (Standby)	Fuel Oil Tank (Standby)
105	Not Listed	Oil pump House	Oil pump House	Oil pumping station	Oil Pumphouse	Oil Pumphouse	Oil Pumphouse	Oil Pumphouse
106	Not Listed	Water Softener Building	Demolished					
107	Not Listed	C.P.O. Barracks	C.P.O. Barracks	C.P.O. Barracks	Admin. Office and Barracks	Admin. Office and Barracks	Adm. Off. And Barracks	Police Station
108	Not Listed	Waiting Station	Waiting Station	Waiting Station	Waiting Station	Waiting Station	Waiting Station	Demolished
109	Not Listed	Overflow Pharmacy and Reception	Barracks	Barracks	Barracks	Barracks	Barracks	Demolished



**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
110	Not Listed	Linen, Bag and Misc. Storage	Storage	Storage	Storage (Vacant)	Rod and Gun Locker	Rod and Gun Locker	Demolished
111	Fire House No. 1	Fire Station No. 1	Fire Station No. 1	Fire Station No. 1	Fire Station No. 2	Fire Station No. 2	Fire Station No. 2	Port Ops Storage
112	Not Listed	Derrick house	Derrick house	Crane Machinery	Derrick House	Derrick House	Derrick House	Port Control Storage
113	Not Listed	Lumber Shed	Lumber Shed	Lumber Storage	Lumber Shed	Lumber Shed	Lumber Shed	Port Ops Storage
114	Not Listed	Storage	Storage	Storage	Storage	Storage	Storage	vacant
115	Not Listed	Garage & Shop	Wine Mess	Storage	Wine Mess and COM Mgrs Qtrs	Wine Mess, Wives Club - EM	Wine Mess, Wives Club - EM	Demolished
116	Not Listed	Storage	Storage locker	Storage	Demolished			
117	Exposition Building – Palace N	Barracks N	Demolished					
118	Exposition Building – Palace K-1	Barracks K-1	Demolished					
119	Not Listed	Barracks (Marine)	Barracks	Barracks	Barracks and Office	Not Listed	Not Listed	Demolished
120	Not Listed	Storage	Office	Office	Storage	Demolished		
121	Not Listed	Electric Shop	Classrooms	Classrooms	Demolished			
122	Not Listed	Greenhouse	Greenhouse	Greenhouse	Demolished			
123	Not Listed	Office and Storage (Nursery)	Office and Tool Shed	Office and Tool Shed	Demolished			



**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
124	Not Listed	Waiting Station	Waiting Station	Waiting Station	Waiting station	Waiting station	Waiting station	Demolished
125	Not Listed	Garage	Garage	Garage	Storage	Storage	Storage	Demolished
126	Not Listed	Storage	Paint Locker	Paint Locker	Demolished			
127	Not Listed	Radio Materiel School C	Laboratory	Classrooms	Laboratory	Laboratory	Laboratory	Demolished
128	Not Listed	Scrub House	Storage	Storage	Storage	Storage	Storage	Storage
129	Not Listed	Scrub House	Jeep Garage	Garage	Storage	Storage	Storage	Storage
130	Not Listed	Scrub House	Scrubhouse	Storage	Storage	Storage	Storage	Storage
131	Not Listed	Scrub House	Scrubhouse	Storage	Drill Team	Elect. Hobby	Radio Station	Medical-Dental Storage
132	Not Listed	Storage	Storage	Storage	Storage	Demolished		
133	Not Listed	Fuel Oil Tank	Fuel Oil Tank	Fuel Oil Storage	Fuel Oil Tank	Demolished		
134	Not Listed	Fuel Oil Tank	Fuel Oil Tank	Fuel oil Storage	Fuel Oil Tank	Demolished		
135	Not Listed	Garbage House	Garbage House	Storage	Launderette	Launderette	Launderette	Sunday School
136	Not Listed	Garbage House	Garbage House	Storage	Demolished			
137	Exposition Building Palace - K,	Subsistence K	Demolished					
138	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>



**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
139	Exposition Building – Palace – C 2	Gymnasium	Demolished					
140	Not Listed	Officers Mess	Officers Club	Comm. Officers Mess (Open)	COM (Open)	COM (Open)	COM (Open)	Nimitz Conference Center
141	Not Listed	Explosives Office	Carpenter Shop	Carpenter Shop and Storage	Storage	Storage	Storage	Vacant
142	Not Listed	Oil Storage Building	Paint Locker	Paint Locker	Paint locker	Demolished		
143	Not Listed	Gasoline Pump House	Carpenter Shop	Gasoline Pumping Station	Storage	Storage	Storage	vacant
144	Not Listed	Gasoline Storage	Salt Water pump House	Salt Water pumping Station	Not Listed	Demolished		
145	Not Listed	Gasoline Storage Tank	Gasoline Tank	Not Listed	Demolished			
146	Not Listed	Control and Dispatch	Office	Storage	Security Office Vehicle Gate	Security Office Vehicle Gate	Security Office Vehicle Gate	Main gate
147	Exposition Building (Home and Garden), Aquacade,	Barracks C-1	Demolished					



**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

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148	Exposition Building (Aquacade),	Swimming Pool	Swimming Pool	Swimming Pool (Secured)	Demolished			
149	Exposition Building (Hall of Science),	Bakery	Demolished					
150	Exposition Building (Hall of Science),	Barracks J	Demolished					
151	Exposition Building (Vacationland)	Barracks I	Demolished					
152	Exposition Building (Vacationland)	Ship Services	Demolished					
153	Not Listed	Garbage House	Demolished					
154	Not Listed	Storage	Demolished					
155	Exposition Building (Ford Motor Company Building)	Palace H School	Demolished					
156	Not Listed	Gun Shed	Gun Shed	Classrooms	Classroom	Classroom	Classroom (vacant)	Demolished



**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

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157	Not Listed	Fire House # 2	Fire House # 2	Fire House No. 2	Fire House No. 1	Fire House No. 1	Fire House No. 1	Fire Station #1
158	Not Listed	Air Compressor Building	Air Compressor Building	Storage	Demolished			
159	Not Listed	Plotting Room	Plotting Room	Classrooms	Classrooms	Classrooms (Vacant)	Classrooms (Vacant)	Demolished
160	Not Listed	Shop No. 2	Ship Mockup #2	Classrooms	Classrooms	Classrooms (Vacant)	Classrooms (Vacant)	Demolished
161	Not Listed	Shop No. 1	Ship Mockup #1	Classrooms	Classrooms	Classrooms (Vacant)	Classrooms (Vacant)	Demolished
162	Not Listed	Acetylene Generator B	Acetylene Generator B	Storage	Storage	Storage	Storage	Demolished
163	Not Listed	Diving Tank Building	Diving Tank Building	Classrooms	Demolished			
164	Not Listed	Night lookout Training Building	Night lookout Training Building	Storage	Classrooms	Community Facility	Community Facility	Demolished
165	Not Listed	Storage	Storage	Storage	Auto Accessory Sales	Auto Accessory Sales	Not Listed	Demolished
166	Exposition Building (General Motors Building), School	Palace G School	Demolished					





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NAVSTA TI  
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167	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>
168	Exposition Building (General Motors Building), Gyro Compass Shop	Gyro Compass Shop	Demolished					
169	Storage	Storage	Demolished					
170	Exposition Building (Hall of Science), Theatre Office	Theatre Office	Demolished					
171	Exposition Building (Hall of Science), Theatre	Theatre	Demolished					
172	Exposition Building (Hall of Science), Barracks	Barracks F	Demolished					



**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

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173	Exposition Building Palace E	Barracks E	Demolished					
174	Exposition Building Palace E	Offices	Demolished					
175	Exposition Building Palace E	Offices	Demolished					
176	Tower of the Sun	Band Stand	Band Stand	Band Stand	Demolished			
177	Exposition Building Palace D	Reception	Demolished					
178	Exposition Building Palace D	Offices	Demolished					
179	Exposition Building Palace D	Barracks	Demolished					
180		Hangar	Garage & Shops	Garage and Shops	12 ND Transportation Ctr.	Transportation	Transportation	PWC Transportation Shop
181		Gasoline Storage Tanks	Gasoline Tanks	Gasoline Storage	Demolished			
182		Gasoline Pump House	Gasoline Pump House	Gasoline Pumping Station	Demolished			



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183		Office	Office	Administration	Traffic Control office	Storage	Storage	Yacht club MWR
184		Sentry House	Vehicle Gate Guard	Sentry Booth	Waiting Station	Waiting Station	Waiting Station	Bus Stop
185		Waiting Station	Demolished					
186		Waiting Station	Waiting Station	Waiting Station	Demolished			
187		Chapel	Chapel	Chapel	Chapel	Chapel	Chapel	Chapel
188		Barracks	Barracks	Barracks	Admin & Barracks	Administration	Administration Vacant	Demolished
189		Barracks	Barracks	Barracks	Admin & Office	Not Listed	Not Listed	Demolished
190		Barracks	Storage	Barracks	Public School	Public School	Public School	Demolished
191		Barracks	Barracks-Storage	Barracks	Public School	Public School	Public School	Demolished
192		Degaussing Range	Degaussing Range	Radar Bomb Scoring Unit	Storage	Demolished		
193		Garage	Garage	Radar Bomb Scoring Unit	Storage	Demolished		
194		Transportation Building	Garage & office	Administration	Classrooms	Demolished		
195		Barracks	Barracks	Barracks	Brig Retraining and Barracks	Brig Retraining and Barracks	Brig Retraining and Barracks	Brig Overflow
196		Barracks	Barracks	Barracks	Barracks	Public School	Public School	Demolished



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197		Barracks	Electronics Materiel School	Classrooms	Classrooms	Classrooms	Classrooms	Demolished
198		Barracks	Electronics Materiel School	Classrooms	Classrooms	Classrooms	Classrooms	Demolished
199		Barracks	Electronics Materiel School	Classrooms	Classrooms	Classrooms	Classrooms	Demolished
200		Barracks	Electronics Materiel School	Classrooms	Classrooms	Classrooms	Classrooms	Demolished
201		Subsistence	Galley	Galley and Mess Hall	Retail Store-warehouse	Retail Store warehouse	Retail Store warehouse	MWR warehouse
202		Ships Service	Store and Cafeteria	Retail Store and restaurant	Navy Exchange Cafeteria	Navy Exchange Cafeteria	Navy Exchange Cafeteria	NEX storage
203		Barracks	Barracks	Barracks	Barracks	Barracks (Vacant)	Barracks (Vacant)	Demolished
204		Barracks	Barracks	Barracks	Barracks	Barracks (Vacant)	Barracks (Vacant)	Demolished
205		Barracks	Barracks	Barracks	Barracks	Barracks (Vacant)	Barracks (Vacant)	Demolished
206		Barracks	Barracks	Barracks	Barracks	Barracks (Vacant)	Barracks (Vacant)	Demolished
207		Barracks	Barracks	Barracks	Barracks	Barracks (Vacant)	Barracks (Vacant)	Demolished
208		Barracks	Barracks	Barracks	Barracks	Barracks (Vacant)	Barracks (Vacant)	Demolished



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209		Barracks	Barracks	Barracks	Barracks	Vacant	Barracks (Vacant)	Demolished
210		Barracks	Barracks	Barracks	Barracks	Not Listed	Demolished	Demolished
211		Barracks	Barracks	Barracks	Barracks	Demolished		
212		Barracks	Barracks	Barracks	Barracks (CPO)	Vacant (CPO)	Barracks (CPO) Vac	Demolished
213		Barracks	Barracks	Not Listed	Demolished			
214		Barracks	Barracks	Not Listed	Demolished			
215		Administration	Shops	Administration and Training	Chapel, Hobby Shop, TV Shop office	Chapel, Hobby Shop, TV Shop office	Chapel, Hobby Shop, TV Shop office	Vacant
216		Assembly Shed	Draft Shed	Administration and Training	Assembly Shed (Vacant)	Storage Shed, Rec. Veh.	Storage Shed, Rec. Veh.	Vehicle Storage
217		Bachelor Officers Qtrs.	Separation	Post Office	Station Locator Office, Red Cross	Pers. Office, Fam Service Ctr., Red Cross	Pers. Office, Fam Service Ctr., Red Cross	Cable TV
218		Storehouse	Administration	Administration	Admin. Office	Admin Off. Proj. Team	Admin Off. Proj. Team	Demolished
219	Transformer and Storage	Transformer and Storage	Demolished					
220		Shop	Classroom	Classrooms	Demolished			
221		Administration	Office-Storage	Administration and Storage	Office and Storage	Office and Storage	Office and Storage	Demolished
222		Brigade Guard House	Brig	Brig	Brig	Confinement Facility	Confinement Facility	Demolished



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223		Paint Shop	Bus Washer	Bus Washing Shed	Demolished			
224		Garage & Checking Station	Trans. Repair Facilities	Garage	Demolished			
225		Gun Shed	Gun Shed Storage	Storage	Hobby Shop Garage	Hobby Shop Garage	Hobby Shop Garage	Hobby shop garage
226		Bachelor Officer Qtrs	Bachelor Officers Qtrs	Bachelor Officers Qtrs	Demolished			
227		Subsistence Bldg. (Officers)	Cafeteria	Comm. Officers Mess (Closed)	1 <sup>st</sup> and 2 <sup>nd</sup> PO mess (open)	1 <sup>st</sup> and 2 <sup>nd</sup> PO mess (open)	1 <sup>st</sup> and 2 <sup>nd</sup> PO mess (open)	Fog Watch Club
228		Bachelor Officer Qtrs	Bachelor Officers Qtrs	Bachelor Officers Qtrs	Demolished			
229		C.P.O. Club	CPO Club	CPO Mess	CPO Club	CPO Club	CPO Club	Pizza Restaurant
230		Subsistence (Waves)	Waves Subsistence	Waves Galley and Mess	Shop	Shop	Shop	Mobile Ord. Tech. unit
231		Wave Officers Qtrs	Barracks Waves CPO	Barracks Waves	Barracks Waves	Barracks Waves	Barracks Waves	Demolished
232		Wave Barracks (Enlisted)	Wave Barracks	Barracks Waves	Barracks Waves	Barracks Waves	Barracks Waves	Demolished
233		Instruction Building	Admin. DCS Radiological School	Administration	Classroom, Administration, D.C.T.C.	Classrooms Admin., UNREP	Classrooms Admin., UNREP	Calif. Nat'l Guard



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NAVSTA TI  
BUILDING USE CHRONOLOGY**

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234		Nurses Qtrs	CPO Qtrs	Barracks	Classrooms and Barracks	Classrooms	Classrooms	Demolished
235		Ward, Blood Bank and Lab.	Rec. Sta. Chapel	Barracks	Demolished			
236		Administration	Classrooms	Classrooms	Classrooms, D.C.T.C.	Classrooms, D.C.T.C.	Classrooms, D.C.T.C.	Demolished
237		Oil Storage	Oil Storage Tank	Oil Storage	Oil Storage Tank	Oil Storage Tank	Oil Storage Tank	Demolished
238		Shops and Boiler House	Shops and Boiler House	Repair Shop	Shop and Boiler House	Shop and Boiler House	Shop and Boiler House	Demolished
239		Suction Pump	Suction Pump	Pump House	Oil Separating pit	Oil Separating pit	Oil Separating pit	Demolished
240		Forecastle	Forecastle	Training Unit Mockup	Forecastle, Mock-up	Forecastle, Mock-up	Forecastle, Mock-up	Demolished
241		Boiler Room	Boiler Room	Training Unit Mockup	Boiler Room, Mock-up	Boiler Room, Mock-up	Boiler Room, Mock-up	Demolished
242		Engine Room	Engine Room	Training Unit Mockup	Engine Room, Mock-up	Engine Room, Mock-up	Engine Room, Mock-up	Demolished
243		Flight Deck	Flight Deck	Training Unit Mockup	Flight Deck, Mock-up	Flight Deck, Mock-up	Flight Deck, Mock-up	Demolished
244		Diving Tank	Diving Tank	Training Unit Mockup	OBA Storage and Repair	OBA Storage and Repair	OBA Storage and Repair	Demolished
245		Oil Separator	Oil Separator	Training Unit Mockup	Oil Separating Pit	Oil Separating Pit	Oil Separating Pit	Demolished



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246		Smothering Pit	Smothering Pit	Training Unit Mockup	Smothering pit	Smothering pit	Smothering pit	Demolished
247		Oil Storage	Oil Storage	Fuel Oil Storage	Oil Storage	Oil Storage	Oil Storage	Demolished
248		Pump House	Pump House	Pumping Station	Pump House	Pump House	Pump House	Pump House
249		Gasoline Storage	Gasoline Storage	Gasoline Storage	Gasoline Storage	Gasoline Storage	Gasoline Storage	Demolished
250		Suction Tank	Sump Tank	Sump	Suction Tank	Suction Tank	Suction Tank	Demolished
251		Foam Tank	Foam Tank	Foam Storage	Foam Tank	Foam Tank	Foam Tank	Demolished
252		Tank	Tank (Open)	Training	Training Tank (Open)	Training Tank (Open)	Training Tank (Open)	Demolished
253		Xmas Tree	Xmas Tree	Training	Training Tank	Training Tank	Training Tank	Demolished
254		Xmas Tree	Xmas Tree	Training	Training Tank	Training Tank	Training Tank	Demolished
255		Tank	Tank (Open)	Training	Tank (Open)	Tank (Open)	Tank (Open)	Demolished
256		Gasoline Storage	Gasoline Tank	Gasoline Storage	Gasoline Tank	Gasoline Tank	Gasoline Tank	Demolished
257		Dispensary and Ward	Dispensary	Infirmary	Dispensary	Dispensary, Dental and Nursery	Dispensary, Dental and Nursery	Child Care Center
258		Administration	Post Office, Bank	Administration	U.S Post Office, Bank, and CU	U.S Post Office, Bank, and CU	U.S Post Office, Bank, and CU	U.S. Post Office
259		Gun Mount	Gun Mount	Classrooms	Demolished			
260		Storehouse and Office	Storehouse and Office	Storage	Offices, Storehouse	Offices, Storehouse	Offices, Storehouse	Servmart





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261		Gym Pool and Bowling	Gym Pool and Bowling	Gymnasium	Swimming Pool, Bowling Alley	Swimming Pool, Bowling Alley	Swimming Pool, Bowling Alley	Gym, Pool, Bowling
262		Theatre	Theatre #3	Theatre	Demolished			
263		Welfare Building	Welfare Building	Recreation	Spec. Ser. Off., EM Club, Library	Offices, Library, EM Club	Offices, Library, EM Club	Demolished
264		Refrigerated Storehouse	Refrigerated Storehouse	Storage, Provision	Refrigerated Storehouse	Refrigerated Storehouse	Refrigerated Storehouse	PWC shops
265		Hostess House	Admin. Bldg	Administration	Admin Bldg	Admin Bldg	Admin Bldg	Library
266		Sonar School Building	Sonar School Bldg	Classrooms	Demolished			
267		Trans. Storage	Trans Pool 12th ND	Barracks	Teen Club	Teen Club	Teen club	Demolished
268		Gun Loading Shed	Gun Loading Shed	Classrooms	Classrooms	Classrooms (Vac)	Classrooms (Vac)	Demolished
269		Office Chem. Warfare	Office Chem. Warfare	Administration	Instr D.C.T.C.	Not Listed	Not Listed	Demolished
270		Paint and Oil Storage	Paint and Oil Storage	Storage	Storage	Not Listed	Demolished	Demolished
271		Officers Rec. Bldg.	Officers Rec. Bldg.	Recreation	COM (Open) Annex	COM (Open) Annex	COM (Open) Annex	Community Facility
272		Elec. And Mech. Service	Sub Stn and Compressor	Air Compressor Station	Sub Sta.	Sub Sta., Storage	Sub Sta., Storage	Demolished



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273		Decontaminati on Bldg	Decontaminati on Bldg	Classroom	Decontaminati on Bldg	Not Listed	Not Listed	Demolished
274		Dynamometer Shop	Dynamometer Shop	Not Listed	Demolished			
275		Waves Barracks (Enlisted)	Waves Barracks (Enlisted)	Barracks, Waves	Barracks	Instruction	Instruction	Demolished
276		Office	Film Exchange	Storage	Insp. Office	Not Listed	Not Listed	Demolished
277		Magazine Ammunition	Storage	Storage	Not Listed	Demolished		
278		Magazine Ammunition	Storage	Storage	Not Listed	Demolished		
279		Magazine Ammunition	Small Craft-Ship Group	Storage	Not Listed	Demolished		
280		Magazine Ammunition	Storage-Medical	Storage	Not Listed	Demolished		
281		Magazine Ammunition	Film storage	Storage	Not Listed	Demolished		
282		Magazine Ammunition	Storage	Storage	Not Listed	Demolished		
283		Magazine Ammunition	Storage	Storage	Not Listed	Demolished		
284		Magazine Ammunition	Electronic Storage	Storage	Not Listed	Demolished		
285		Magazine Ammunition	Storage	Storage	Not Listed	Demolished		
286		Magazine Ammunition	Tear Gas Storage	Storage	Not Listed	Demolished		



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287		Magazine Ammunition	Film Storage	Storage	Not Listed	Demolished		
288		Gas Chamber	Gas Chamber	Training	Storage	Demolished		
289		Storage	Shop	Storage	Storage	Storage	Storage	Paint Storage
290		Storage	Storage	Storage	Storage	Storage	Storage	Port Ops Storage
291		Gun Mount	Gun Mount	Gun Mount	Demolished			
292		Storage Shed	Storage Shed	Storage	Storage Shed	Storage Shed	Storage Shed	Storage Shed
293		Shed	Mechanical School	Shop	Instructions	Instructions	Instructions	Shed (NTTC)
294		Gear Locker	Gear Locker	Storage	Not Listed	Demolished		
295		Generator Building	Generator Building	Training Unit Mockup	Not Listed	Demolished		
296		Shelters Office	Water Taxi Pier	Administration	Office (Vacant)	Demolished		
297		Transformer House	Transformer House	Storage	Storage	Storage	Storage	Demolished
298		Loading Shed	Waiting Station	Waiting Station	Waiting station	Waiting station	Waiting Station	MWR Boat House
299		Loading Shed	Waiting Station	Demolished				
300		Office	Storage	Storage	Demolished			
301		Subsistence	Storage	Not Listed	Demolished			
302		Subsistence	Storage	Not Listed	Demolished			
303		Subsistence	Storage	Not Listed	Demolished			
304		Toilets	Toilets	Not Listed	Demolished			
305		Toilets	Toilets	Not Listed	Demolished			



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306		Supply Office	Storage	Not Listed	Demolished			
307		Barracks Army	Storage	Not Listed	Demolished			
308		Barracks Army	Storage	Not Listed	Demolished			
309		Barracks Army	Shops-Film Exch.	Not Listed	Demolished			
310		Barracks Army	Shops-Film Exch.	Not Listed	Demolished			
311		Barracks Army	Shops-Film Exch.	Storage	Demolished			
312		Barracks Army	Shops-Film Exch.	Storage	Demolished			
313		POW Subsistence Storage	Storage	Not Listed	Demolished			
314		Gun Mount	Gun Mount	Not Listed	Demolished			
315		School	Demolished					
316		School	Demolished					
317		School	Demolished					
318	Service Station	Gun Mount	Gun Mount	Classrooms	Ham Radio Station	Vacant	Vacant	Demolished
319		School	Demolished					
320		School	Demolished					
321		School	Demolished					
322		Gun Mount	Demolished					
323		Gun Trainer	Gun Trainer	Classrooms	Demolished			



**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
324		Assembly Shed	Demolished					
325		Shop	Shop & Storage	Shop and Storage	Shop Pest Control	Shop Pest Control	Shop Pest Control	Pest Control Shop
326		Gun Shed	Gun Shed	Classrooms	Not Listed	Demolished		
327		Salvage Building	Salvage Building	Not Listed	Demolished			
328		Transformer House	Transformer House	Transformer house	Transformer House	Transformer House	Transformer House	Transformer House
329		Storehouse	Office-Storehouse	Administration	Demolished			
330		Store	Ship Ser. Gas Station	Gasoline Service Station	Navy Exc. Gas Station	Navy Exc. Gas Station	Navy Exc. Gas Station	Grounds Maintenance Shop
331		Greenhouse	Greenhouse	Greenhouse	Demolished			
332		POW Brig	Storage	Storage	Not Listed	Demolished		
333		Recreation Building	Demolished					
334		Paint Locker	Demolished					
335		Store	Bus Paint Shop	Paint Shop	Shops, Can Washing	Shops, Can Washing	Shops, Can Washing	Paint Shop
336		Linoleum Shop	Linoleum Shop	Storage	Demolished			
337		Masons Locker	Masons Locker	Storage	Demolished			



**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
338		Duty Barracks	Duty Barracks	Not Listed	Demolished			
339		Duty Barracks	Duty Barracks	Not Listed	Demolished			
340		Dock Masters Office	Dock Masters Office	Not Listed	Demolished			
341			Buttercup	Training unit Mockup	Instruction, USS Buttercup	Instruction, USS Buttercup	Instruction, USS Buttercup	Instruction, USS Buttercup
342				Classrooms	Instruction, RADIAC	Instruction UNREP	Instruction UNREP	Instruction UNREP
343				Classrooms	Instruction, RADIAC	Instruction	Instruction	Instruction
344				Storage	Radium vault	Radium Vault	Radium Vault	Radium Vault
345				Incinerator	Demolished			
346				Classroom	Radio Trans. Sta	Radio Trans. Sta	Radio Trans. Sta	Offices
347				Training Unit Mockup	Gun Mount	Gun Mount	Gun Mount	Gun Mount
348				Issue Room	Instruction	Instruction	Demolished	
349				Field Work Shop	Instruction	Instruction	Demolished	
350				Repair Shop	Instruction	Demolished		
351				Repair Shop	Demolished			
352				Classrooms	Instruction	Instruction	Instruction	Demolished
353				Classrooms	Instruction	Instruction	Instruction	Demolished



**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
354				Storage	Storage, COM (Open)	Inst. (Fire Dept.)	Inst. (Fire Dept.)	Demolished
355				Riggers Shed	Sand Blasting Shed	Sand Blasting Shed	Sand Blasting Shed	Sand Blast Shed
356					Steam Clean and Car Wash	Not Listed	Demolished	Demolished
357					Bus Wash	Bus Wash	Bus Wash	Demolished
358					Resistor Bank Building	Resistor Bank Building	Resistor Bank Building	Storage
359					Classrooms	Classrooms	Demolished	
360					Boat House – Pier 2	Boat House – Pier 2	Boat House – Pier 2	Demolished
361					Hot Water Tank Building	Hot Water Tank Building	Hot Water Tank Building	Hot Water Tank Building
362					Storage Shed	Storage Shed	Storage Shed	Storage Shed
363					Barracks	Barracks	Barracks	Cooking School
364					Barracks	Barracks	Barracks	Barracks
365					Barracks	Barracks	Barracks	Barracks
366					Barracks	Barracks	Barracks	Barracks
367					Barracks	Barracks	Barracks	Barracks
368					Subsistence bldg	Subsistence bldg	Subsistence bldg	EM Dining Hall



**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
369					Bachelor Officers Qtrs and Subsistence	Bachelor Officers Qtrs and Subsistence	Bachelor Officers Qtrs and Subsistence	Officers Club
370					Gasoline Filling Station	Gasoline Filling Station	Gasoline Filling Station	Gasoline filling Station
371					USS Pandemonium (mock-up trainer)	USS Pandemonium (mock-up trainer)	USS Pandemonium (mock-up trainer)	USS Pandemonium (mock-up trainer)
372					Training Facility-Antenna Tower	Training Facility-Antenna Tower	Training Facility-Antenna Tower	Demolished
373					Training Facility-Antenna Tower	Training Facility-Antenna Tower	Training Facility-Antenna Tower	Demolished
374					Sump House No.12	Sump House No.12	Sump House No.12	
375					Training Facility-Antenna Tower	Training Facility-Antenna Tower	Training Facility-Antenna Tower	Demolished
376					Training Facility-Antenna Tower	Training Facility-Antenna Tower	Training Facility-Antenna Tower	Demolished





**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
377					Sump House No. 17	Sump House No. 17	Sump House No. 17	Sump House
378					Sump House No. 9	Sump House No. 9	Sump House No. 9	Sump House No. 9
379					Paint Locker	Paint Locker	Paint Locker	Paint Locker
380					Sump House No. 11	Sump House No. 11	Sump House No. 11	Sump House No. 11
381					Paint Locker	Paint Locker	Paint Locker	Storage
382					Sump House No. 21	Sump House No. 21	Sump House No. 21	Sump House No. 21
383					Radio Tower	Radio tower	Radio tower	Radio tower
384					Garage, Training Tanks	Garage, Training Tanks	Garage, Training Tanks	Garage, Training Tanks
385					Storage	Storage	Storage	Skeet Range Bldg.
386					Storage	Not Listed	Demolished	Demolished
387					Demolished			
388					Demolished			
389					Demolished			
390					Sump House No. 7	Sump House No. 7	Sump House No. 7	Sump House No. 7
391					<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>
392					<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>
393					Sump House No. 16	Sump House No. 16	Sump House No. 16	Sump House No. 16



**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
394					Sump House No. 5	Sump House No. 5	Sump House No. 5	Sump House No. 5
395					Sump House No. 4	Sump House No. 4	Sump House No. 4	Sump House No. 4
396					Sump House No. 6	Sump House No. 6	Sump House No. 6	Sump House No. 6
397					Tennis Courts (6)	Tennis Courts (6)	Tennis Courts (6)	Tennis Courts (6)
398					Tennis Courts	Tennis Courts	Tennis Courts	Tennis Courts
399					Training Facility-Antenna Tower	Training Facility-Antenna Tower	Training Facility-Antenna Tower	Demolished
400					Training Facility-Antenna Tower	Training Facility-Antenna Tower	Training Facility-Antenna Tower	Demolished
401					Theatre	Theatre	Theatre	Theatre
402					Gymnasium	Gymnasium	Gymnasium	Gymnasium
403					Demolished			
404					Demolished			
405					Flag Pole (Building 1)	Flag Pole (Building 1)	Flag Pole (Building 1)	Flag Pole
406					<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>
407					Athletic Field	Athletic Field	Athletic Field	Athletic Field



**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
408					<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>
409					<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>
410					Mechanical Equipment Bldg	Demolished		
411					<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>
412					Storage	Storage	Storage	Demolished
413					Storage	Storage	Storage	Storage
414					Transformer House	Transformer House	Transformer House	Demolished
415					Operation Bldg	Operation Bldg	Operation Bldg	Waste Water treatment
416					Digester Tank	Digester Tank	Digester Tank	Digester tank
417					Sedimentation Tank	Sedimentation Tank	Sedimentation Tank	Sedimentation Tank
418					Demolished			
419					<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>
420					<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>
421					Storage	Storage (Fire Dept.)	Storage (Fire Dept.)	Storage (Fire Dept.)
422					<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>



**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
423					Hose Storage Shed	Not Listed	Not Listed	Not Listed
424					Switchgear House	Switchgear House	Switchgear House	Switchgear House
425					Switchgear House	Switchgear House	Switchgear House	Switchgear House
426					Switchgear House	Demolished		
427					Switchgear House	Demolished		
428					Switchgear House	Demolished		
429					Switchgear House	Demolished		
430					<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>
431					<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>
432					<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>
433					<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>
434					<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>
435					<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>
436					<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>



**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
437					Police Station (located on Clay Street in San Francisco)	Police Station (located on Clay Street in San Francisco)	Police Station (located on Clay Street in San Francisco)	Demolished
438					<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>
439					<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>
440					Sump House No. 3	Sump House No. 3	Sump House No. 3	Sump House No. 3
441					Sump House No. 19	Demolished		
442					Not Listed	Not Listed	Not Listed	Medical-Dental Clinic
443					Sump House No.8	Sump House No.8	Sump House No.8	Sump House No.8
444					Sump House No. 10	Sump House No. 10	Sump House No. 10	Sump House No. 10
445					Storage and Salvage Bldg	Storage	Storage	Storage
446					Storage	Storage	Storage	Demolished
447					Bus Stop Shelter	Bus Stop Shelter	Bus Stop Shelter	Weather Shelter
448					Truck Service Facilities	Truck Service Facilities	Truck Service Facilities	Storage



**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
449					Administration and storage,	Administration and storage,	Administration and storage,	Reserve Training Center
450					Administration	Administration	Administration	MWR
451						<i>Number not used</i>	<i>Number not used</i>	<i>Number not used</i>
452						Barracks	Barracks	BEQ
453						Barracks	Barracks	BEQ
454						Storage	Storage	Storage
455						Heating Plant	Heating Plant	Boiler Plant
456						Gasoline Storage Tanks- Moved from YBI to TI in 1968	Gasoline Storage Tanks	Gasoline Storage Tanks
457						Storage Shed	Storage Shed	Demolished
458	Pyrotechnics Storage	Not Listed	Not Listed	Not Listed	Not Listed	Pyrotechnics Storage, Paint Storage	Pyrotechnics Storage, Paint Storage	Pyrotechnics Storage, Paint Storage
459						Skeet Range	Skeet Range	Skeet Range
460						Microwave Tower	Microwave Tower	Microwave Tower



**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
461						Damage Control School Classrooms, NTTC Headquarters, FTC	Damage Control School Classrooms, NTTC Headquarters, FTC	Damage Control School Classrooms, NTTC Headquarters, FTC
462						Decontamination Building, FTC	Decontamination Building, FTC	Decontamination Building, FTC
463						Gas Chamber	Gas Chamber	Gas Chamber
464						Smoke Elimination Structure	Smoke Elimination Structure	Demolished
465						Trickling Filter	Trickling Filter	Trickling Filter
466						Secondary Sedimentation	Secondary Sedimentation	Secondary Sedimentation
467						Digester #2	Digester #2	Digester #2
468						Sludge Dewatering Structure	Sludge Dewatering Structure	Sludge Dewatering Structure
469						No Break Generator Building	No Break Generator Building	No Break Generator Building



**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
470						Saluting Battery Gun Mount	Saluting Battery Gun Mount	Saluting Battery Gun Mount
471						Smoke Elimination Facility Control Building	Smoke Elimination Facility Control Building	Demolished
472						Flag Pole	Flag Pole	Flag Pole
473						Flag Pole	Flag Pole	Flag Pole
474						Flag Pole	Flag Pole	Flag Pole
475						Flag Pole	Flag Pole	Flag Pole
476						West Guard Tower	West Guard Tower	Demolished
477						East Guard Tower	East Guard Tower	Demolished
478						Basketball Court	Basketball Court	Basketball Court
479						Basketball Courts (16)	Basketball Courts (16)	Demolished
480						Public Toilets	Public Toilets	Public toilets
481						Incinerator	Incinerator	Incinerator
482							Antenna Tower	Antenna Tower
483							Refreshment Stand	Refreshment Stand
484							Dewater Tower	Demolished





**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
485							Little League Field	Little League Field
486							Barge Shelter	Demolished
487							CPO Barracks and Administration	CPO Barracks and Administration
488							CPO Barracks	CPO Barracks
489							CPO Barracks	CPO Barracks
490							<i>Number not used</i>	<i>Number not used</i>
491							Separating Pit	Demolished
492							Recreation Grounds	Recreation Grounds
493							Storm water pump	Storm water pump
494							<i>Number not used</i>	<i>Number not used</i>
495							Sentry Booth	Demolished
496							Harbormaster Office and Boathouse	Harbormaster Office and Boathouse
497							Fitness Center	Fitness Center



**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
498							Wind Generator Tower on Building 260	Demolished
499							<i>Number not used</i>	<i>Number not used</i>
500							<i>Number not used</i>	<i>Number not used</i>
501							Armory	Armory
502							Child Care Center	Child Care Center
503							<i>Number not used</i>	<i>Number not used</i>
504							<i>Number not used</i>	<i>Number not used</i>
505							Training Mockup (Does not appear on any map)	Training Mockup (Does not appear on any map)
506							Training Mockup (Does not appear on any map)	Training Mockup (Does not appear on any map)
507							<i>Number not used</i>	<i>Number not used</i>



**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
508							Training Mockup (Does not appear on any map)	Training Mockup (Does not appear on any map)
509							Training Mockup (Does not appear on any map)	Training Mockup (Does not appear on any map)
510-519							<i>Number not used</i>	<i>Number not used</i>
520							Steam Heat Building	Steam Heat Building
521-529							<i>Number not used</i>	<i>Number not used</i>
530							Pier Steam Plant	Pier Steam Plant
531-539							<i>Number not used</i>	<i>Number not used</i>
540							Steam Heat Building	Steam Heat Building
541-549							<i>Number not used</i>	<i>Number not used</i>
550							Steam Heat Building	Steam Heat Building
551-564							<i>Number not used</i>	<i>Number not used</i>



**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
565							Battle Simulator Trainer	Demolished
566-569							<i>Number not used</i>	<i>Number not used</i>
570							Operational Trainer Facility	Operational Trainer Facility
571							Collimation Tower	Collimation Tower
572							RAS Operations Tower	RAS Operations Tower
573							Collimation tower	Collimation tower
574							Electrical Substation	Electrical Substation
575-579							<i>Number not used</i>	<i>Number not used</i>
580							NTTC Elevator Trainer	NTTC Elevator Trainer
581-599							<i>Number not used</i>	<i>Number not used</i>
600							Administration /Academic Building for Fire Fighting School	Administration /Academic Building for Fire Fighting School



**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
601-604							<i>Number not used</i>	<i>Number not used</i>
605							P-250 Pump Trainer Firefighting	P-250 Pump Trainer Firefighting
606							Advanced Shipboard Firefighting	Advanced Shipboard Firefighting
607							OBA Locker	OBA Locker
608							General Shipboard Firefighting	General Shipboard Firefighting
609							General Shipboard Firefighting	General Shipboard Firefighting
610							Equalization Tank (Firefighting)	Equalization Tank (Firefighting)
611							Equalization Tank (Firefighting)	Equalization Tank (Firefighting)
612							Aviation Firefighting	Aviation Firefighting
613							General Shipboard Firefighting	General Shipboard Firefighting



**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
614							General Shipboard Firefighting	General Shipboard Firefighting
615							Utility Building	Utility Building
616							Aviation Tower	Aviation Tower
617							P-250 Tower (Firefighting)	P-250 Tower (Firefighting)
618							Propane Farm	Propane Farm
619-669							<i>Number not used</i>	<i>Number not used</i>
670							Brig	Brig
671							Brig Carpenter Shop	Brig Carpenter Shop
672-679							<i>Number not used</i>	<i>Number not used</i>
680							Sewage Processing	Sewage Processing
681							Not Listed	Not Listed
682							Not Listed	Not Listed
683							Not Listed	Not Listed
684							Not Listed	Not Listed
685							Not Listed	Not Listed
686							Not Listed	Not Listed



**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
687							Not Listed	Not Listed
688							Not Listed	Not Listed
689							Not Listed	Not Listed
690							Electronic Sign	Electronic Sign
691-1099							<i>Number not used</i>	<i>Number not used</i>
1100-1449								See Table 3-3
Pier 1	Unknown	Fueling Pier	Fueling Pier	Fueling pier	Demolished approximately 1961	Not Listed	Fueling Pier, General purpose Pier. Built 1986	General Purpose Pier
Pier 2	Small boat berthing	Small boat	Small boat	Small Boat Pier	Small Boat Pier	Small Boat Pier	Small boat berthing.	Small boat berthing
Pier 3	Pier and Floats	Pier and Floats	Pier and Floats	Pier	Demolished			
Pier 4	Pier and Floats	Pier and Floats	Pier and Floats	Pier	Demolished			
Pier 5	Marine Railway	Marine Railway	Marine Railway	Marine Railway	Demolished			
Pier 6	Pier and Floats	Pier and Floats	Pier and Floats	Pier	Demolished			



**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
Pier 7	Pier and Floats	Pier and Floats	Pier and Floats	Pier	Demolished			
Pier 8	Pier and Floats	Pier and Floats	Pier and Floats	Pier	Demolished			
Pier 9	Marine Railway	Marine Railway	Marine Railway	Marine Railway	Demolished			
Pier 9A	Marine Railway – 50 Ton	Marine Railway – 50 Ton	Marine Railway – 50 Ton	Marine Railway	Marine Railway	Demolished		
Pier 10	Fuel Pier	Fuel Pier	Fuel Pier	Pier	Demolished			
Pier 11	Ship's Berthing and Floating Dry Dock Pier, Ship's Berthing Pier	Floating Dry dock Pier	Floating Dry dock Pier	Pier	Ship's Berthing Pier	Ship's Berthing Pier	Ship's Berthing Pier	Ship's bething pier
Pier 12	Repair Pier, Small Boat Pier	Repair Pier, Small Boat Pier	Repair Pier, Small Boat Pier	Pier	Small boat Pier	Small boat Pier	Small boat Pier	Small boat pier
Pier 13	Maintenance Pier	Maintenance Pier	Maintenance Pier	Pier	Pier	Pier	Pier	Demolished
Pier 14	Maintenance Pier	Maintenance Pier	Maintenance Pier	Pier	Pier	Pier	Pier	Demolished
Pier 15	Maintenance Pier	Maintenance Pier	Maintenance Pier	Pier	Pier	Pier	Pier	Demolished
Pier 16	Maintenance Pier	Maintenance Pier	Maintenance Pier	Pier	Pier	Pier	Pier	Demolished
Pier 17	South Pier	South Pier	South Pier	Pier	Pier	Pier	Pier	Demolished
Pier 18	Short Pier	Demolished						





**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
Pier 19	Repair Pier, Marine Railway	Repair Pier, Marine Railway	Repair Pier	Marine Railway (Surveyed)	Demolished			
Pier 20	Ferry Slip (Oakland Landing)	Ferry Slip (Oakland Landing)	Ferry Slip	Ferry slip	Ferry slip	Ferry slip	Ferry slip	Demolished
Pier 21	North pier, Berthing Pier, Fuel Pier	North pier, Berthing Pier, Fuel Pier	North pier	Pier	Fuel Pier	Fuel Pier	Fuel Pier	Damaged
Pier 22	Ammunition Pier	Ammunition Pier	Ammunition Pier	Pier	Pier	Pier	Pier	Demolished
Pier 23	Small boat landing, Recreational, fishing pier	Small boat landing, Recreational, fishing pier	Small boat landing	Pier	Small boat landing	Small boat landing	Small boat landing	Fishing pier
Pier 24	Small Boat Pier	Small Boat Pier	Small Boat Pier	Small Boat Pier	Small Boat Pier	Small Boat Pier	Small Boat Pier	Demolished
Pier (Unnumbered)						Recreational Marina	Recreational Marina	Marina
Shed (Unnumbered)						Bottled gas storage	Bottled gas storage	Bottled Gas Storage
YBI Pier 1	Receiving Ship Pier	Pier 1	Pier	Pier	USCG Pier	USCG Pier	USCG Pier	USCG Pier
YBI Pier 2	Long Wharf	Pier 2	Pier	Pier	Demolished			
YBI Pier 3	Fueling Pier	Fueling Pier	Pier	Pier	Not Listed	Demolished		



**TABLE 3-4  
NAVSTA TI  
BUILDING USE CHRONOLOGY**

Building/Site No.	1939 (TI-HRA-11)	June 1945 (TI-HRA-26)	July 1949 (TI-HRA-27)	June 1952 (TI-HRA-28)	August 1968 (TI-HRA-29)	December 1971 (TI-HRA-30)	June 1973 (TI-HRA-31)	December 1994 (TI-HRA-11)
YBI Pier 4	Not Listed	Pier 4	Pier	Pier	Demolished			
Army Pier (YBI)	Torpedo (Mine) loading Pier	Not Listed	Not Listed	Not Listed	Demolished			



## 4.0 HRA METHODOLOGY

An HRA is a tool used by the Navy to provide a comprehensive review and assessment of the impact of radiological operations at Navy or U.S. Marine Corps installations. This section describes the processes used by the Navy to prepare an HRA.

### 4.1 HRA OVERVIEW

Documentation of operations involving radioactive materials conducted at a Navy or Marine Corps installation, regulatory controls of these operations, and closeout surveys following the operations are vital to the future uses of current and former Navy and Marine Corps property. The Navy uses an HRA to document historical radiological operations at an installation and to recommend future actions. This gives Navy management a critical tool needed to properly control, investigate, and/or release property.

This HRA generally follows the guidelines in MARSSIM for preparation of a Historical Site Assessment and provides information in a format similar to the PA protocol used by the EPA within the CERCLA process (**TI-HRA-3**).

An HRA provides historical documentation of radiological operations for a specified period. Since NAVSTA TI is closed and being prepared for transfer as the result of the BRAC Program, this HRA documents identified radiological operations of the Naval Station as a Navy facility up to the time of closure and subsequent radiological surveys and investigations through 2003, with two exceptions (Building 233 and IR Site 12 solid waste disposal areas).

Building 233 is currently being surveyed for residual radioactivity from a radium spill in 1950. The spill was cleaned up to the standards of the time, but the building is being surveyed again to ensure it is acceptable to today's standards. Results of this survey will be reported in a separate document.

Past subsurface investigations performed at IR Site 12 indicate several small areas on the northwestern and northern perimeter of the site contained buried solid waste. Investigation trenches installed in these areas typically identified soil mixed with metal, glass, and wood



rubbish. Naval Sea Systems Command Detachment, Radiological Affairs Support Office (NAVSEADET RASO) initially determined the likelihood of radioactive material being present at Site 12 was very low, however as a conservative precaution recommended radiological surveys be performed in the solid waste disposal trench areas of Site 12 (**TI-HRA-32**). Soil samples have been collected from various trenches in the IR Site 12 area. Over 2000 gamma radiation readings have been recorded in the trenches and around the soil piles created by the trenching. Evaluation of analyses is pending at this writing and will be documented in the Site 12 Remedial Investigation report.

## **4.2 PURPOSE**

The purpose of the NAVSTA TI HRA is to document radiological operations involving G-RAM. This includes the following radiological operations:

- Training of personnel on the calibration, maintenance, and operation of radiation monitoring instruments.
- Training of personnel on radiological monitoring, and decontamination of ships and airplanes.
- Berthing of OPERATION CROSSROADS ships prior to those ships being given final radiological clearance (the actual decontamination procedures were not performed at TI).

In general, this HRA provides the following information about these radiological operations:

- History of buildings, structures, and outdoor areas potentially impacted by radiological operations.
- Potential, likely, or known sources of radioactive material and radioactive contamination.
- Previous investigation results.
- Contamination migration assessments.
- Recommended future actions.

## **4.3 MARSSIM GUIDELINES**

This section describes MARSSIM guidance and how it applies to the NAVSTA TI HRA.



### **4.3.1 Historical Site Assessment**

Preparation of this HRA is the first step in following MARSSIM guidelines for evaluating the effects of past radiological operations. This is followed by scoping surveys and, if necessary, site characterization and remedial actions. The final action to demonstrate regulatory compliance for free release of the property is the final status survey (FSS). The FSS report is the final clearance document for a property that is presented to regulators and the public.

Per MARSSIM guidance, this HRA will:

- Identify potential, likely, or known sources of radioactive material and radioactive contamination based on existing or derived information.
- Identify sites that need further action, as opposed to those posing no risk to human health or the environment from radiological operations.
- Identification of potentially contaminated media.
- Provide an assessment for the likelihood of contamination migration.
- Provide information useful to Scoping and Characterization Surveys.
- Provide initial classification of the area or survey unit as ‘impacted’ or ‘non-impacted’.

### **4.3.2 Historical Research**

MARSSIM recommends that historical information be collected by:

- Reviewing site evaluations; federal, state, and local investigations; and emergency actions.
- Reviewing existing radiological data in licenses, site permits, authorizations, and operating records.
- Interviewing previous employees or personnel with knowledge of radiological operations at the site.
- Performing site reconnaissance by reviewing maps and blueprints and conducting a physical inspection of facilities.
- Using professional judgment.



### **4.3.3 Non-Impacted and Impacted Sites**

After review of the information obtained during historical research, MARSSIM recommends assigning a general preliminary area classification of “non-impacted” or “impacted” to all areas at the site.

Non-impacted areas are those with no history of radiological operations or those that have no reasonable potential for residual contamination such as residential or administrative buildings. Areas with only standard safety devices that contain generally licensed radioactive material, and commercially available, exempt quantity radioactive items such as smoke detectors or exit signs, are classified as non-impacted if the site has no other radiological history. Non-impacted areas are not considered for radiological investigation because there is no reasonable potential for radioactive material to be present. Should information become available that identifies radiological operations associated with a non-impacted area, the area is reclassified as impacted. Discovery of minimal radioactivity attributable to natural background radiation or fallout from weapons testing is not, in itself, cause for designation of an area as impacted. Areas containing machines that produced ionizing radiation (such as x-ray machines) are not classified as impacted based solely on the use of the machines.

Impacted areas are generally those with a history of radiological materials being used, stored, and/or disposed and therefore having the potential for residual radioactive contamination. Examples include locations where leaks or spills are known to have occurred, former burial or disposal sites, areas where radioactive decontamination was performed, or radium paint facilities. Although an impacted site may be remediated and released as free from residual contamination, the site is not generally reclassified as non-impacted.

### **4.3.4 Potentially Contaminated Media**

Once an area is properly classified, the next process involves the identification of potentially contaminated media within the area. While MARSSIM focuses on surface soils and building surfaces, it also provides preliminary guidance on other media types, including:



**Surface Media** - A term used to describe the top layer of soil, fill, gravel, waste piles, concrete, or asphalt that is available for direct exposure, growing plants, resuspension of particles for inhalation, and mixing from human disturbances.

**Subsurface Media** - A term used to describe solid materials below the surface medium.

**Sediment** - Material that settles to the bottom of a liquid or is deposited by water.

**Surface Water** - A term used to describe waters from rain run-off, streams, rivers, lakes, coastal tidal waters, and oceans.

**Groundwater** - A term used to describe the waters contained in subsurface materials and aquifers.

**Air** - A term used to describe a pathway for resuspension and dispersal of contaminated media in the atmosphere.

**Structures** - A term used to describe man-made surfaces that are above or below the ground surface, such as buildings and drydocks.

#### **4.4 PREPARATION OF THE NAVSTA TI HRA**

This section discusses the approach and rationale of the HRA, document reviews, field investigations, and interviews, site designation, radionuclide identification, and evaluation of previous investigations conducted specifically to prepare the NAVSTA TI HRA.

##### **4.4.1 NAVSTA TI HRA Approach and Rationale**

To prepare the NAVSTA TI HRA, all available historical and current radiological and non-radiological information was evaluated. The research was conducted during the period of September 2004 through May 2005. This research became the basis for designating sites as non-impacted or impacted and will subsequently be used by the Navy and other Federal, state, and local regulatory agencies to determine future actions for the sites.

Obtaining and evaluating information during preparation of the HRA included:

- Archival research.
- Site assessments and reconnaissance.
- Personal interviews by e-mail and by phone.
- Site designation and classification.



- Identification of radionuclides of concern.

These activities are discussed in Sections 4.4.2 through 4.4.6.

#### **4.4.2 Archival Research**

Navy operations at NAVSTA TI were discontinued in 1997. Since the majority of the personnel working on NAVSTA TI were active duty military, and since military personnel are routinely transferred to new duty stations, archival research was the primary method used to prepare this HRA. Every effort was made to find as many records as possible concerning radiological operations at NAVSTA TI. Both government and private archives were reviewed.

A listing of all archival documents and sources used as references in this HRA are detailed in the listings in Section 10.0. Electronic copies of documents used as references are provided on this compact disc as Appendix B. The numbering of the references is not consecutive because they correspond directly to the database of historical information compiled during research for the HRA.

##### **4.4.2.1 Archive Locations**

Table 4-1 lists archives where information on NAVSTA TI was found. Many hundreds of pertinent documents varying in length from 1 to 900 pages and more than 200 maps and drawings were reviewed. Research at three of the archive locations was performed at the archive. The regional National Archives and Records Administration (NARA) facility at San Bruno, California was visited four times between September 2004 and April 2005. The NAVSEADET RASO records were investigated in October 2004 and again in April 2005. The Naval Historical Center at the Washington Navy Yard in Washington D.C. was visited in October 2004. In addition, the available maps, drawings, and records in storage in Building 1 on NAVSTA TI were investigated during eight visits between September 2004 and May 2005.

##### **4.4.2.2 Archive Information**

Archival information was reviewed to identify potential G-RAM sources, areas of use, radiological controls, regulatory procedures, and releases of radioactive materials at NAVSTA TI.





Reviews of historical records identified two main, separate, but connected categories of radiological operations, and one brief connection to the OPERATIONS CROSSROADS nuclear weapons tests.

**Radiological Safety Training, 1947-1993** - In December of 1946, the Bureau of Naval Personnel directed the Damage Control School at Treasure Island to set up a course of instruction in Radiological Safety to furnish naval officers with the specialized training necessary to evaluate and combat atomic weapon damage. The first course in Radiological Safety convened at 0800 on March 17, 1947 in Building 7 (**TI-HRA-33**). A radiological history of radiation safety training is presented in Section 6.3.

**Calibration, Maintenance, and Operation of Radiation Detection Instruments, 1947-1993** After initially establishing the Radiological Safety class, the Damage Control Training Center also began Radiological Defense classes including laboratory exercises in the calibration of radiation detection instruments (ion chambers). A radiological history of the calibration, maintenance and operation of radiation detection instruments is provided in Section 6.2.

**Convenience berthing for ships from OPERATION CROSSROADS, in 1946** - Following the two nuclear weapons detonations of the OPERATIONS CROSSROADS test series, many of the target ships and support ships returned to the continental United States for decontamination and clearance from radiological restrictions. In the San Francisco Bay area returning ships were surveyed and decontaminated at Hunters Point Shipyard (HPS) and at Mare Island Shipyard. A radiological history of the ships known to have berthed at NAVSTA TI is provided in Section 6.4.

#### **4.4.3 Site Assessments and Reconnaissance**

##### **4.4.3.1 Historical Assessments**

One base-wide assessment has been performed on NAVSTA TI to identify and assess sites posing a potential threat to human health or the environment due to contamination from past hazardous material operations including radioactive materials. This assessment (**TI-HRA-4**) addresses the entire Naval Station. Other radiological remediations or release surveys have been performed to address specific areas or buildings on Treasure Island. The surveys included scans,



direct measurements, air and soil sample analysis, and swipe sample analysis. These methods were used to evaluate the radionuclides of concern and associated release limits at the time of the survey.

Assessments were performed solely by the Navy. No records have been found to indicate that federal, state, or local regulatory agencies have performed any assessments on NAVSTA TI. Section 6.6 includes a synopsis of each known radiological assessment, including investigation techniques and findings, from 1950 through 2003. Section 5.0 discusses the types of radioactive materials used at NAVSTA TI. A generic description of pathways these materials could have taken to impact human health and the environment is detailed in Section 7.0. A comprehensive site-specific summary of this information is provided for each impacted site in Section 8.0.

#### **4.4.3.2 Current Assessments**

Two radiological assessments are currently in progress. A survey of building 233 is in progress to determine if there is residual radium present from a spill in 1950. Future assessment activities in the solid waste disposal areas of IR Site 12 in the northern part of Treasure Island will also include screening for radioactive materials as a potential contaminant of concern. The scope of these assessments is addressed in Section 6.0, and the results, when available, will be published in separate reports.

#### **4.4.3.3 HRA Site Reconnaissance**

As a supplement to archival research, on-site visual inspections of areas with a history of radiological operations were conducted. Through these site visits, current facilities were compared with previous radiological assessments, historical documentation, and maps. The history for each impacted site, with descriptions of the current condition of the site, is provided in Section 8.0. An example of the value of the site visit is the case of Building 7. This building is one of the original buildings constructed for the 1939 International Exposition. The Radiation Safety School was initially located on the fourth floor of Building 7 (**TI-HRA-34**). On-site inspection of Building 7 in 2004 reveals that the building has only two levels. No fourth floor exists. Additional research of records eventually revealed that the west wing of Building 7 was a



four-story wing (TI-HRA-35) which was destroyed by fire and demolished in 1957 (TI-HRA-36).

#### **4.4.4 Interviews**

One aspect of the research and investigation is the personal interview. During research into radiological operations at some other closed or closing military bases, personal interviews provided useful information beyond that available in archives. Such was not the case for NAVSTA TI. Newspaper advertisements were placed in the major circulation Bay Area newspapers including the San Francisco Examiner, the San Francisco Chronicle, the San Jose Mercury News, and the Oakland Tribune and run for two consecutive Sundays. The ads requested anyone with knowledge of radiological operations on NAVSTA TI to call in to a 1-800 phone number. The text of the advertisement is in Appendix A. The ads were run on November 14 and November 21, 2004. One individual who actually was stationed on NAVSTA TI responded to the ad. However, she had no knowledge of the radiological operations on the Naval Station.

In addition to the newspaper advertisements, a fact sheet discussing the HRA process was published and sent to more than 1,100 people on the NAVSTA TI mailing list. The fact sheet also solicited input from the public but no responses were received (TI-HRA-37)

Based upon the historical research, some additional individuals were identified who could provide information about the radiological operations on NAVSTA TI based on their personal involvement. Telephone and/or e-mail interviews were conducted and information derived from those interviews was recorded.

Appendix A provides details of the interviews that were conducted by NAVSEADET RASO in 2003, 2004, and 2005.

#### **4.4.5 Site Designation**

Each building, structure, and open space at NAVSTA TI has been designated as either radiologically non-impacted or impacted based on information derived from the archive reviews,



site reconnaissance, and personal interviews. Impacted areas have been assessed as to the possibility and extent of residual contamination and recommendations of actions to evaluate the extent of potential residual radioactive contamination or radiologically free release of the property are provided. If a site has been previously radiologically free-released by the Navy and California regulators to current standards, no further action is recommended. Recommendations for each impacted site are provided in Section 8.0.

#### **4.4.6 Radionuclide Identification**

To properly assess a site, the HRA must determine any radionuclide that was used, who used it, and where it was used at NAVSTA TI. Table 4-2 lists radionuclides that were used at NAVSTA TI. This list was compiled from several documents that identified uses of the individual isotopes. The reference for each isotope is listed in Table 4-2. Most of the sources were used as check sources or calibration sources for radiation survey instruments. The Cs-137 and Br-82 were used to simulate radioactive fallout. Br-80, K-42, and Na-24 were byproducts of the neutron activation of Br-82 and thus were present with the Br-82 used to simulate radioactive fallout.

Any radionuclide that could have decayed through 10 half-lives since its time of use at NAVSTA TI is no longer considered a radionuclide of concern. Table 4-3 lists the radionuclides that may potentially still be a concern at NAVSTA TI today. Radionuclides used only as instrument check sources are not likely to leak. If they were to leak they would not go undetected for very long because of longstanding requirements to conduct periodic leak tests. No reports of leaking check sources were found in any of the documents reviewed for this HRA. The assessments in Section 8.0 of non-impacted sites (i.e. sites that only used sealed sources or were only associated with radionuclides that have decayed through 10 or more half-lives) will therefore conclude that no further action is required. The short-lived isotopes used on NAVSTA TI to simulate radioactive fallout (Br-80, Br-82, K-42, Na-24) had such short half-lives and low initial quantities, that all traces were gone within three months of the last use in 1972.



## **4.5 HRA BOUNDARIES**

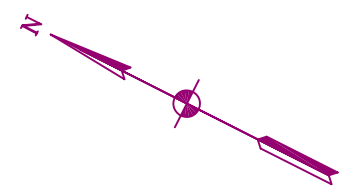
### **4.5.1 Physical Boundaries**

It is not the intent or purpose of this HRA to assess the radiological status of sites outside of NAVSTA TI, rather it addresses radiological operations within the physical boundaries of the Naval Station as described in Section 3.0. Review of the history of operations on NAVSTA TI had not indicated that there were any instances of NAVSTA TI routine radiological operations performed off station. The report of the Building 233 spill notes that some students lived off station and states that the Director of the Department of Public Health, San Francisco was notified and concurred in the procedures used in locating, monitoring, and decontaminating residences in the San Francisco area. Further, one student resided at the Presidio of San Francisco. The Commanding Officer of the Presidio gave permission to the monitoring and decontamination of the student's quarters. Two separate newspaper accounts of the spill and the follow-up surveys in the San Francisco area reported that "traces of radium" "were tracked into homes widely scattered throughout the bay area" "but nowhere was radioactivity found exceeding that of luminous dials on a wrist watch" (TI-HRA-38). No specific locations were identified in the newspaper accounts or in the reports made by the navy. Therefore this HRA only addresses the radiological operations within the physical boundaries of the NAVSTA TI. A map of NAVSTA TI areas covered by the HRA is provided in Figure 4.1.

### **4.5.2 Temporal Boundaries**

The Navy leased the NAVSTA TI property in 1941 and started operating as a Navy facility. The Navy took title to NAVSTA TI in April 1942. The first known use of radioactive materials on NAVSTA TI was in 1947. For purposes of this HRA, the temporal HRA boundaries are 1941 through June 2003. The current investigations of Building 233 and Site 12 are briefly discussed in this report; however, final reports of these investigations will be provided in separate site-specific reports.

# NAVAL STATION TREASURE ISLAND



**LEGEND**

- IMPACTED SITE
- NON-IMPACTED SITE
- SWDA** SOLID WASTE DISPOSAL AREA

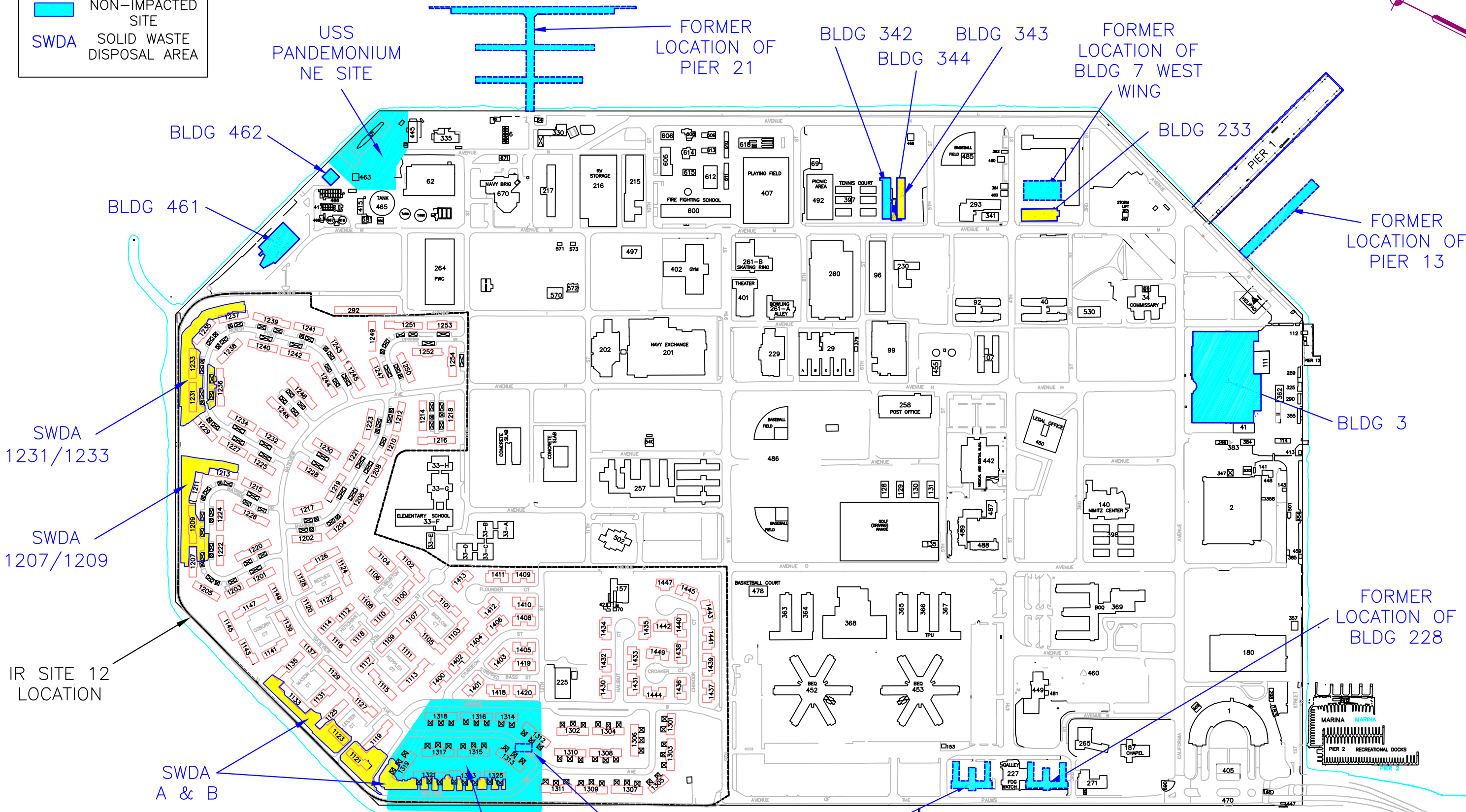


FIGURE 4-1A



750 Dump Road  
Mare Island  
Vallejo, California

HISTORICAL RADIOLOGICAL  
ASSESSMENT SITES,  
TREASURE ISLAND NAVAL STATION  
SAN FRANCISCO, CALIFORNIA

# YERBA BUENA ISLAND

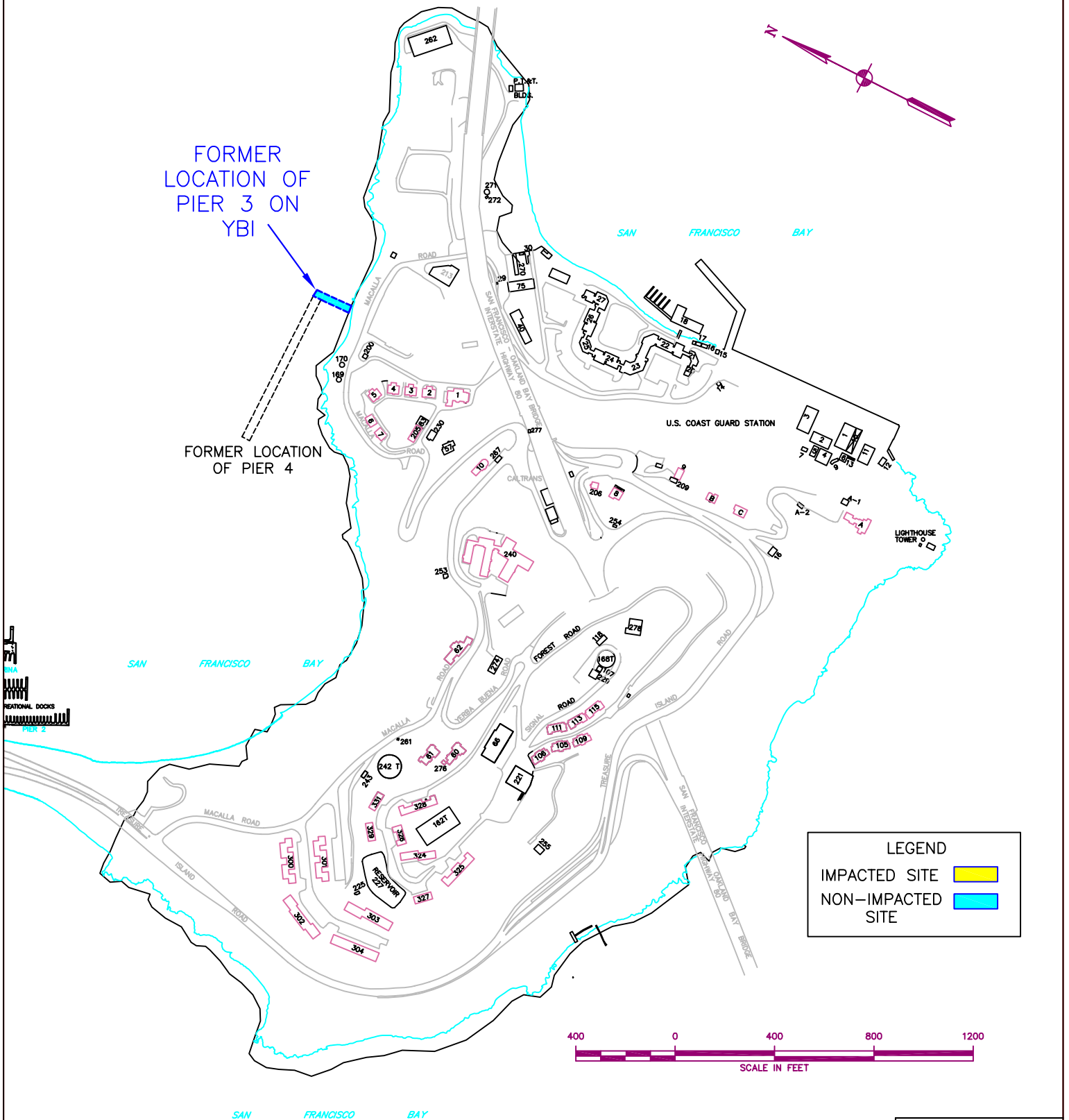


FIGURE 4-1B

**WESTON SOLUTIONS**  
 750 Dump Road  
 Mare Island  
 Vallejo, California

HISTORICAL RADIOLOGICAL  
 ASSESSMENT SITES,  
 TREASURE ISLAND NAVAL STATION  
 SAN FRANCISCO, CALIFORNIA



# SECTION 4

## TABLES





**Table 4-1  
Archive Locations**

<b>ARCHIVE FACILITY</b>	<b>LOCATION</b>
National Archives and Records Administration (NARA)	San Bruno, California
Department of Energy/Bechtel Reading Room	Las Vegas, Nevada
Naval Historical Center	Washington D.C.
Naval Sea Systems Command Detachment Radiological Affairs Support Office (RASO)	Yorktown, Virginia
Tetra Tech EM Inc. Electronic Library	San Francisco, California
San Francisco Public Library	San Francisco, California

**TABLE 4-2  
Radionuclides used at NAVSTA TI**

<b>Radionuclide</b>	<b>Half-life</b>	<b>Radiation</b>	<b>Uses</b>	<b>Ref.</b>
Am-241 (americium)	432 years	alpha, gamma	Instrument Calibration	<b>TI-HRA-40</b>
Ba-133 (barium)	10.5 years	gamma	Instrument Calibration	<b>TI-HRA-41 TI-HRA-40</b>
Ba-137m (barium)	2.55 minutes	beta, gamma	check source	<b>TI-HRA-42</b>
Be-7 (beryllium)	53.44 days	gamma	Instrument Calibration	<b>TI-HRA-40</b>
Br-80 (bromine)	17.4 minutes	beta, gamma	Decontamination Training	<b>TI-HRA-43</b>
Br-82	35.3 hours	beta, gamma	Decontamination Training	<b>TI-HRA-43</b>
C-14 (carbon)	5,730 years	beta	check source	<b>TI-HRA-40</b>
Cd-109 (cadmium)	464 days	gamma	Instrument Calibration	<b>TI-HRA-40</b>
Co-60 (cobalt)	5.27 years	beta, gamma	Instrument Calibration	<b>TI-HRA-44 TI-HRA-45 TI-HRA-41</b>
Cs-137 (cesium)	30.17 years	beta,	Decontamination Training	<b>TI-HRA-46 TI-HRA-45</b>
H-3 (tritium)	12.28 years	beta	Instrument Calibration	<b>TI-HRA-40</b>
In-113m (indium)	1.66 hours	gamma	Instrument Calibration	<b>TI-HRA-42</b>



K-42 (potassium)	12.36 hours	beta, gamma	Decontamination Training	TI-HRA-43
Kr-85 (krypton)	10.72 years	beta, gamma	check source	TI-HRA-40
Na-22 (sodium)	2.60 years	beta, gamma	check source	TI-HRA-40
Na-24	15 hours	beta, gamma	Decontamination Training	TI-HRA-43
Pu-239 (plutonium)	24,131 years	alpha, gamma	Instrument Calibration	TI-HRA-45
Ra-226 (radium)	1,600 years	alpha, beta, gamma	Instrument Calibration,	TI-HRA-47
Sn-113 (tin)	115.1 days	gamma	check source	TI-HRA-42
Sr-90 (strontium)	28.6 years	beta	Instrument Calibration	TI-HRA-41
Tc-99 (technetium)	213,000 years	beta, gamma	check source	TI-HRA-41
Th-232 (thorium)	1.4 E+4 million years	alpha, gamma	check source	TI-HRA-40
Y-90 (yttrium)	64.1 hours	beta	Instrument Calibration	TI-HRA-41

**Table 4-3  
Radionuclides of Concern at NAVSTA TI**

<b>RADIONUCLIDES</b>	<b>HALF-LIFE</b>	<b>RADIATION</b>	<b>USES</b>
<b>Am-241 (americium)</b>	<b>432 years</b>	<b>alpha, gamma</b>	<b>Instrument calibration</b>
<b>Ba-133 (barium)</b>	<b>10.5 years</b>	<b>gamma</b>	<b>Instrument calibration</b>
<b>C-14 (carbon)</b>	<b>5,730 years</b>	<b>beta</b>	<b>Check source</b>
<b>Cd-109 (cadmium)</b>	<b>464 days</b>	<b>gamma</b>	<b>Instrument calibration</b>
<b>Co-60 (cobalt)</b>	<b>5.27 years</b>	<b>beta, gamma</b>	<b>Instrument calibration</b>
<b>Cs-137 (cesium)</b>	<b>30.17 years</b>	<b>beta</b>	<b>Decontamination training</b>
<b>H-3 (tritium)</b>	<b>12.28 years</b>	<b>beta</b>	<b>Instrument calibration</b>
<b>Kr-85 (krypton)</b>	<b>10.72 years</b>	<b>beta, gamma</b>	<b>Check source</b>
<b>Na-22 (sodium)</b>	<b>2.60 years</b>	<b>beta, gamma</b>	<b>Check source</b>
<b>Pu-239 (plutonium)</b>	<b>24,131 years</b>	<b>alpha, gamma</b>	<b>Instrument calibration</b>
<b>Ra-226 (radium)</b>	<b>1,600 years</b>	<b>alpha, beta, gamma</b>	<b>Instrument calibration</b>
<b>Sr-90 (strontium)</b>	<b>28.6 years</b>	<b>beta</b>	<b>Instrument calibration</b>
<b>Tc-99 (technetium)</b>	<b>213,000 years</b>	<b>beta, gamma</b>	<b>Check source</b>
<b>Th-232 (thorium)</b>	<b>1.4 x 10<sup>4</sup> years</b>	<b>alpha, gamma</b>	<b>Check source</b>



## **5.0 REGULATORY INVOLVEMENT**

This section provides an overview of regulatory agencies involved with the oversight of radioactive materials and their use at NAVSTA TI. Included is the regulatory authority and requirements for the HRA, as well as the involvement of regulatory agencies at NAVSTA TI.

### **5.1 FEDERAL REGULATORY AGENCIES**

#### **5.1.1 Atomic Energy Commission (AEC)**

The Atomic Energy Act (AEA) of 1 August 1946 established the AEC to develop and manage the atomic energy program following WW II. A civilian government agency, the AEC assumed responsibility for control of radioactive material and its uses from the military's Manhattan Project, the group that developed the atomic bomb during WW II. The AEC's mission included the production and control of fissionable material, accident prevention, research, and peaceful uses of the atom, including the commercial generation of electricity. While the AEC had control of atomic energy production and nuclear materials, facilities using the materials remained under government control. The act provided for a five-member commission, the General Advisory Committee, as well as a Military Liaison Committee within the National Military Establishment, which worked with the AEC on military applications of atomic energy.

In 1953, the DoD established the Committee on Atomic Energy (CAE) to provide assistance and guidance for research and development activities within DoD. The main fields of interest for the CAE were atomic research and its effect on national security and research and development of atomic energy for military use. During this time, the AEC and DoD also formalized the "Agreement for the Development, Production and Standardization of Atomic Weapons" that established regulations to prevent conflicts of responsibility between the military and the AEC **(TI-HRA-48)**.

The AEC controlled uses of radioactive materials by issuing "authorizations" or "permits" until 1954, when the AEA was modified. This modification amended AEC controls and established the licensing program, which allowed for partnerships with private facilities to produce



fissionable materials. An additional amendment in 1964 permitted private ownership of nuclear fuels, aiding the growing nuclear power industry.

The AEC was dissolved when the Energy Reorganization Act of 1974 established two new federal agencies to administer and regulate atomic energy activities: the U.S. Energy Research and Development Administration (ERDA) and the NRC. The NRC assumed responsibilities for regulation of the byproduct, source, and special nuclear material previously controlled by the AEC. Military applications of radioactive material remained under the control of ERDA, which was renamed the DOE in 1977.

### **5.1.2 AEC Licensing Controls**

With the establishment of AEC licensing controls in 1954, procurement and use of radioactive materials became more stringently controlled. Users were required to submit lengthy “license applications,” with different license types required for byproduct, source, or special nuclear material. AEC required license applications to include:

- Quantity of each radionuclide to be possessed at any one time.
- Purposes for which the licensed material was used.
- Location where radioactive materials were used.
- Qualifications of a Radiation Safety Officer.
- Demonstration that facilities were adequate to safely control materials and protect human health.
- Administrative and managerial controls.
- Monitoring procedures and instrumentation.
- Material receipt and accountability procedures.
- An occupational radiation safety program for workers.
- Standard operating and emergency procedures.
- Radioactive waste disposal procedures.



## 5.2 NAVY RADIOACTIVE MATERIALS CONTROLS

### 5.2.1 General Controls

The first formal document controlling use of radioactive material by the Navy was Safety Series No. 9 of 1942 for Ra-226 (**TI-HRA-49**). However, the Navy did not establish a formal radiological controls program for all types of radioactive material until 1946, shortly after the end of WW II. These controls were the predecessors of the more stringent radiological controls programs the Navy has in effect today. The first Radiological Safety Manual for general applications of radioactive material was issued in 1947 by the Chief of Naval Operations (CNO) (**TI-HRA-50**). This manual was based on knowledge gained from the bombing of Hiroshima and Nagasaki and OPERATION CROSSROADS testing of the atomic bomb. As experience with and knowledge of the effects of radiation on ships and naval personnel grew, the Navy worked to establish more protective requirements that met or exceeded federal regulations.

In the late 1940s and early 1950s, the Bureau of Medicine and Surgery (BUMED) and the Bureau of Ships (BUSHIPS) worked closely with the radiation laboratory (RADLAB) and the Naval Radiological Defense Laboratory (NRDL) at HPS to develop controls for use of radioactive material throughout the Navy. Simply due to their close proximity to HPS, the instructors and students at the Damage Control School at NAVSTA TI benefited from the radiological knowledge being developed at NRDL. BUMED established and incorporated safety tolerances into regulations, determined physiological effects and developed treatment methods, and approved specifications for instruments to cover medical uses and exposure to radioactive materials. BUMED continues to oversee the radiation health protection program in the Navy and Marine Corps today.

BUSHIPS developed and procured instruments to detect radioactivity, equipment to protect personnel onboard ships, and methods and equipment for decontaminating ships. Eventually, the Navy reorganized, and these responsibilities were assigned to the Naval Sea Systems Command (NAVSEA). Today, NAVSEA remains responsible for the safety and control of ionizing radiation, including radioactive material, by the Navy and Marine Corps and provides oversight and regulatory guidance to the NNPP, Nuclear Weapons Radiological Controls Program, and G-RAM Program (known as the Radiological Affairs Support Program [RASP]).



## 5.2.2 AEC Licensing of Navy Headquarters Commands

In some instances, the Navy's headquarters commands applied to the AEC for authority to use licensed radioactive material. The AEC licenses were issued to a single headquarters command even though the material might only be used by an individual field command or ship. In some instances, the licenses authorized use of a radioactive commodity by multiple commands. Two such licenses that directly involved NAVSTA TI are listed below.

**AEC Source Material License No. SMB-473** was issued to the Naval Electronics Systems Command on January 23, 1969. The license states "for use within the Naval Establishment as instrument check sources" (**TI-HRA-51**). The check sources were uranium and thorium. Amendment No. 1 to this license changed the uranium to depleted uranium in January of 1974. There is no indication that NAVSTA TI used depleted uranium sources.

**U.S. NRC Materials License No. 08-00038-12** was issued to the Naval Electronics Systems Command. The original issue date is not known but Amendment No. 35 issued on January 31, 1979, authorized use of C-14, Cs-137, Kr-85, Sr-90, and Tc-99. Amendment No. 36 issued January 23, 1980 added Am-241. The license states "Licensed material may be used throughout the United States" (**TI-HRA-52**).

## 5.3 REGULATORY INVOLVEMENT AT NAVSTA TI AND AEC LICENSES

NAVSTA TI was subject to the AEC licensing requirements for radioactive materials that began in 1954, with additional oversight provided by BUMED and BUSHIPS. The State of California became an Agreement State with the AEC on September 1, 1962, and established the California Agreement State Licensing Program managed by the CDHS. As a Federal entity, NAVSTA TI remained under the AEC licensing program. However, it should be noted that use of radioactive material by Navy contractors or NAVSTA TI lessees could have fallen under auspices of the CDHS licensing program. No records have been found that indicate uses of radioactive materials by contractors or lessees. The AEC licenses for NAVSTA TI are discussed below.

The AEC issued two separate licenses for possession and use of radioactive material on NAVSTA TI. These licenses are summarized below and detailed in Table 5-1.



**AEC Byproduct Material License 04-04346-01** was initially issued on January 30, 1959 to the Restricted Weapons Defense Division, Treasure Island. The license authorized the use of radioactive materials for simulation of a fallout radiation field on a training ship for indoctrination of monitors and decontamination teams. The license was terminated on February 8, 1982. The uses of radioactive material covered by this license were transferred to license 04-04346-02 on the same day.

**AEC Byproduct Material License 04-04346-02** was initially issued to the RADIAC Instrument Maintenance School, Treasure Island on June 22, 1959. The license authorized the use of radioactive materials for calibration of RADIAC instruments and training of personnel in the use of radiation detection instruments. On February 8, 1982, Amendment No. 29 to license 04-04346-02 added authorization to use radioactive materials for simulation of fallout radiation for indoctrination and training of personnel. On April 1, 1987 license 04-04346-02 was officially converted to Navy Radioactive Materials Permit (NRMP) 04-62639-C1NP. The NRMP was terminated by Amendment No. 6 on February 24, 1994.

#### **5.4 NON-LICENSED ACTIVITIES AT NAVSTA TI INVOLVING RADIOACTIVE MATERIAL**

In addition to the radioactive materials licensed by the AEC, small quantities of radioactive material, below levels requiring licensing by the AEC, were probably also used in commodity items throughout the Naval Station, such as smoke detectors, deck markers, check sources for radiation survey instruments, and radioluminescent dials and gauges. Since one of the schools operated on NAVSTA TI was the Electronics School, many items of electronic equipment such as radar and radios and test equipment were in use. Use of non-AEC licensed materials sources of ionizing radiation used by the NAVSTA TI are described below.

Naturally Occurring Radioactive Material (NORM) and other radioactive materials not requiring licensing by the AEC were probably used throughout the Naval Station in various commodity items. Some examples include smoke detectors containing (americium-241 [Am-241] after 1970), exit signs (tritium [H-3]) after 1970), sound-powered telephone jacks (Ra-226), deck markers (Ra-226 and strontium-90 [Sr-90]), electron tubes (many different radionuclides), radio



receivers and transmitters containing radium dials, knobs and switches (Ra-226), thoriated welding rods (thorium-232 [Th-232]), divers' watches (Ra-226, H-3, and promethium [Pm-147]), and wristwatches and compasses (Ra-226, H-3, and Pm-147). Formalized controls for these items were not found, which is common because these controls were not typically warranted during the operational time of NAVSTA TI. (Formal controls were established in NAVSUPINST 5101.6 series starting in about 1964 under AEC licenses.)

Controlled disposal of radioactive commodity items began in the late 1960s when the Navy instituted a program to control devices containing Ra-226 that included removal of radium devices from ships and replacement with non-radium substitutes (**TI-HRA-53**). Gradually, the Navy expanded the control program to include all commodity items containing radioactive material. Prior to the implementation of the control programs, NAVSTA TI likely disposed of these items as normal trash. Disposal of these items in commercial landfills was common practice by private industry as well. Although NAVSTA TI did not operate a solid waste landfill, several localized areas of solid waste disposal have been identified in the area around the former bunkers at the north end of Treasure Island. The area now known as IR Site 12, is a potential location for disposal of such radioactive commodities. This area was used until about 1965. Aerial photographic analysis performed by the U.S.EPA appears to confirm that waste disposal stopped at about that time (**TI-HRA-54**). Most of the licensed commodities had controlled disposal procedures and were not introduced into the Navy until 1964 or later. It is unlikely that these commodities exist in the solid waste disposal areas.

## **5.5 FEDERAL REGULATORY AUTHORITY AND OVERSIGHT AT NAVSTA TI**

The following sections discuss the current regulatory agencies that oversee NAVSTA TI. Each organization has distinct responsibilities. By agreement, federal agencies do not share jurisdiction over a site.

### **5.5.1 NRC**

The NRC is the federal regulatory authority for use of source, special nuclear and byproduct material as defined in Title 10 of the CFR. Currently the Navy holds a NRC Master Materials License to cover use of NRC-licensed radioactive material by the Navy and Marine Corps.





One of the two AEC licenses specifically issued to NAVSTA TI, **04-04346-01** was terminated and the functions transferred to License No. **04-04346-02**. The other license, License No. **04-04346-02**, was converted to a Navy Radioactive Material Permit. Therefore, the NRC did not review license termination documentation for either license.

## **5.5.2 EPA**

The EPA is a federal agency that was established in 1970 to protect human health and to safeguard the natural environment (air, water, and land). The EPA is divided into 10 geographic regions; NAVSTA TI falls under the jurisdiction of EPA Region IX. Each regional office is responsible for execution of EPA's programs within that region. EPA works closely with other Federal agencies and state and local governments to enforce environmental regulations. While EPA sets environmental regulations, often the responsibilities for oversight activities are delegated to state offices. For NAVSTA TI, the EPA oversees the radiological release of outdoor structures and open areas but defaults release of buildings to the CDHS. The EPA is a member of both the BRAC Cleanup Team (BCT) and the Restoration Advisory Board (RAB). EPA regulatory programs at NAVSTA TI are discussed below.

### **5.5.2.1 CERCLA**

CERCLA (commonly known as Superfund) was enacted by Congress in 1980 and allows the EPA to:

- Establish prohibitions and requirements for closed and abandoned hazardous waste sites.
- Hold the persons responsible for releases of hazardous waste at a site liable for cleanup of the site.
- Establish a trust fund to provide for cleanup when a responsible party cannot be identified.

The act authorizes two kinds of response actions:

**Short-Term Removals**, which are prompt responses to address releases or threatened releases.



**Long-Term Remedial Responses**, which are permanent actions taken to significantly reduce the danger of a release or threat of release of hazardous substances that are serious but not immediately life threatening.

CERCLA also enabled the revision of the NCP to provide guidance and procedures to respond to releases and threatened releases of hazardous substances, pollutants, or contaminants. This revision also established the NPL.

### **5.5.2.2 SARA**

SARA amended CERCLA in 1986 and made significant changes to the program. These changes provided new enforcement authorities, including:

- Stressing the importance of permanent remedies and innovative technologies.
- Considering other environmental laws and regulations.
- Increasing state involvement.
- Increasing the focus on human health problems.
- Encouraging greater citizen participation in the decision-making process.

SARA also required EPA to revise the Hazard Ranking System (HRS) to ensure accurate assessment of sites placed on the NPL. As noted earlier, NAVSTA TI is not listed on the NPL.

### **5.5.3 NPL**

CERCLA requires that the statutory criteria of the HRS be used to establish a list of national priorities of known or threatened releases of hazardous substances, pollutants, or contaminants throughout the United States. The NPL is the result of this requirement. A tool used in the CERCLA process upon completion of the HRS, the NPL is an appendix of the NCP. Identification of a site for the NPL provides notification to the public that the EPA has determined that the site warrants further investigation to assess risks to human health and the environment and serves as notice to responsible parties that EPA may be seeking remedial action. Inclusion of a site on the NPL is not a judgment of the activities of the property owner



nor does it require action or assign liability. The NPL primarily serves to identify a location where remedial actions appear to be warranted. NAVSTA TI is not listed on the NPL.

### 5.5.3.1 Major Steps in the CERCLA Process

The CERCLA process has been divided into the following series of steps:

- **PA** - A screening process to determine if further study is necessary.
- **SI** - An on-site investigation to determine if there has been a release or a potential for a release and to determine any associated threats.
- **RI** - A process generally taken by the responsible agency to determine the nature and extent of the problem associated with the release.
- **Removal Actions** - An expedited action taken to remove a more immediate environmental threat or health hazard.
- **FS** - Action taken by the lead agency to develop and evaluate options for remedial actions.
- **Proposed Plan (PP)** - Presentation of the nature and extent of contamination, alternatives evaluated, and preferred approach to remediation.
- **Record of Decision (ROD)** - A public document that describes the selected cleanup action.
- **Remedial Design** - Technical analysis of the site remedy with detailed plans for implementation.
- **Remedial Action** - Actual implementation of the cleanup.

## 5.6 DEPARTMENT OF THE NAVY

Because this HRA deals with G-RAM, the Navy's regulatory involvement is addressed below.

### 5.6.1 NRSC

The NRC has granted the CNO a Master Materials License, which allows the Navy to administer and manage the use of licensed radioactive materials by the Navy and Marine Corps. To manage that license authority, the Navy established the Naval Radiation Safety Committee (NRSC) chaired by CNO N45 (**TI-HRA-55**). The NRSC is supported by two technical support centers: the Navy Environmental Health Center, which manages medical uses of radioactive materials, and the NAVSEA Detachment, Radiological Affairs Support Office (NAVSEADET RASO),



which manages industrial and operational uses. RASO is the Navy office providing support for radiological issues at NAVSTA TI.

### **5.6.2 RASP**

The CNO delegated responsibility for the safe uses of radioactive materials and machines that produce ionizing radiation to the NAVSEA. To implement the responsibilities for G-RAM, NAVSEA established the RASP (**TI-HRA-56**). RASO provides technical support to NAVSEA for administration and management of the RASP. While this is the current organization since 1984, the RASP and RASO were established in 1972. RASO made technical assistance visits approximately every 3 years since 1974 (**TI-HRA-57, TI-HRA-58, TI-HRA-42, TI-HRA-59**). During these visits, radiological operations including procedures and leak test records were routinely reviewed.

### **5.6.3 IR Program**

The Navy established the IR Program to implement the requirements of the Defense Environmental Restoration Program (DERP) and CERCLA. The purpose of the IR Program is to identify, investigate, and clean up or control releases of hazardous substances and to reduce the risk to human health and the environment from past waste disposal operations and hazardous materials spills on Navy and Marine Corps property in a cost-effective manner. The IR Program is managed by the Naval Facilities Engineering Command (NAVFAC). RASO provides technical expertise to NAVFAC for G-RAM issues associated with IR sites.

The IR Program manages Navy property closed under the BRAC Program. The specific manager for NAVSTA TI is the BRAC Program Management Office West (BPMOW), which works with the EPA, as well as state and local agencies and the public, to ensure all actions taken at NAVSTA TI comply with CERCLA. The BPMOW uses a BRAC Cleanup Team (BCT) that comprises representatives from all regulatory agencies and BPMOW to review ongoing and proposed actions at NAVSTA TI on a monthly basis. Additionally, representatives from regulatory agencies, the local community, special interest groups, and the Navy comprise a restoration advisory board (RAB). The RAB meetings are held bi-monthly to exchange information on environmental cleanup issues. The meetings are open to the public.



## **5.7 STATE OF CALIFORNIA**

The State of California works with EPA and SWDIV to ensure all aspects of CERCLA are implemented at NAVSTA TI. The primary state agencies involved with NAVSTA TI are detailed below.

### **5.7.1 CDHS**

CDHS is the recognized authority on public health and a technical leader in scientific investigation. This department also implements the California Agreement State Radioactive Material Licensing Program. CDHS concurrence is required for release of all property being transferred from federal ownership to state, local or private ownership.

### **5.7.2 DTSC**

As a department of the California Environmental Protection Agency, the Department of Toxic Substances Control's (DTSC) mission is to protect Californians from exposure to hazardous wastes. DTSC is a member of the BCT and RAB and plays an integral role in overseeing the cleanup actions at NAVSTA TI.

### **5.7.3 RWQCB**

The Regional Water Quality Control Board (RWQCB) is a regional office of the California State Water Resources Control Board. The RWQCB develops and enforces water quality objectives and protects the beneficial uses of the state's waters. The RWQCB oversees the Petroleum Program and groundwater issues at NAVSTA TI and is a member of the RAB.

## **5.8 CITY AND COUNTY OF SAN FRANCISCO**

The City and County of San Francisco takes an active role in the ongoing development and reuse of NAVSTA TI. San Francisco is the prospective transferee of NAVSTA TI from the Navy.

## **5.9 LOCAL COMMUNITY**

The local community provides input on NAVSTA TI's environmental cleanup activities via the Treasure Island Development Authority (TIDA), the Citizens Advisory Board (CAB) of the



TIDA and the RAB. The Navy maintains a NAVSTA TI mailing list of over 1100 names including residents of TI and YBI, business on TI, elected officials, community groups, media contacts and surrounding community members.

## **5.10 CURRENT CONTRACTORS**

While the Navy has an NRC Master Materials License that would cover the residual radioactive material at the site, it is Navy policy that the contractor actually performing the work must maintain independent license authority.

All contractors performing radiological work at NAVSTA TI prepare site work plans delineating proposed work efforts and safety measures. These work plans are reviewed by RASO and the appropriate regulatory agencies prior to initiation of work efforts. RASO also provides oversight during the work process and reviews all subsequent reports.

Contractors performing radiological work at NAVSTA TI involving licensable quantities of radioactive material must have an NRC or a California Agreement State license for remediation, packaging, and transportation of any resultant waste.



## SECTION 5

### TABLES



**Table 5-1**  
**Atomic Energy Commission Licenses**  
**Issued To NAVSTA TI**

<b>LICENSE NO./ AMENDMENT</b>	<b>ISSUED TO</b>	<b>DATE</b>	<b>AUTHORIZED ISOTOPES</b>	<b>COMMENTS</b>
4-4346-1 Initial Issue	Restricted Weapons Defense Division	1/30/59	Cs-137 7.8 curies total. 12 sources of 0.65 curies each	For simulation of a fallout radiation field on a training ship.
4-4346-1 Amend. #1	Restricted Weapons Defense Division	12/15/60	No change in isotopes or quantities	
4-4346-1 Amend. #2	Restricted Weapons Defense Division	7/5/61	No change in isotopes or quantities	
4-4346-1 Amend. #3	Restricted Weapons Defense Division	1/4/62	No change in isotopes or quantities	
4-4346-1 Amend. #4	Restricted Weapons Defense Division	6/3/64	No change in isotopes or quantities	
4-4346-1 Amend. #5	Restricted Weapons Defense Division	11/19/64	A. Cs-137 7.8 curies total. 12 Sources of 0.65 curies each B. Br-82 4 curies C. Br-80 240 millicuries D. K-42 180 millicuries E. Na-24 66 millicuries	B through E added for use in Model 11F3A radiological training device for use in radiation monitoring, decontamination and contamination control training exercises. B through E are all short-lived isotopes.
04-04346-01 Amend. #6	NBC Defense Department	5/20/66	A. Cs-137 7.1 curies total 11 Sources of 0.65 curies each B. Br-82 4 curies C. Br-80 240 millicuries D. K-42 180 millicuries	Deleted one Cs-137 source





**Table 5-1**

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<b>LICENSE NO./ AMENDMENT</b>	<b>ISSUED TO</b>	<b>DATE</b>	<b>AUTHORIZED ISOTOPES</b>	<b>COMMENTS</b>
			E. Na-24 66 millicuries	
04-04346-01 Amend. #7	NBC Defense Department	1/5/67	No change in isotopes or quantities	
04-04346-01 Amend. #8	NBC Defense Department	9/6/68	No change in isotopes or quantities	
04-04346-01 Amend. #9	NBC Defense School Division	2/27/69	Cs-137 7.1 Curies Total. 11 Sources of 0.65 Curies each.	Short-lived isotopes deleted during transfer of training ship.
04-04346-01 Amend. #10	NBC Defense School Division	6/24/69	No change in isotopes or quantities	
04-04346-01 Amend. #11	NBC Defense School Division	5/22/70	A. Cs-137 7.1 curies total 11 Sources of 0.65 curies each B. Br-82 4 curies C. Br-80 240 millicuries D. K-42 180 millicuries E. Na-24 66 millicuries	Short-lived isotopes added again after transfer of training ship
04-04346-01 Amend. #12	NBC Defense School Division	6/4/70	No change in isotopes or quantities	
04-04346-01 Amend. #13	NBC Defense School Division	3/18/71	No change in isotopes or quantities	
04-04346-01 Amend. #14	NBC Defense School Division	5/20/72	Cs-137 7.1 curies total. 11 Sources of 0.65 curies each	Use of short-lived isotopes terminated
04-04346-01 Amend. #15	NBC Defense School Division	9/20/73	No change in isotopes or quantities	
04-04346-01 Amend. #16	NBC Defense School Division	9/11/74	No change in isotopes or quantities	



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<b>LICENSE NO./ AMENDMENT</b>	<b>ISSUED TO</b>	<b>DATE</b>	<b>AUTHORIZED ISOTOPES</b>	<b>COMMENTS</b>
04-04346-01 Amend. #17	NBC Defense School Division	10/1/75	No change in isotopes or quantities	
04-04346-01 Amend. #18	Naval Technical Training Center	5/18/78	No change in isotopes or quantities	
04-04346-01 Amend. #19	Naval Technical Training Center	9/22/78	Cs-137 11 sources not to exceed 0.54 curies each	Curie content reduced
04-04346-01 Amend. #20	Naval Technical Training Center	6/14/79	No change in isotopes or quantities	
04-04346-01 Amend. #21	Naval Technical Training Center	2/8/82	None	License terminated concurrent with Amendment # 29 to License 04-04346- 02
4-4346-2 Initial Issue	RADIAC Instrument Maintenance School	6/22/59	A. Co-60 500 millicuries total. No source to exceed 100 millicuries. 22 sources B. Cs-137 120 curies C. Co-60 2025 millicuries total in 9 sources	Authorized use is for calibration of RADIAC instruments and training of personnel in the use of radiation detection instruments.
4-4346-2 Amend. #1	RADIAC Maintenance Branch	11/21/60	A. Co-60 160 millicuries total. 4 sources B. Co-60 521 millicuries total. 7 sources C. Co-60 2254 millicuries total. 10 sources D. Cs-137 120 curies	A total of 10 Co-60 sources deleted
4-4346-2 Amend. #2	RADIAC Maintenance Branch	5/22/61	No change in isotopes or quantities	
4-4346-2 Amend. #3	RADIAC Maintenance Branch	4/19/62	No change in isotopes or quantities	
4-4346-2 Amend. #4	RADIAC Maintenance Branch	5/2/63	No change in isotopes or quantities	



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<b>LICENSE NO./ AMENDMENT</b>	<b>ISSUED TO</b>	<b>DATE</b>	<b>AUTHORIZED ISOTOPES</b>	<b>COMMENTS</b>
4-4346-2 Amend. #5	RADIAC Maintenance Branch	10/28/63	No change in isotopes or quantities	
4-4346-2 Amend. #6	RADIAC Maintenance Branch	4/14/64	No change in isotopes or quantities	
4-4346-2 Amend. #7	RADIAC Maintenance Branch	11/19/64	No change in isotopes or quantities	
4-4346-2 Amend. #8	RADIAC Maintenance Branch	7/30/65	A. Co-60 436.11 millicuries total. 8 sources B. Co-60 1446.68 millicuries total. 3 sources C. Cs-137 100 curies	A total of 10 Co-60 sources deleted Authorized use for A and B is calibration of instruments and training of personnel. Authorized use for C is use in Model AN/UDM-1A RADIAC Calibrator.
4-4346-2 Amend. #9	RADIAC Maintenance Branch	1/13/66	No change in isotopes or quantities	
4-4346-2 Amend. #10	RADIAC Instrument Maintenance Division	6/17/66	No change in isotopes or quantities	
4-4346-2 Amend. #11	RADIAC Instrument Maintenance Division	1/5/67	No change in isotopes or quantities	
4-4346-2 Amend. #12	RADIAC Instrument Maintenance Division	5/4/67	No change in isotopes or quantities	
04-04346-02 Amend. # 13	RADIAC Instrument	7/10/67	A. Co-60 340.47 millicuries total. 7 sources	One Co-60 source deleted



**Table 5-1**  
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<b>LICENSE NO./ AMENDMENT</b>	<b>ISSUED TO</b>	<b>DATE</b>	<b>AUTHORIZED ISOTOPES</b>	<b>COMMENTS</b>
	Maintenance Division		B. Co-60 894.27 millicuries total. 3 sources C. Cs-137 100 curies	
04-04346-02 Amend. # 14				Amendment not found
04-04346-02 Amend. # 15	RADIAC Instrument Maintenance Division	2/7/68	A. Co-60 340.47 millicuries total. 7 sources. B. Co-60 894.27 millicuries total. 3 sources C. Cs-137 100 curies D. Cs-137 30 curies	D added for use in Model TS-1216(B)/UD RADIAC Calibrator
04-04346-02 Amend. # 16	RADIAC Instrument Maintenance Division	10/7/68	No change in isotopes or quantities	
04-04346-02 Amend. # 17	RADIAC Instrument Maintenance Division	10/15/69	No change in isotopes or quantities	
04-04346-02 Amend. # 18	RADIAC Instrument Maintenance Division	6/4/70	No change in isotopes or quantities	
04-04346-02 Amend. # 19	RADIAC Instrument Maintenance Division	3/18/71	No change in isotopes or quantities	
04-04346-02 Amend. # 20	RADIAC Instrument Maintenance Division	6/5/72	A. Co-60 180.375 millicuries total. 7 sources. B. Co-60 551.34 millicuries total. 3 sources C. Cs-137 87 curies	Isotope curie contents reduced due to decay.



**Table 5-1  
Atomic Energy Commission Licenses  
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<b>LICENSE NO./ AMENDMENT</b>	<b>ISSUED TO</b>	<b>DATE</b>	<b>AUTHORIZED ISOTOPES</b>	<b>COMMENTS</b>
			D. Cs-137 27 curies	
04-04346-02 Amend. # 21	RADIAC Instrument Maintenance Division		No change in isotopes or quantities	Date of issue not legible
04-04346-02 Amend. # 22	RADIAC Instrument Maintenance Division	9/11/74	No change in isotopes or quantities	
04-04346-02 Amend. # 23	RADIAC Instrument Maintenance Division	9/30/75	No change in isotopes or quantities	
04-04346-02 Amend. # 24	Naval Technical Training Center	6/9/77	A. Co-60 92.1 millicuries total. 7 sources. B. Co-60 241.2 millicuries total. 3 sources C. Cs-137 76.9 curies D. Cs-137 24 curies	Isotope curie content reduced due to decay
04-04346-02 Amend. # 25	Naval Technical Training Center	5/26/78	A. Cs-137 76.9 curies B. Cs-137 24 curies	Deleted previous Items A and B (ten Co-60 sources). Renamed previous Items C and D to be Items A and B.
04-04346-02 Amend. # 26	Naval Technical Training Center	1/31/80	No change in isotopes or quantities	
04-04346-02 Amend. # 27	Naval Technical Training Center	7/8/81	A. Cs-137 77 curies B. Cs-137 24 curies	
04-04346-02 Amend. # 28	Naval Technical Training Center	11/2/81	No change in isotopes or quantities	
04-04346-02 Amend. # 29	Naval Technical Training Center	2/8/82	A. Cs-137 77 curies B. Cs-137 24 curies C. Cs-137 not to exceed 400 millicuries	In conjunction with termination of License 04-04346-01, item C added to this license. Quantity of sources not



**Table 5-1  
Atomic Energy Commission Licenses  
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<b>LICENSE NO./ AMENDMENT</b>	<b>ISSUED TO</b>	<b>DATE</b>	<b>AUTHORIZED ISOTOPES</b>	<b>COMMENTS</b>
			per source	listed. Item C for use in simulation of fallout radiation for indoctrination and training of personnel.
04-04346-02 Amend. # 30	Naval Technical Training Center	10/29/82	No change in isotopes or quantities	
04-04346-02 Amend. # 31	Naval Technical Training Center	2/9/84	No change in isotopes or quantities	
04-04346-02 Amend. # 32	Naval Technical Training Center	1/8/86	A. Cs-137 69 curies B. Cs-137 22 curies	Previous Item C (Sources for fallout training) deleted. .
04-04346-02 Amend. # 34	Naval Technical Training Center	8/20/86	A. Cs-137 69 curies B. Cs-137 22 curies	Last license issued directly to NAVSTA TI by AEC/NRC. This license converted to Navy Radioactive Material Permit 04-62639 C1NP on 4/1/87.
NRMP 04-62639- C1NP Amend. # 0	Naval Technical Training Center	5/3/89	A. Cs-137 63 curies B. Cs-137 22 curies C. Am-241/Be-7 100 millicuries	Converted from NRC license. Item C added.
NRMP 04-62639- C1NP Amend. # 1	Naval Technical Training Center	6/6/90	No change in isotopes or quantities	
NRMP 04-62639- C1NP Amend. # 2	Naval Technical Training Center	8/16/90	No change in isotopes or quantities	
NRMP 04-62639- C1NP Amend. # 3	Naval Technical Training Center	11/9/90	No change in isotopes or quantities	
NRMP 04-62639- C1NP Amend. # 4	Naval Technical Training Center	7/28/92	No change in isotopes or quantities	
NRMP 04-62639- C1NP Amend. # 5	Naval Technical Training Center	7/7/93	No change in isotopes or quantities	
NRMP 04-62639- C1NP Amend. # 6	Naval Technical Training Center	2/2/94	None	NRMP terminated.



## **6.0 HISTORY**

This section presents a historical overview of NAVSTA TI as it relates to the use of radioactive materials. There are many details augmented in Section 8.0. Two separate, but closely related, operational areas accounted for the major uses of radioactive materials on NAVSTA TI. These two areas are:

- Uses of radioactive sources to train naval personnel on the calibration and operation of radiation monitoring instruments.
- Uses of radioactive sources to train naval personnel on monitoring and decontamination of ships and airplanes.

A third possible, albeit very minor, source of radioactive materials is the berthing of OPERATION CROSSROADS ships at NAVSTA TI. Although no ship decontamination operations were known to have occurred at NAVSTA TI some OPERATION CROSSROADS ships which were decontaminated at HPS were temporarily berthed at NAVSTA TI prior to those ships receiving final radiological clearance.

The first documented uses of radioactive materials on NAVSTA TI began in 1947. Radiological studies, surveys, and characterizations conducted on Treasure Island since radiological activities began are summarized in this section. Survey and remedial actions after June 2003, in Building 233 and at IR Site 12, are not included. These will be documented in separate reports.

### **6.1 TREASURE ISLAND**

Construction of TI was begun in February of 1936. The island was built by creating a rock seawall on the Yerba Buena shoals on the north side of YBI. After the seawall was built up, almost 30 million cubic yards of sand and gravel fill were deposited into the cavity made by the seawall.



**Figure 6.1 Construction of Treasure Island 1937  
(TI-HRA-60)**

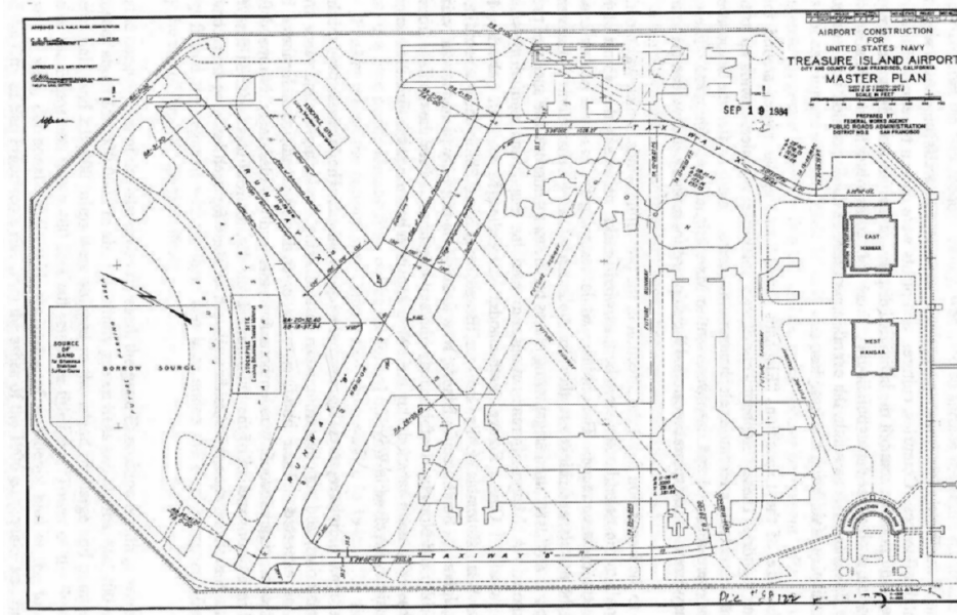
While TI was being completed, construction began on two large hangers and the Terminal and Administration building. These three buildings were intended to be permanent structures and were to be employed as airport facilities after completion of the International Exposition. On February 18, 1939, the Golden Gate International Exposition opened on TI on-time.



**Figure 6.2 Golden Gate International Exposition on Treasure Island 1939  
(TI-HRA-61)**



The exposition closed in September 1940. Earlier plans had been to convert TI into an international airport following the closure of the exposition. A master plan for construction of the Treasure Island Airport prepared by the U.S. Public Roads Administration and approved by the 12<sup>th</sup> Naval District Acting Public Works Officer on July 2, 1941 shows two crossing runways and three future runways taking up almost all available space on the island.



**Figure 6.3 Treasure Island Airport Master Plan (TI-HRA-62)**

During the same time frame, the Navy was actively attempting to obtain Treasure Island for a naval base. In mid-1940 Admiral Greenslade attempted to get the Navy Department to agree to lease TI from the City of San Francisco. His efforts were denied at that time. However, it was becoming clear to the City of San Francisco that the proposed airport at TI would soon be too small. The city agreed to lease TI to the Navy in exchange for assistance in obtaining land south of San Francisco for use as an international airport. Treasure Island was leased to the Navy in February 1941. After the attack on Pearl Harbor in December 1941, the Navy accelerated use of TI. In April 1942, the Navy took title to TI and YBI. Many of the structures built for the International Exposition were converted to Navy uses. By mid 1942 the runways previously built in anticipation of conversion to an airport were partially overtaken by new buildings in support of the ever increasing mission of the Naval Training and Distribution Center.



**Figure 6.4 Treasure Island 1942 (TI-HRA-63)**

By June 1942, there were 20 separate divisions operating under three main command groups all assigned to the Naval Training and Distribution Center. Throughout the war, the emphasis on training of Navy enlisted and officer personnel grew rapidly. The first technical school on TI was the Radio Materiel School which opened in 1941. Training was conducted on skills such as Fire Control, Gunner's Mate, Electric Hydraulics, Gyro Compass, Rangefinder Operations, Advanced Welding, and Underwater Cutting and Welding. At the end of World War II, the entire military downsized. Even so, The Commander-in-Chief directed a Damage Control Training Center be established at TI for the purpose of training the post-war Navy. The length of instruction was changed from 3 weeks to 6 weeks. The school was ordered to be moved from Cogswell Polytechnical College in San Francisco to a suitable location on TI. In January 1946, the Damage Control School was established in Building 7 on TI. In March of 1946 the U.S. Naval School (Damage Control) took over the functions performed by the Chemical Warfare School. In April of 1946, the U.S. Naval School (Damage Control) assumed all functions of the Fire Fighting School. The October 1946 authorized complement of instructors and staff for the Damage Control School was 17 officers and 31 enlisted personnel.



In July of 1946, the United States conducted two atmospheric nuclear weapon tests in the Bikini Atoll. These tests were known as OPERATION CROSSROADS. Many of the support ships involved in those tests were brought back to the continental United States for radiological survey, decontamination and eventual release from radiological control restrictions. In the San Francisco Bay area, these ships were processed at Hunters Point Shipyard (HPS) and at Mare Island Naval Shipyard (MINS). There is no evidence any decontamination work was performed at Treasure Island. There is documentation that some of the ships were berthed at Treasure Island following decontamination at HPS. This will be discussed in Section 6-4.

Of more significance relative to TI, was the recognition of the need to prepare for the potential of atomic warfare. Command History for the period 1 October 1946 to 10 December 1946 reported that a letter was received from the Bureau of Naval Personnel that directed setting up a course in Radiological Safety to furnish naval officers with the specialized training necessary to evaluate and combat atomic weapon damage. In January of 1947 the fourth floor of the Damage Control School, Building #7, was converted into a suitable location for the Radiological Safety School. The facility consisted of three lecture rooms, a laboratory suitable for demonstrating practical exercises, a meter repair and stowage room, and a room for storing a radioactive source needed for the practical exercises (TI-HRA-64).

## **6.2 RADIOLOGICAL SAFETY SCHOOL**

On March 17, 1947, the first class in Radiological Safety convened at 0800 with 39 students in attendance. An officer assigned to the U. S. Public Health Service also attended the first course as an observer and evaluator (TI-HRA-33). To support this additional training, the Bureau of Naval Personnel increased the authorized complement of instructors and staff by five officers and five enlisted personnel. Some technical support for the training was provided by NRDL, which had been set up at HPS. The NRDL radiation safety officer (RSO) was assigned additional duty to deliver lectures to naval personnel attending the Radiation Safety School at TI. Students from the radiation Safety School were given initial radiation safety physical examinations at NRDL. Additional technical support was provided by technical advisors from nearby University of California at Berkeley. After completion of a second Radiation Safety class in Building 7, the new Commanding Officer moved the Radiation Safety School next door to Building 233. Larger



quarters were required to accommodate the increased student population anticipated for future training classes. The third class in Radiation Safety convened in Building 233 on June 30, 1947. Prior to that class, the U.S. Naval School (Damage Control) was renamed the U.S. Naval Damage Control Training Center.

Training in radiation monitoring, safety, etc continued to grow. In 1948, the mission statement of the Damage Control Training Center included instruction in Fire Fighting, Chemical Warfare and associated subjects, Radiological Safety, defensive Atomic Defense for officers, and damage control for prospective commanding officers and prospective executive officers.

In January 1950, during a training session in which students were to learn to calibrate radiation survey instruments, a spill of radium occurred in the first floor laboratory of Building 233 (**TI-HRA-47**). A capsule containing approximately 40 milligrams of radium was inadvertently dropped and became damaged. Foot traffic in the laboratory resulted in tracking the radium sulfate powder throughout the building before the spill was detected. The dry powdery nature of the radium sulfate also resulted in spreading the contamination to many of the students and school staff in attendance. The first indications a spill had occurred were erratic readings from the survey instruments being used by the students. Initial investigations by the students and the instructors concluded the cause of the erratic readings was a leak of radon gas from one of the capsules. This conclusion was supported by the fact a similar leak had occurred a year earlier (**TI-HRA-47**).

All personnel in the laboratory were sent to a classroom for monitoring. Several students were found to be contaminated. Initial personnel decontamination with an abrasive soap and scrubbers was successful for some, but not all of the students. The liquids generated by the initial personnel decontamination efforts were probably washed down the drain. After several attempts at decontamination were unsuccessful, the remaining contaminated personnel were sent home with instructions to carefully continue the decontamination. In the meantime, investigation in the laboratory revealed a damaged radium capsule and deposits of radium on the floor of the laboratory. The building was closed and all personnel attending classes (approximately 150) were sent home. The following day, personnel from the classes were brought back for additional monitoring. The initial Damage Control Training Center report states that “a decontamination



center was established at the Chemical Warfare School” (TI-HRA-47) on the day after the spill. The Chemical Warfare School was housed in buildings 269 and 273. Building 269 was the office for the Chemical Warfare School. Building 273 is specifically identified as a decontamination building. These buildings are approximately one half mile from Building 233. There are no details of the decontamination performed at the Chemical Warfare School. Since the decontamination building (273) was in place and used for training in chemical decontamination, it is very likely the building was properly prepared for radioactive contamination including provisions to prevent contamination of building surfaces and provisions for collection of decontamination liquids. Both Buildings 269 and 273 have been demolished to make way for new housing.

On the day following the spill, a team from NRDL arrived and commenced monitoring staff and students present in Building 233 on the day of the spill. On the second day following the spill, five still contaminated individuals were decontaminated. Personnel decontamination was initially accomplished using abrasive soap, hand scrubbers and deck scrubbers. Citric acid solution was also used. During the follow-up decontamination performed by NRDL personnel, a special decontamination solution of trisodium citrate, Triton X-100 (a detergent), and Hyamine 1622 (a disinfectant) was used (TI-HRA-65).

Monitoring and decontamination teams were formed and started monitoring of homes and quarters of staff and students on and off NAVSTA TI. Monitoring of personnel continued for 7 days. Contamination of students and personal effects are documented but not contamination levels in specific locations. It is known that both Bachelor Officers Quarters were monitored (TI-HRA-47). (The 1949 map of NAVSTA TI lists Buildings 226 and 228 as the Bachelor Officers Quarters (TI-HRA-27). Other quarters on NAVSTA TI may have been monitored as well, but there are no specific records to indicate monitoring took place. All monitoring of student and staff homes and quarters was completed with no reports of residual contamination. On the third day following the spill, NRDL entered Building 233 to assess conditions, locate the spill, and vacuumed up about one quarter of the spilled radium.

It became apparent that a large personnel change and monitoring station would be required for the handling of the working parties necessary to clean the building. Consequently, “an



unoccupied building across the street from the contaminated building was prepared for this purpose” (TI-HRA-66). The identification of the building used for the monitoring and decontaminating station is not clear. The NRDL report includes a detailed diagram of the decontamination station. A detailed examination in 2005 of each nearby existing building as well as review of building floor plans indicate that none of the existing buildings could have accommodated the decontamination station.

Monitoring and decontamination of Building 233 proceeded. This work was accomplished by personnel wearing protective clothing and self-contained breathing apparatus. Air analyses were performed throughout the cleanup. Radon concentration exceeded the maximum allowable levels for two weeks after the spill. Radium samples exceeded the maximum allowable for more than a month (TI-HRA-65). Several methods of decontamination were utilized. By the end of March 1950, the contamination had been cleaned up to the extent that a request was submitted to the BUMED to grant operational clearance for Building 233. The Chief of the BUMED concurred with the request for operational clearance and authorized the Commandant, Twelfth Naval District to grant operational clearance which was granted on May 1, 1950. More than three months later, a request for final clearance was submitted by the Commanding Officer of the Damage Control Training Center. The request reported all surfaces had been further decontaminated or if unable to be decontaminated, it was removed and disposed. Air samples and smear samples were all less than the AEC limits identified in the NRDL report (TI-HRA-66). These limits were:

For airborne long-lived alpha activity — 0.33 d/m/ft<sup>3</sup> (disintegrations per minute per cubic foot of air volume)

For smear (wipe sample) alpha activity — 2000 d/m/150 cm<sup>2</sup> (disintegrations per minute per 150 square centimeters of surface area)

Finally, the interior of Building 233 was completely painted. The Chief of the BUMED granted final clearance for Building 233 on September 11, 1950, almost nine months after the spill of radium took place (TI-HRA-67).



No further records of Building 233 during its use for instrument calibration training have been found. Buildings, 342, 343, and 344 were built in 1951 for the Naval Technical Training Center. Buildings 342, 343 and 344 were used for RADIAC Instruction and for storage of the radium and other portable sources. The 1952 listing of buildings on TI contained in the map of U.S. Naval Station, Treasure Island identifies Buildings 342 and 343 as classrooms assigned to U S Naval Schools Command and Building 344 as a storage building assigned to U S Naval Schools Command (**TI-HRA-28**). It would appear the ever-expanding classes and student population required the Damage Control Training Center to move to larger facilities. Note that the Damage Control Training Center was renamed the Damage Control School under the U.S. Naval Schools Command in April of 1952. At that time, courses offered by the Damage Control School included Atomic Defense, Atomic, Biological, Chemical Defense, and RADIAC Instrument Maintenance among others. Students included personnel from all branches of the military services, as well as officers from several foreign countries. The Damage Control Schools were reorganized in 1955 and again in 1956. In the 1956 reorganization, the Biological/Chemical Warfare School, which had been part of the Atomic Defense School, was established as a separate school. The six separate schools then under the Damage Control School were: Damage Control Primary School, Fire Fighters School, RADIAC Maintenance School, Atomic Defense School, Damage Control Class 'A' School, and the Biological Warfare/Chemical Warfare School.

In January 1958, the first class for Medical Officers was convened for the study of defense against Atomic, Biological and Chemical Warfare. This class was intended to be offered twice a year for Medical Officers from all services. The third and fourth courses (January and May 1959) are described as courses for Senior Medical Officers. The courses were four weeks in duration and covered the medical aspect of modern warfare.

In April 1959, the RADIAC Instrument Maintenance School of the Naval Schools Command applied for a Byproduct Material License from the Atomic Energy Commission. License No. 4-4346-2 was issued June 22, 1959 and authorized possession and use of 22 Co-60 sources totaling no more than 500 millicuries with no individual source greater than 100 millicuries; one cesium-137 source of 120 curies; and nine Co-60 sources totaling 2025 millicuries. The possession and use of these sources was authorized for "Calibration of RADIAC instruments and training of



personnel in the use of radiation detection instruments”. Over the years, the isotopes and quantities authorized by License No. 4-4346-2 changed as the needs of the school changed. License No. 4-4346-2 remained continuously in effect until April 1, 1987 at which time it was converted to a Navy Radioactive Material Permit. A tabular history of License No. 4-4346-2 is presented in Table 5-1. Buildings 342 and 343 were used as classrooms, calibration rooms, laboratories, offices, and equipment issue rooms. Instruction on RADIAC calibration and maintenance, and RADIAC instrument use were presented in these two buildings and in the fenced off compound in-between the two buildings. Building 344 was the source storage vault for portable sources. By 1972, Building 342 was only used for storage space, a workshop, and a counting room. One of the three laboratories in Building 342 had been turned over to the Underway Replenishment School, and another was no longer being used. Radioactive material use in Building 342 was discontinued in 1972. Building 342 was being turned over to other schools for use. In 1982, the Byproduct Material License was modified to remove Building 342 from the authorized locations list. In January 1986, the license was again modified to remove Building 344 from the authorized locations list (**TI-HRA-68**). Building 344 was still in use as a storage location for radioactive sources as confirmed by the 1986 Technical Assistance visit by RASO (**TI-HRA-59**). The 1986 modification removing Building 344 from the license was a mistake. The initial issue of the Navy Radioactive Materials Permit (which superseded the Byproduct material License) in 1989 again included Building 344 as an authorized location (**TI-HRA-69**).

During a routine survey of the Building 344 vault in March 1988, two waste containers were found to be contaminated. An investigation revealed the source of the contamination was a cesium/barium mini-generator kit. Small vials labeled as “Cesium 137/Barium 137,” and “Tin 113/Indium 113” were found inside the kit. Contamination levels inside the kit were higher than in the waste containers leading to the conclusion the source of the contamination in the waste containers was liquid from the mini-generator kit. Swipe surveys were taken in the area where the kit was located and swipe surveys of the shelves and floor of the vault gave no readings above background. The mini-generator kit and the contaminated waste were secured. Arrangements for off-site disposal of the contaminated waste were made via the Navy Supply Center, Oakland (**TI-HRA-70**).





In April of 1990, the NTTC submitted a request to remove Building 344 from the NRMP. Amendment No. 3 to the NRMP removed Building 344 from the authorized locations in November of 1990 (**TI-HRA-71**). In August of 1991 the Commanding Officer of the NTTC reported that although the NRMP had been amended to remove Building 344, documentation of close-out surveys of Building 344 had not been performed and in fact contaminated material was stored in Building 344 until July of 1991 (**TI-HRA-72**). Closeout surveys of Building 344 were performed later in 1991 and were reported to RASO in June of 1992 along with a new request to amend the NRMP (**TI-HRA-73**). A follow-up letter in July of 1993 corrected some calculations concerning MDA. The corrections did not affect the results of the previously completed surveys. (**TI-HRA-74**).

### **6.3 DECONTAMINATION TRAINING**

One of the recommendations from the investigation of the 1950 radium spill in Building 233 was to replace the radium capsules with Co-60 sources. Even before the decontamination of Building 233 was complete, action was initiated to replace the radium sources. In February 1951 six Co-60 sources were transferred to the Damage Control School on Treasure Island from NRDL. Four of the six sources were sent to the Damage Control Center and two were sent to the Electronics School.

The first documented training on ship decontamination procedures was in 1952. It is not clear that the training at that time included use of mockups or even used radioactive sources. Since four Co-60 sources were shipped to the Damage Control Training Center at NAVSTA TI in 1951 (**TI-HRA-44**), it is probable that these sources were utilized in the decontamination training. It is clear that some formal training was provided in April of 1952. Crewmen from the Military Sea Transportation Service (MSTS) ship General E T Collins, were sent to Treasure Island for Damage Control School including training on Nuclear Decontamination procedures. They were subsequently returned to their ship and participated in OPERATION IVY nuclear weapons testing at Eniwetok in 1952 (**TI-HRA-75**). During the 1950s, there were more than 60 nuclear tests just in the Marshall Islands. Personnel trained at the Naval Schools Command on Treasure Island participated in many of these tests. For example, planning for the OPERATION HARDTACK series of 33 nuclear tests in 1958 called for a monitors training program to be



conducted at the Naval Schools Command, Treasure Island. The 'standard' two week atomic defense course given by the Naval Schools Command was to be augmented by two weeks of additional training given by experienced radiation and contamination control personnel (TI-HRA-76).

In July of 1956, a training ship, the USS Pandemonium, was 'launched'. The USS Pandemonium was built from materials of salvage and scrap companies. It was a full-scale, above the water-line, mockup of a 173 foot patrol craft and was located on the northwest part of Treasure Island, Figure 6-5. A complete water washdown system was donated by the Damage Control Section of the Bureau of Ships. The USS Pandemonium was 'commissioned' in February 1957 and was described as "one of the most realistic training aids to be found in the Atomic, Biological, and Chemical Defense School". One design feature of the USS Pandemonium was the ability to simulate various radiation levels at various locations on the mockup. Wells containing sealed cesium-137 sources were installed at eleven locations on the ship. Using cables from a central position, an instructor was able to withdraw one or more sources from their shielded wells so the students using monitoring instruments could locate 'radioactivity' during a training exercise.

As noted earlier, the Atomic Energy Commission began issuing licenses for possession and use of radioactive materials in 1954. In 1958, the Restricted Weapons Defense Division of the U.S. Naval Schools Command applied for an AEC license to support training on the USS Pandemonium. A Byproduct Material License No. 4-4346-1 was issued by the Atomic Energy Commission to the Restricted Weapons Defense Division on January 30, 1959. The license authorized possession and use of 12 sealed cesium-137 sources for 'simulation of a fallout radiation field on a training ship for indoctrinating monitors and decontamination teams'.

Decon Exercise on Training Ship PANDEMONIUM  
Treasure Island, circa 1954

DECONTAMINATION

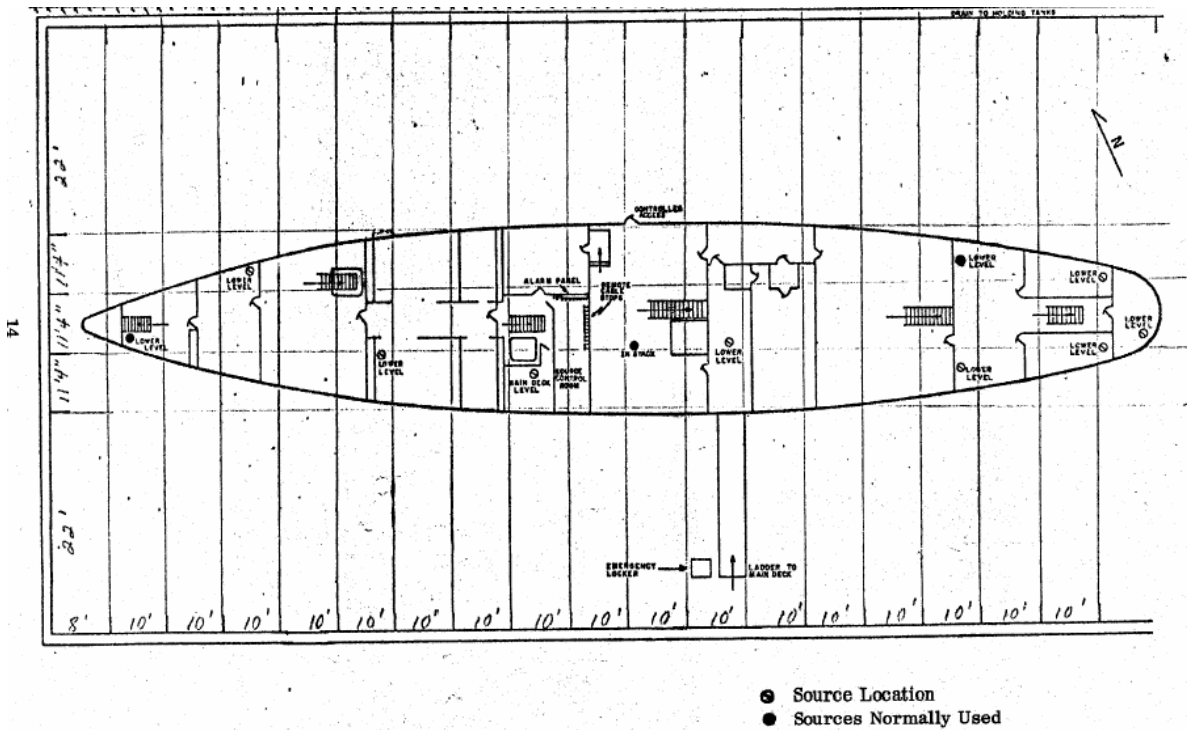


Decontamination is the process of removing radioactive contamination from an undesirable location to another location where the contamination is acceptable. DECONTAMINATION DOES NOT DESTROY THE RADIOACTIVITY. The radiological hazard is controlled by concentrating and confining the radioactive material as is done in industrial operations, or by diluting and dispersing the radioactive material as in field situations.

**Figure 6.5 Decontamination Training on USS Pandemonium.**

Note the date. The USS Pandemonium was not constructed until 1956, therefore the date is in error and is probably 1957 or 1958. Photograph courtesy of R. Sulit. (TI-HRA-77)

A plan view of the layout of the USS Pandemonium training ship showing the location of the installed cesium-137 sources is contained in Figure 6.6.



**Figure 6.6 Plan View of USS Pandemonium (TI-HRA-45)**

Training in contamination detection and subsequent decontamination became more sophisticated with the introduction of short-lived isotopes (a short-lived isotope is one with such a short half-life that it decays to a negligible quantity in a matter of hours or perhaps days). During the actual training of personnel for the OPERATION HARDTACK series of nuclear tests, short-lived isotopes were used to contaminate the exterior decks of the Pandemonium (TI-HRA-78). The advantages of using the short-lived isotopes are: the contamination could be spread over a surface rather than appear as a point source thus better simulating a real contamination situation, trainees could experience detecting the contamination with survey instruments, trainees could witness first-hand the affect that decontamination techniques had on the contaminated areas. Decontamination involved spraying and scrubbing the surfaces of the mockup with water and detergent to wash away the radioactive contamination. No documented information exists, however, the contaminated liquid thus created was probably allowed to soak into the ground where the short-lived isotopes decayed away. This conclusion is based on the reports of testing of a radiological spreader device discussed below. Trainees and instructors agreed the use of the short-lived isotopes was more realistic than when fixed sources were used. A recommendation was made to develop a device for spreading the short-lived isotopes. The Bureau of Naval



Personnel approved the recommendation and authorized the Naval Training Devices Command (NDTC) to develop a prototype for testing.

The prototype device for spreading radioactivity on the mockup was tested jointly by the US Naval Schools Command, Treasure Island and the NRDL. Six tests over a period from November 1962 through February 1963 were conducted under actual training conditions to determine if the device was useful and could be used safely. One of the tests involved contaminating a jet aircraft. The other tests were conducted on the USS Pandemonium. The tests of the Radiological Trainer Device concluded the device was a valuable tool and should be incorporated into the training program at TI as well as other locations with the proper facilities to control the use of radioactive sources (**TI-HRA-78**). The report of testing states “drainage from the area was from an old sewer system that is isolated from the sanitary sewers and leads directly to San Francisco Bay.” During the tests, all inlets to the drain were blocked off to prevent discharge into the bay. The effluent from the washdown operations was allowed to soak into the soil. The report goes on to recommend installation of holding tanks to collect the effluent until it decays. The Bureau of Personnel issued approval for incorporating use of the trainer into the course curriculum. A technical briefing and demonstration of the trainer was presented to interested representatives from all military services in September 1963 (**TI-HRA-79**). In December of 1963, the Naval Schools Command, Treasure Island submitted a formal request for an amendment to the AEC license covering the USS Pandemonium. The request notes that control of contaminated run-off is maintained by allowing the run-off to flow into two holding tanks each with a capacity of 6,000 gallons. The run-off, once it had decayed to a safe level of radiation is drained into the bay by means of a 6-inch pipe (**TI-HRA-80**). On November 19, 1964, the AEC issued an amendment to Byproduct Material License No. 04-04346-01, adding authorization for possession and use of short-lived isotopes bromine-82, bromine-80, potassium-42, and sodium-24 (**TI-HRA-43**). The principal isotope was bromine-82 with a half-life of 35.3 hours. The remaining three isotopes all have half-lives less than the bromine-82 and are incidental to the generation of that isotope by reactor irradiation. In 1966, an amendment was issued to the license which reduced the total quantity of cesium-137 allowed to eleven sealed sources of 0.65 curies each (**TI-HRA-43**).



The USS Pandemonium remained in use until July 1969. However, a new damage control school complex was being constructed on the Northeast end of Treasure Island. The new complex consisted of Building 461, Building 462, and the fenced-in area at the northeast end of the island containing the foundation for the USS Pandemonium and the below grade collection tanks. The USS Pandemonium was to be moved to the new complex, Figure 6-7. In anticipation of that move, a request was submitted to amend the Byproduct Material License to delete the possession and use of the short-lived isotopes. Amendment No. 9 to the license was approved on February 27, 1969. In May of 1969, a request was submitted to the AEC to again modify the license to accomplish the move of the USS Pandemonium. Amendment No. 10 to the license approved the modification request which included temporarily storing the cesium-137 sealed sources in Building 344 until the transfer of the training ship to the new damage control school complex was complete. The new complex consisting of Buildings 461, 462, and the exercise area (containing the USS Pandemonium and two below-grade concrete holding tanks) was accepted in March of 1970. Refurbishment of the USS Pandemonium, Figure 6-7 and reinstallation of the sources was completed in September of 1970. Amendment No. 11 to the license again authorized the possession and use of the same short-lived isotopes previously authorized by Amendment No. 5, as well as the fixed cesium-137 sources. The Naval Schools Command Instruction governing radioactive sources specified collecting the runoff water from the decontamination exercises in the holding tanks until the bromine-82 had decayed to below the allowable levels for discharge ( $< 3 \times 10^{-4}$  microcuries per milliliter) (**TI-HRA-81**). A 1973 drawing of the Sanitary Sewer System shows a single 6-inch pipe leading from the holding tanks to the bay (**TI-HRA-82**). In May of 1972, the Naval Schools Command submitted a request to the AEC to delete the authorization for use of the short-lived isotopes in the Radiological Trainer. The request was approved later the same month at which time the simulation of radiation fallout contamination reverted to use of the fixed cesium-137 sources installed in the USS Pandemonium. License No. 04-04346-01 remained in effect and unchanged except for identification of responsible personnel, until February 1982. At that time, by Amendment No. 21, License No. 04-04346-01 was terminated. This did not mean that use of the USS Pandemonium was ended. A concurrent amendment (No. 29) on the same February date was approved for License No. 04-04346-02 adding the authorization for possession and use of cesium-137 sources for simulation of fallout training. Thus, the authorization for possession and use of cesium sources for the USS



Pandemonium remained continuously in effect. License No 04-04346-02 was renewed for the last time by Amendment No. 32 on January 8, 1986. The main change affected by Amendment No. 32 was deletion of authorization for the Cs-137 sources used in the USS Pandemonium. The following year, the Byproduct Material License was superseded by Navy Radioactive Material Permit 04-62639-C1NP. At that time, the Radiological Affairs Support Office took over the detailed management of the radioactive material licensing for the Navy. The initial issue of the NRMP authorized a Cs-137 source of approximately 63 curies, a Cs-137 source of approximately 20 curies, and an americium-241/beryllium-7 neutron source. These same sources were authorized in each amendment of the NRMP until the permit termination on February 24, 1994. The radioactive sources were transferred to the Service School Command in Orlando, Florida (**TI-HRA-83**). Throughout the history of the USS Pandemonium, no mention was ever made to indicate a problem with the use or control of the Cs-137 sources. Some of the survey instruments utilized during decontamination training contained installed instrument check sources. All sources were required to be leak checked every six months. In 1980, the Radiological Affairs Support Office of the Naval Nuclear Power Unit analyzed leak tests performed by NTTC on eleven Cs-137 sources used on the USS Pandemonium. The leak test results were all at or below the minimum detectable activity of  $8.19 \times 10^{-6}$  microcuries. Also tested at the same time were three other devices containing Cs-137 sources, a TS-1216 calibrator, a TS-1189 calibrator, and a UDM-1 calibrator. These three sources were also well below the NRC limit for indication of a leaking source (**TI-HRA-84**). In addition to the specific leak tests just discussed, there were no reports of leaking check sources submitted. Thus there is no evidence to indicate a loss of control of radioactivity at either of the USS Pandemonium sites or at the buildings (461 and 462) associated with the final USS Pandemonium site. The short-lived isotopes used with the radioactive spreader device had a half-life of less than 36 hours, were last used in 1972 and are no longer present.



**Figure 6.7** USS Pandemonium after move to Northeast corner of Treasure Island Approximately 1970. (TI-HRA-85)

#### **6.4 BERTHING OF OPERATION CROSSROADS SHIPS**

At least four OPERATIONS CROSSROADS ships were berthed at NAVSTA TI after being decontaminated at HPS and before they were given final clearance. Three of the ships were berthed at NAVSTA TI before being given operational clearance, but after having been monitored. A Navy Port Director report listed three OPERATION CROSSROADS ships present at NAVSTA TI on December 2, 1946. The USS CEBU, ARG-6, an internal combustion engine repair ship, was berthed at Pier 21 on TI. The LST-388, a tank landing ship, was berthed at Pier 13 on TI. The LST-861, a tank landing ship, was berthed at the short dock on YBI (TI-HRA-86). The USS ACHOMAWI, ATF-148, a fleet ocean tug, departed HPS for TI on December 9, 1946, the actual berthing location is not listed (TI-HRA-87). Final radiological clearance was granted





to each of the four ships by December 21, 1946 (**TI-HRA-88**). The three identified piers used for OPERATIONS CROSSROADS ships have all been demolished. All four ships were monitored before arriving at NAVSTA TI, and all four ships subsequently received final clearances. There is no likelihood of contamination due to the berthing of OPERATION CROSSROADS ships. As noted in Section 6.0, there is no documentation that any OPERATIONS CROSSROADS ships were decontaminated while berthed at NAVSTA TI.

## **6.5 OTHER BUILDINGS AND LOCATIONS**

One additional building and two sites on NAVSTA TI had a potential for exposure to radioactive materials. There is no documentation to indicate that a spill occurred or a spread of contamination or a loss of control of radioactive material took place. The building and sites are listed here for completeness.

Building 3 provided administrative office space for the Damage Control School Hull Technician “A” School in the 1980s. RADIACS with check sources were maintained in that area (**TI-HRA-89**). There were no reports of leaking check sources.

What is now known as IR Site 12 on the northern end of NAVSTA TI was once a disposal area for trash and debris. The US EPA aerial photographic analysis of historical photographs of the area conclude that trash and debris were disposed of at that site between 1946 and 1963, most notably in the four solid waste disposal areas (**TI-HRA 54**). However, although general waste disposal sites on military facilities have been frequently been used for disposal of unlicensed radioactive materials such as radioluminescent devices, this practice was more common at naval facilities where ships and planes were maintained and repaired. This was particularly true at repair facilities that had radium dial painting operations. NAVSTA TI’s mission has always been training, not repair, which greatly reduces the possibility of finding radioluminescent devices in NAVSTA TI disposal areas. In a letter to the Navy, the California Integrated Waste Management Board recommended conducting surveys of the site (**TI-HRA-90**). Gamma monitoring outside of the known solid waste disposal areas was conducted during 2003 as part of the Site 12 Housing Area Sitewide Investigation (**TI-HRA-91**). Approximately 580 test pits were excavated to a depth of 4 feet. Radiation monitoring of the removed soil and the test pits detected only natural radioactivity. Evaluation of analyses will be documented in a separate

report. This recent sampling and analysis plan for chemicals possibly disposed of over the years in IR Site 12 shows the boundaries of IR Site 12 as well as the locations within IR Site 12 known to be areas of solid waste disposal (TI-HRA-91). See Figure 6.8.



**Figure 6.8 Installation Restoration Site 12 (TI-HRA-91)**

The sanitary drain system connected to Building 233 may have been exposed to radioactive materials during the initial survey and cleanup associated with the radium spill. The students participating in the exercise were initially taken upstairs for survey and decontamination of hands and shoes. The building was a classroom and laboratory facility and was likely not set up to collect contaminated liquids generated from washing and scrubbing of hands and shoes.



## **6.6 HISTORICAL INVESTIGATIONS AND SURVEYS**

Some radiological investigations and surveys have been conducted on NAVSTA TI and some are in progress.

### **6.6.1 Building 233 Radium Spill**

The first known radiological investigation of a spill of radioactive material on NAVSTA TI took place in January 1950 following the spill of approximately 40 milligrams of radium in Building 233. The investigation of the magnitude and extent of this spill involved monitoring of alpha airborne activity and radon activity inside Building 233. In addition, alpha wipe surveys and beta-gamma direct radiation survey measurements were performed. Since many of the occupants of Building 233 left the building before the extent of the spill was fully identified, radioactive contamination was carried by personnel (on shoes, clothing etc) to personal automobiles and personal residences. Direct measurements and wipe surveys of alpha radioactivity revealed various levels of contamination in automobiles, on furniture, and on clothing (**TI-HRA-65**).

Numerous innovative decontamination techniques were utilized to control and contain and eventually remove the radium contamination. Some of the techniques were as simple as using damp wipes and hot tri-sodium phosphate cleaning solutions. Other methods included use of high efficiency filtered vacuum cleaners, paint removal, wire brushing, flame decontamination (burning off the surface layer of concrete and wood), and material disposal. Some items such as small portable furniture, rubber floor mats, linoleum flooring, etc. were simply packaged as radioactive waste and disposed (**TI-HRA-66**). More than 200 barrels of radioactive waste were generated and were stored aboard the USS Independence at Hunters Point Shipyard. The drums were weighted with concrete and were sunk at sea at a depth of more than 100 fathoms (**TI-HRA-105**).

### **6.6.2 Building 344 Investigation**

In March of 1988, a scheduled routine beta-gamma wipe survey of the waste containers inside the storage vault revealed low levels of loose contamination on the inside of the waste containers. Only wipe surveys were feasible in this location because the numerous sources maintained in the vault made direct radiation surveys not possible. After the wipes were removed



from the vault and counted, revealing the low levels of contamination, an investigation quickly identified the source to be the mini-generator kit located on a shelf near the waste containers. Surveys of the shelf containing the mini-generator kit, all other shelves in the vault and of the floor of the vault were all negative. No spread of radioactivity was found outside of the mini-generator kit and the waste containers.

Cleanup of the low levels of contamination simply involved packaging and off-site disposal of the mini-generator kit and the waste containers. Arrangements for off-site disposal were made by NSC Oakland (**TI-HRA-70**).

### **6.6.3 Closeout Survey of Building 344**

The closeout survey of Building 344 was conducted in 1991. Alpha, beta, and gamma wipes were collected and analyzed by NTTC. Following review of the initial survey data, the NTTC submitted a summary of the Building 344 survey data to RASO along with a request for amendment of the NRMP to remove Building 344 from the authorized storage locations (**TI-HRA-73**). Further review by RASO resulted in an additional report from the NTTC to RASO to clarify calculation of minimum detectable activity (MDA) for alpha activity (**TI-HRA-74**). The Radiological Affairs Support Office reviewed the Building 344 survey data and recommended approval of termination of the NRMP by letter in 1994 (**TI-HRA-92**). The actual change to the NRMP, Amendment No. 3, was issued in November 1990 (**TI-HRA-71**). This amendment removed Building 344 from the NRMP leaving only building 343 as an authorized location for possession of radioactive materials.

### **6.6.4 Closeout Survey of Building 343**

Closeout surveys of Building 343, the last authorized location for possession of licensed radioactive material, were conducted in June 1993. The Naval Technical Training Center submitted a request to the Radiological Affairs Support Office for termination of the NRMP No. 04-62639-C1NP (**TI-HRA-83**). The request, an 86 page document, contained documentation of the disposal of all sources, wipe surveys of all sources and source containers, and wipe surveys of the rooms in building 343. This document included the leak tests of the sealed and plated calibration sources and AN/UDM-7 alpha calibrators that were stored in Building 343. All leak tests were less than the MDA of the counting system used by NTTC. RASO analyses of 172



wipes taken in a portion of Building 343 was reported in July 1993 (**TI-HRA-94**). RASO reported all beta wipes were equal to or less than the lower limit of detection (LLD) for beta of 88 disintegrations per minute (dpm), and all, but six, alpha wipes were equal to or less than the LLD for alpha of 2.5 dpm. Two of the six alpha wipes above the LLD were also above release limits. They were located on a counter top in the storeroom. Of the remaining four wipes above the LLD (but well below release limits), two were in shelves in the storeroom, one was on the floor in the restroom, and one was in a drawer in the Chemical, Biological, Radiological Defense Laboratory. Follow-up wipes were taken by the Naval Technical Training Center to resolve the six alpha wipes (**TI-HRA-95**). The Naval Technical Training Center reported that the areas were decontaminated using commercial decontamination spray foam. RASO analyses of the six areas resurveyed by NTTC determined that all six were less than the LLD for both alpha and beta (**TI-HRA-96**). There were no direct surveys taken and the wipes were not analyzed for gamma isotopes. An additional 95 wipes were forwarded to RASO for alpha, beta, and gamma analyses of the remainder of Building 343 in July 1993 (**TI-HRA-97**). RASO reported all beta wipes were equal to or less than the LLD for beta of 92 dpm, and all, but two, of the alpha wipes were less than or equal to the LLD for alpha of 2.1 dpm. The two alpha wipes above the LLD were well below the release limits. All wipes were counted as a group for gamma in a High Purity Ge (Germanium) detector for 50,000 seconds. No gamma other than natural background was detected (**TI-HRA-98**).

Amendment No. 6 terminated the Navy Radioactive Material Permit (**TI-HRA-93**). Documentation had been provided that stated all surveys were complete and all radioactive material properly disposed.

#### **6.6.5 Investigation of Installation Restoration Site 12 Solid Waste Disposal Areas**

Gamma monitoring outside of known solid waste disposal areas was conducted in 2003. Approximately 580 test pits were excavated to a depth of 4 feet. Radiation monitoring of the removed soil and the test pits detected only natural radioactivity. Evaluation of the analyses will be documented in a separate report.



## **7.0 ASSESSMENT OF IMPACTED SITES**

This section describes the methods and definitions used in Section 8.0 to categorize and assess the likelihood of residual contamination at impacted sites, the contaminated media involved, the potential for migration of contamination, and the recommended actions for each impacted site. Evaluations and definitions are based on guidance provided in MARSSIM.

Impacted sites were assessed based on the site's operational history and whether G-RAM was used, stored, or potentially disposed of at the site. Previous site surveys, studies, and investigations, when available, were also used to confirm or expand on the historical information.

The historical radiological surveys and investigations at NAVSTA TI were conducted prior to the publication of MARSSIM in December 1996; therefore, the terminology used in this section will not necessarily apply to historical (pre-MARSSIM) documents. However, the radiological investigations that are currently being conducted on NAVSTA TI are being conducted following MARSSIM guidelines.

### **7.1 IMPACTED SITES**

An impacted site is one that has a potential for radioactive contamination based on historical information or is known to contain radioactive contamination. Areas immediately adjacent to the primary impacted site may be included in this designation. Impacted sites include:

- Sites where radioactive materials were used or stored.
- Sites where known spills, discharges, or other unusual occurrences involving radioactive materials have occurred, or may have occurred, that could have resulted in the release or spread of contamination.
- Sites where radioactive materials might have been disposed of or buried.

### **7.2 NON-IMPACTED SITES**

A non-impacted site is one with no reasonable possibility for residual radioactive contamination. Examples of areas that would be non-impacted, rather than impacted, include buildings or sites



where only sealed sources were used and there were no reports of source leakage, where only survey instruments containing check sources were used or stored, or where only short-lived radionuclides were used. Non-impacted areas do not receive any level of survey coverage.

### **7.3 IMPACTED SITE ASSESSMENTS**

Assessments for each impacted site are provided in Section 8.0. These are based on the historical information and site surveys conducted prior to June 30, 2003. The assessments cover both media and migration pathways. These assessments may change in the future as the result of the implementation of recommended actions or location of additional historical information. The system used to assess the potential radiological contamination at an impacted site is detailed below.

#### **7.3.1 Contamination Potential**

The potential for residual radioactive contamination at each impacted site has been determined through a professional evaluation of historical information, previous survey results, and site reconnaissance. As recommended actions are completed in the future, these assessments will change. Contamination potentials are categorized as:

- **Known-Restricted Access** - Radioactive contamination is known to exist at levels that could require protective clothing, respiratory protection, radiation monitoring, and site access controls.
- **Known-Continued Access** - Low levels of contamination exist, but the contamination is contained in a system, fixed on building surfaces, or is in generally inaccessible areas.
- **Likely** - Residual radioactive contamination is expected but has not been confirmed.
- **Unlikely** - Residual radioactive contamination is not expected but investigation is warranted.
- **Unknown** - Residual radioactive contamination potentially exists but no clear indication of possible contamination levels or contaminants has been established.
- **None** - Radioactive contamination has been fully assessed and removed, if necessary, and the site has been free-released by the Navy and regulators. The site remains classified as impacted but no further action is required.

### 7.3.2 Contaminated Media

Section 8.0 also categorizes and assesses different types of media at each impacted site that contain, or are suspected of containing, radioactive contamination. Previous survey data, historical information, and professional judgment were used to confirm the presence of contamination or determine contamination potential. Generic terms, as defined in MARSSIM, are used to categorize the types of material that would contain the contamination. For example, if a building contains radioactive contamination in concrete floor materials, the medium would be defined as “structures.” To ensure that all potential media contamination has been evaluated, Section 8.0 includes an assessment for all media categories for each impacted site. The definitions for the types of media that could be contaminated are provided below.

- **Surface Soil** - The top layer of soil (to 6 inches bgs), fill, gravel, waste piles, concrete, or asphalt that is available for direct exposure, growing plants, resuspension of particles for inhalation, and mixing from human disturbances. This definition includes surface sediment in underwater areas.
- **Subsurface Soil** - Solid materials and media found below the surface soils.
- **Sediment** - Material that settles to the bottom of a liquid or is deposited by water.
- **Surface Water** - Waters found in streams, rivers, lakes, and oceans as well as coastal tidal waters.
- **Groundwater** - Waters contained in subsurface materials and aquifers.
- **Air** Atmosphere that becomes a migration pathway for resuspension and dispersal of radioactive contamination and contaminated media.
- **Structures** - A man-made surface(s) above the surface or contained within subsurface media.
- **Drainage Systems** - Sanitary drains, facility storm drains, or septic systems and leach fields and sediments contained therein. This category can include Bay sediments where drainage to the Bay occurs.

### 7.3.3 Contaminated Media Assessment

Section 8.0 provides an assessment of each contaminated media category at each impacted site. These ratings are determined during the evaluation of each media type. The ratings may change if additional historical information becomes available or further information is developed during the performance of surveys at the site. Ratings are defined below.





- **High** - Evidence of contamination in the media or migration pathway has been identified.
- **Moderate** - The potential for contamination in the media or migration pathway exists, although the extent has not been fully assessed.
- **Low** - The potential for contamination in the type of media or migration pathway is remote.
- **None** - Evidence of contamination in the specific media or migration pathway has not been found, or known contamination has been removed, and surveys indicate that the media or migration pathway meet today's release criteria.

### 7.3.4 Potential Migration Pathways

Migration pathways are the media or transport mechanisms that allow contamination to spread in the immediate vicinity of the contaminated media or off site. The assessment of each impacted site in Section 8.0 provides an evaluation of the potential migration of radioactive contamination. The type of potential or confirmed contaminated media and the radionuclides of concern were used to assess the potential migration pathways.

## 7.4 RECOMMENDED ACTIONS

A recommended action for each impacted site is also provided in Section 8.0. The recommendation is the result of the investigations conducted to determine radionuclides of concern, contamination potential, contaminated media, and potential migration pathways for exposure. The categories of recommended actions are defined below.

- **Emergency Action** - Immediate remediation or containment is required because the levels of radioactive contamination or radiation exposure are such that there is a high potential for significant exposure or release of radioactive materials to the public or the environment.
- **Scoping Survey** - Historical documentation indicates that radioactive materials may be present at an impacted site that has not had an initial evaluation previously performed, and a survey is required to determine if contamination exists. The intent of these surveys is to identify radionuclide contaminants, relative radionuclide ratios, and general levels and extent of contamination. These surveys usually include minimal surface scans, sampling, and dose rate assessments.



- **Characterization Survey** - Radioactive contamination has been confirmed within an impacted site by a scoping survey, and action must be taken to determine the extent of the contamination and to identify and define the extent of the radionuclides of concern. These surveys include facility or site in-depth surveys, sampling, monitoring, and analysis to provide the basis for acquiring necessary technical information to develop, analyze, and select appropriate cleanup techniques.
- **Remediation** - Radioactive contamination has been fully characterized within an impacted site, and remedial or removal action is necessary to comply with site-specific release criteria. Remedial action support surveys are performed while remediation is being conducted to guide the cleanup activities.
- **Final Status Survey** - Historical documentation and previous investigations or remediations indicate that radioactive contamination has been removed from an impacted site, and a survey needs to be conducted in accordance with MARRSIM guidelines to verify that an impacted site complies with applicable site release criteria. This survey includes the appropriate measurements and sampling that will define the radiological condition of a site in preparation for release. The surveys follow completion of decontamination or remediation activities, if any were performed, but can also be conducted to confirm that past radiological activities at an impacted site did not result in residual contamination.
- **Free Release** - Historical documentation and previous investigations and surveys indicate that all applicable release criteria have been met, and the site documentation is ready for review by the Navy and applicable regulators for future non-radiological usage. This may include confirmatory surveys by Navy or regulatory personnel to verify the results reported in the release documentation.
- **No Further Action** - An impacted site has been shown by the Navy and applicable regulatory agencies to meet release criteria.

## 7.5 IMPACTED SITE EXAMPLE

A building, formerly used as a research laboratory, is identified as impacted. Ra-226 contamination levels, slightly above the background level have been measured on interior building surfaces during a scoping survey.

*Contamination Potential—Known-Continued Access.* The contamination has been confirmed, but there are no indications of hazardous levels.

### Potentially Contaminated Media

*Surface Soil-Low* - There is a slight likelihood that contamination from the building could be in the surface soils immediately surrounding the building.



***Subsurface Soil-Low*** - There is a very slight likelihood that contamination from the surface soils could be in subsurface soils. Depending on the information available at the time of rating and professional evaluation of the information, this potential could be identified as “None.”

***Sediment-None*** - There is not sediment associated with the building.

***Surface Water-None*** - There is no surface water near the laboratory.

***Groundwater-None*** - As the contamination is in the interior of the building, there is no potential for groundwater contamination.

***Air- None*** - Contamination found in the building surfaces is insufficient to cause concern for airborne contamination. This rating is based on the type and level of radioactivity identified and if it were fixed or loose surface contamination.

***Structures-High*** - Contamination has been identified in the building.

***Drainage System-High*** - With surface contamination on the building interior surfaces, there is a significant potential that the drainage systems (primarily sanitary) would be contaminated, as most laboratory rooms contain sink drains.

### **Migration Pathways for Exposure to the Public or Environment**

***Surface Soil-Low*** - The potential contamination in the surface soils would present a low probability for exposure to the public or off-site environment, as there is no probable transport mechanism to cause detectable levels of contamination to spread to off-site locations.

***Subsurface Soil-None*** - There is limited means of initially contaminating subsurface soils; therefore, an exposure to the public or off-site environment is not likely.

***Surface Water-None*** - The information on potentially contaminated media already established that there were no surface waters in the vicinity of the building. Contamination in the interior of a building would require transport of the contamination



to surface waters by a secondary method such as runoff to a storm drain system, which is not likely to occur.

***Air- None*** - Low levels of interior building surface contamination would require transport of a significant portion of the contamination outside the confines of the building, and then a secondary mechanism to carry the contamination off site.

***Structures-Low to Moderate*** - Migration of the contamination in the building is likely. However, the potential for contamination to migrate to the public would be dependent on the access and security controls for the building.

***Drainage Systems-Low*** - With contamination on interior building surfaces, the building drainage sanitary system may be contaminated. Low levels in drainage systems would be diluted by flow of non-contaminated liquids from other sources. The exposure potential from this contamination is minimal.

***Recommended Actions*** - Characterization Survey.



## **8.0 FINDINGS AND RECOMMENDATIONS**

This HRA assessed 542 historical and current sites on NAVSTA TI (buildings, structures, and open areas). Eighteen sites were identified as requiring further review and are assessed in this section. Five sites are designated as impacted by historic radiological operations. Thirteen buildings, structures, and open areas at NAVSTA TI are designated as non-impacted.

### **8.1 IMPACTED VERSUS NON-IMPACTED SITES**

The scope of radiological operations at NAVSTA TI has been assessed to determine whether these operations had a direct or indirect effect on buildings, structures, or open areas. These evaluations were based on guidance provided in MARSSIM to define all sites as either “impacted” or “non-impacted” by radiological operations. Impacted sites are those where radiological operations occurred, including the use, handling, packaging, or disposal of radioactive materials where the potential for residual radioactive contamination above background exists.

A summary of the former and current uses of impacted sites is provided in Table 8-1.

Non-impacted sites are those where radiological operations occurred and there is no reasonable possibility for residual radioactive contamination.

A summary of the former and current uses of the non-impacted sites is provided in table 8-2.

### **8.2 SITE ASSESSMENTS**

This section provides complete descriptions for each potentially impacted site, including the former and current uses, radionuclides of concern, and previous radiological investigations of the site and designates the site as impacted or non-impacted. This section also categorizes and defines the likelihood of residual contamination at impacted sites, the contaminated media involved, the potential for migration of G-RAM, and the recommended actions for each impacted site using the categories described in Section 7.0. Five sites are classified as impacted.

Thirteen sites are classified as non-impacted based upon the information developed during the investigation.

### **8.3 SUMMARY OF INDIVIDUAL SITE ASSESSMENTS AND RECOMMENDATIONS**

Details of each of the impacted sites are provided in Sections 8.3.1.1 through 8.3.1.5 and in Table 8-1.

Details of the non-impacted sites are provided in Sections 8.3.2.1 through 8.3.2.13 and in Table 8-2.

#### **8.3.1 IMPACTED SITES**

Each of the impacted sites is discussed in the following paragraphs.

##### **8.3.1.1 Building 233**



**Figure 8.3-1 Building 233**



**Site Description** - Building 233 is a two-story raised wood structure built on pillars in 1944. It was used as the Radiation Safety School beginning in 1947. The 18,790 ft<sup>2</sup> building has classrooms, offices, and laboratories. The radium spill in this building took place in the first floor laboratory in January 1950. Radium contamination from a capsule containing radium sulfate was spread throughout the majority of the building before the spill was discovered. The building was secured and the scheduled classes were suspended and reassigned. Students directly involved in the spill were sent to a second floor classroom for monitoring and to the washroom for decontamination of hands and shoes. Decontamination of hands and shoes was performed using water, an abrasive detergent, and scrubbers. The liquid generated by the decontamination was probably washed down the drain. Decontamination of the building required removal of floor coverings and portable furniture and destructive procedures to completely decontaminate wooden and cement floors. Monitoring inside the building revealed high levels of airborne radon and airborne alpha contamination for weeks after the spill. Only five of the rooms in the building were not contaminated. These rooms had been closed at the time of the spill. It was nine months after the spill before decontamination of the building was completed and it was released for use again.

**Former Uses - Radiation Safety School.** Classrooms and Administration, RADIAC

Calibration training, ATF Laboratory, California National Guard.

**Current Uses** - None, unoccupied.

**Radionuclides of Concern** - Ra-226

**Previous Radiological Investigations** - Extensive surveys of entire building following radium spill. Final Navy clearance granted in September 1950

**Contamination Potential** - Likely

**Contaminated Media**

Surface Soil - Low

Subsurface Soil - None

Sediment - None

Surface Water - None

Groundwater - None

Air - None

Structures - Low

Drainage Systems - Low

**Potential Migration Pathways**

Surface Soil - Low

Subsurface Soil - None

Sediment - None

Surface Water - None

Groundwater - None

Air - None

Structures - None

Drainage Systems - Low

**Recommended Actions** - Characterization surveys of both floors and the crawl space under the building. Scoping surveys of the sanitary drains. See also Section 8.3.1.5



**Figure 8.3-2 Building 233 Location**



### 8.3.1.2 Building 343



**Figure 8.3-3 Building 343**

**Site Description** - Metal one story building built on a concrete foundation. The building was completed in 1951 and covers approximately 8000 ft<sup>2</sup> similar to Building 342. During peak use of this building, it contained a radiological detection instrument issue and storage room, instrument repair shop, three classrooms, staff offices and lounges, washrooms, and the UDM-1A (gamma calibrator using a large Cs-137 source) laboratory.

**Former Uses** - Naval Technical Training Center RADIAC instruction. Calibration range, instrument issue facility, instrument repair shop.

**Current Uses** - None, unoccupied.

**Potential Radionuclides of Concern** - Ra-226.

**Previous Radiological Investigations** - In 1993, Navy closeout surveys of building were performed in advance of terminating NRMP. The NTTC submitted a request to the Radiological Affairs Support Office for termination of the NRMP No. 04-62639-C1NP (**TI-HRA-83**). The request, an 86 page document, documented the disposal of all sources, wipe surveys of all



sources and source containers, and wipe surveys of the rooms in building 343. RASO analysis of 172 wipes taken in a portion of Building 343 was reported in July 1993 (TI-HRA-94). RASO reported all beta wipes were equal to or less than the lower limit of detection (LLD) for beta of 88 disintegrations per minute (dpm), and that all, but six, alpha wipes were equal to or less than the LLD for alpha of 2.5 dpm. Of the six alpha wipes greater than the LLD, two in a storeroom on a counter were above release limits. Follow-up wipes were taken by the NTTC to resolve the six alpha wipes (TI-HRA-95). The NTTC reported that the areas were decontaminated using commercial decontamination spray foam. Although the two above release limits locations were decontaminated, direct surveys of the areas were not performed and gamma analysis of the above limits wipes was not performed. An additional 95 wipes for the remainder of the building were forwarded to RASO for alpha, beta, and gamma analyses in July 1993 (TI-HRA-97). The documentation demonstrated that all surveys had been satisfactorily completed and proper disposal of all sources.

**Contamination Potential** - Unlikely.

#### **Contaminated Media**

Surface Soil - None

Subsurface Soil - None

Sediment - None

Surface Water - None

Groundwater - None

Air - None

Structures - Low

Drainage Systems - None

#### **Potential Migration Pathways**

Surface Soil - None

Subsurface Soil - None

Sediment - None

Surface Water - None

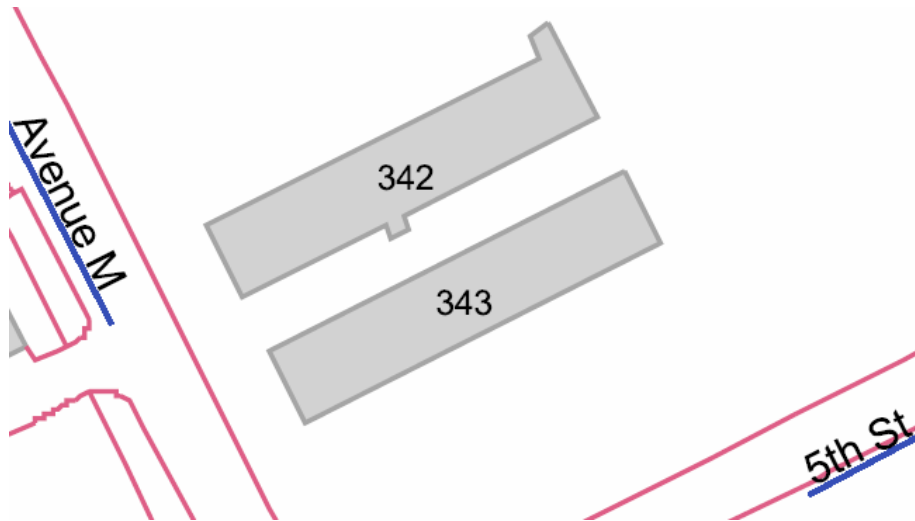
Groundwater - None

Air - None

Structures - None

Drainage Systems - None

**Recommended Actions** - Final Status Survey in the storeroom. Navy's 1993 leak tests demonstrated the building is free of radioactivity except for the instrument storeroom.



**Figure 8.3-4 Building 343 Location**

### 8.3.1.3 Building 344



**Figure 8.3-5 Building 344**

**Site Description** - Building 344 is a small 244 ft<sup>2</sup> concrete building approximately 15 feet by 17 feet. This concrete vault was built in 1951 in conjunction with Buildings 342 and 343. The walls and ceiling are 14-inch thick reinforced concrete to provide radiation shielding for the sources stored within. The floor is set approximately five feet below grade. There is a one-half inch thick steel door. Access to the door is from inside the fenced compound containing the three buildings.



**Former Uses** - Storage location for all portable sources maintained by RADIAC facility when the sources were not in use.

**Current Uses** - None, unoccupied.

**Potential Radionuclides of Concern** - Cs-137.

**Previous Radiological Investigations** - During a routine wipe survey of the Building 344 vault in March 1988, the insides of two waste containers were found to be contaminated. An investigation revealed the source of the contamination was a cesium/barium mini-generator kit. Small vials labeled as “Cesium 137/Barium 137,” and “Tin 113/Indium 113” were found inside the kit. Contamination levels inside the kit were higher than in the waste containers leading to the conclusion the source of the contamination in the waste containers was liquid from the mini-generator kit. Surveys of the area where the kit was located and of the floor and shelves in the vault revealed no other contamination. Cleanup was accomplished by off-site disposal of the waste containers and the mini-generator kit as radioactive waste (**TI-HRA-70**). In 1990, NTTC submitted a request to remove Building 344 from the NRMP. The request was approved and the NRMP was amended (**TI-HRA-71**). In August of 1991 NTTC reported that although the NRMP had been amended to remove Building 344, documentation of close-out surveys of Building 344 had not been performed and in fact contaminated material was stored in Building 344 until July of 1991 (**TI-HRA-72**). Closeout surveys of Building 344 were performed later in 1991 and were reported to RASO in June of 1992 along with a new request to amend the NRMP (**TI-HRA-73**). The Radiological Affairs Support Office reviewed the Building 344 survey data and recommended approval of a termination amendment by letter in 1994 (**TI-HRA-92**).

**Contamination Potential** - Unlikely.

**Contaminated Media**

Surface Soil - None

Subsurface Soil - None

Sediment -None

Surface Water - None

Groundwater - None

Air - None

Structures - Low

Drainage Systems - None

**Potential Migration Pathways**

Surface Soil - None

Subsurface Soil - None

Sediment - None

Surface Water - None

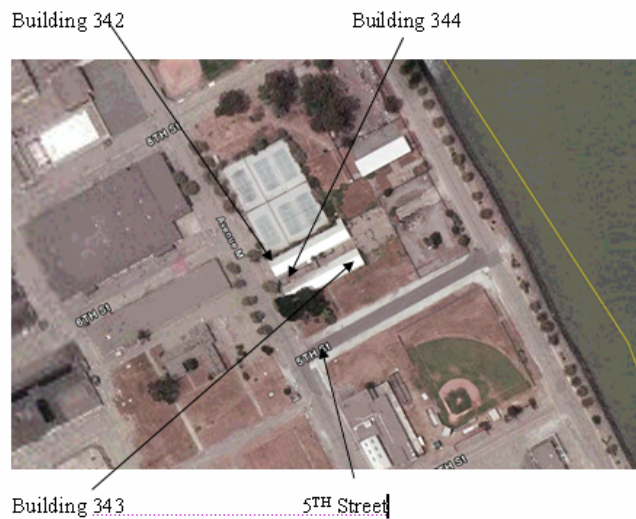
Groundwater - None

Air - None

Structures - Low

Drainage Systems - None

**Recommended Actions** - Final status survey. The Navy closeout surveys by swipe surveys demonstrated the building was free of residual radioactivity. However, contamination had been discovered in the waste containers in the building. A final status survey is warranted to permit release of the building.



**Figure 8.3-6 Building 344 Location**

### 8.3.1.4 INSTALLATION RESTORATION SITE 12



**Figure 8.3-7 Installation Restoration Site 12 (TI-HRA-91)**

**Site Description** - What is now known as Installation Restoration 12 on the northern end of NAVSTA TI was once a disposal area for trash and debris. Four discrete solid waste disposal areas have been identified. Parts of Site 12 were used for storage of ammunition in bunkers and also for the disposal and incineration of refuse. Later, portions of the site were used for material storage. Beginning in the 1960s, the area was developed for military housing. It is believed that over the course of development of the northern portion of the island for residential use, some of the debris and ash has been incorporated into fill material or otherwise scattered as a result of site grading operations (TI-HRA-91). General waste disposal took place around and in-between bunkers. Waste disposal operations continued until approximately 1963.

**Former Uses** - Ammunition bunkers surrounded by cell-type disposal units and general debris areas. Burn pit and incinerator were also used in the area.



**Current Uses** - Multi-family housing area.

**Potential Radionuclides of Concern** - Ra-226

**Previous Radiological Investigations** - None for the known solid waste disposal areas.

**Contamination Potential** - Unlikely.

**Contaminated Media**

Surface Soil - None

Subsurface Soil - None

Sediment - None

Surface Water - None

Groundwater - None

Air - None

Structures - None

Drainage Systems - None

**Potential Migration Pathways**

Surface Soil - None

Subsurface Soil - None

Sediment - None

Surface Water - None

Groundwater - None

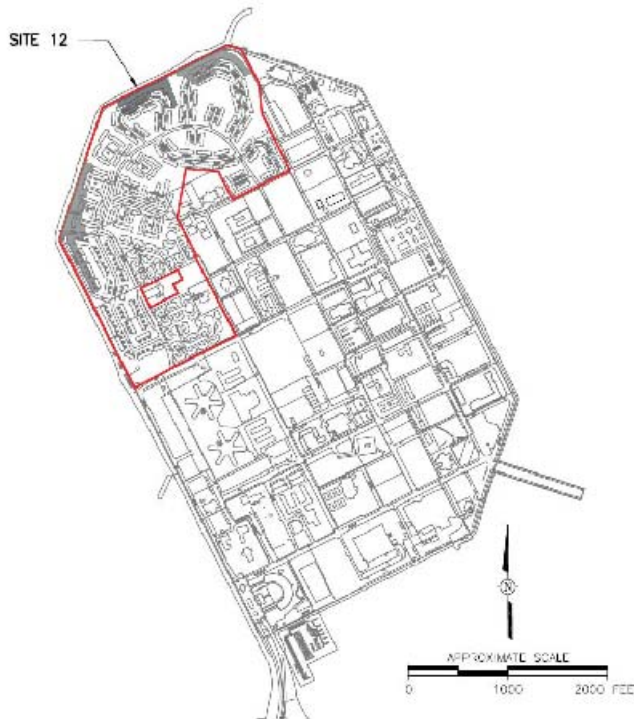
Air - None

Structures - None

Drainage Systems - None

**Recommended Actions** - Perform radiation monitoring during soil excavation of the known solid waste disposal areas.





**Figure 8.3-8 Installation Restoration Site 12 Location**

### **8.3.1.5 Building 233 Sewer Drain**

**Site Description** - Sanitary drains from sinks and washbasins and laboratories may have carried radioactive contamination. Building 233 is a building where contamination is known to have been present. The initial personnel decontamination efforts in Building 233 following the spill in January 1950 were performed using abrasive soap, water, and scrubbers. The liquid generated from that decontamination was probably washed down the drain. Since radium is a heavy element, it can accumulate in low points and low flow areas. (Drawings of Building 233 downstream sanitary drains not included.)

**Former Uses** - Sanitary sewer lines .

**Current Uses** - Sanitary sewer lines.



**Potential Radionuclides of Concern** - Ra-226

**Previous Radiological Investigations** - None identified.

**Contamination Potential** - Unlikely.

**Contaminated Media**

Surface Soil - None

Subsurface Soil - None

Sediment - None

Surface Water - None

Groundwater - None

Air - None

Structures - None

Drainage Systems - None

Sanitary Sewer Lines - Low

**Potential Migration Pathways**

Surface Soil - None

Subsurface Soil - None

Sediment - None

Surface Water - None

Groundwater - None

Air - None

Structures - None

Drainage Systems - None

Sanitary Sewer Lines - Low

**Recommended Actions** - Scoping Survey from upstairs drain points internal to Building 233.  
Sample first sanitary sewer manhole downstream from Building 233.

## 8.3.2 NON-IMPACTED SITES

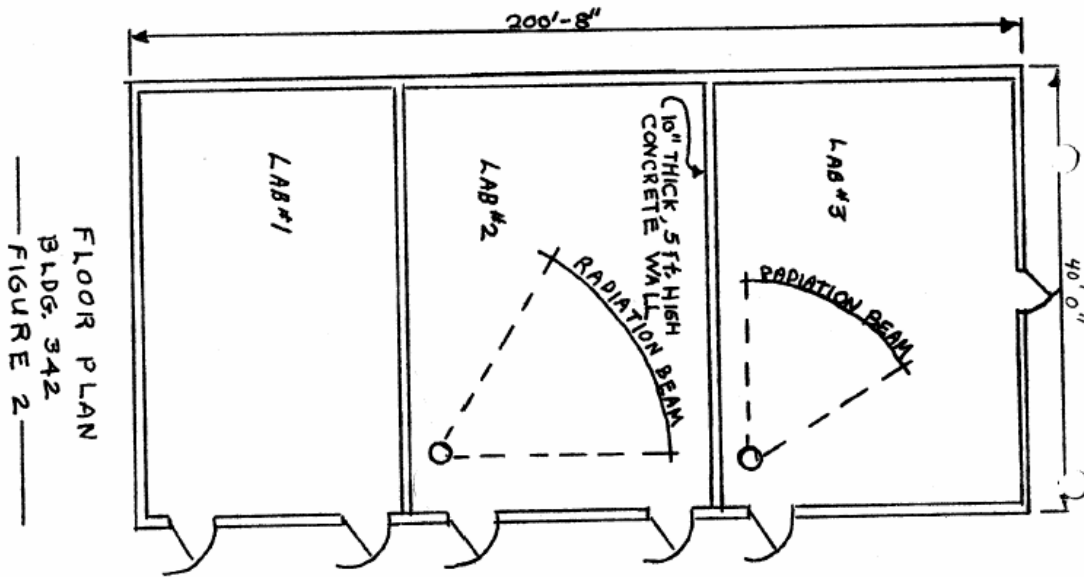
Each of the non-impacted sites is discussed in the following paragraphs.

### 8.3.2.1 Building 342



**Figure 8.3-9 Building 342**

**Site Description** - Metal one story building built on a concrete foundation. The building was completed in 1951. As originally configured, this building of approximately 8000 ft<sup>2</sup> contained three laboratories of equal size. The floor plan of the building as used for instrument calibration and instruction in 1965 is shown below. Laboratories 2 and 3 were used to conduct training exercises and instrument calibrations with sources in fixed locations. The radiation beams from the sealed sources were controlled in specific directions. Periodic leak tests of all sealed sources were required by operational procedures. The use of the building was gradually reduced, and the last use of radioactive sources was in 1972. No reports of leakage were made.



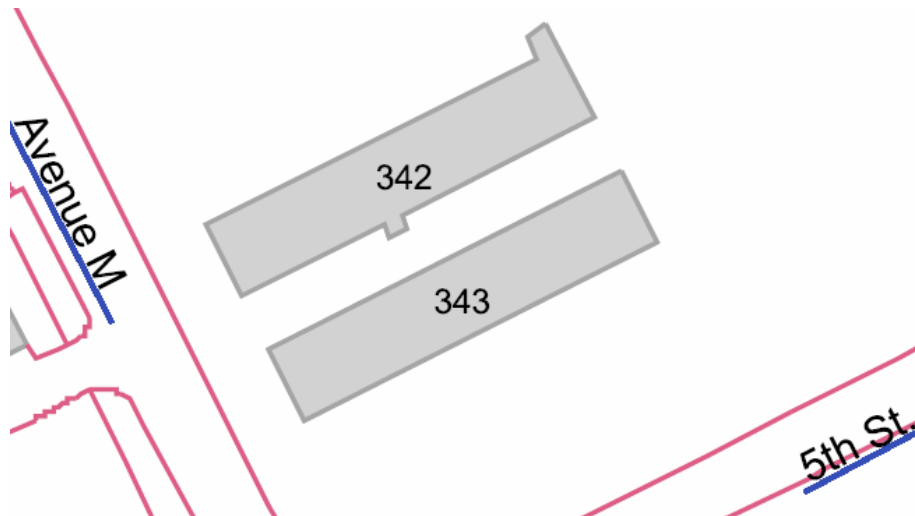
**Figure 8.3-10 Building 342 Floor Plan – 1965 (TI-HRA-99)**

**Former Uses** - RADIAC instruction and RADIAC calibration.

**Current Uses** - None, unoccupied.

**Potential Radionuclides of Concern** - None

**Designated** - Non-impacted. Only sealed sources were utilized in this building. There is no history of source leakage.



**Figure 8.3-11 Building 342 Location**

### 8.3.2.2 Building 3



**Figure 8.3-12 Building 3**

**Site Description** - Building 3 is one of the original buildings constructed on Treasure Island for the 1939 Exposition. It is a large general warehouse building with both arched and flat roofs. The building covers an area of approximately 145,000 square feet.

**Former Uses** - Palace of Fine and Liberal Arts, Port Control Office, Ships Repair Shops, Training School, Equipment Repair. Damage Control HT “A” school administration and offices maintained radiation survey instruments with check sources. There were no reports of leaking check sources.

**Current Uses** – Commercial film studio.

**Radionuclides of Concern** - None.

**Designated** - Non-impacted. Only instrument check sources were stored in this building. There were no reports of check source leakage.



**Figure 8.3-13 Building 3 Location**

### 8.3.2.3 Building 7



**Figure 8.3-14 Former Location of Building 7 West Wing**

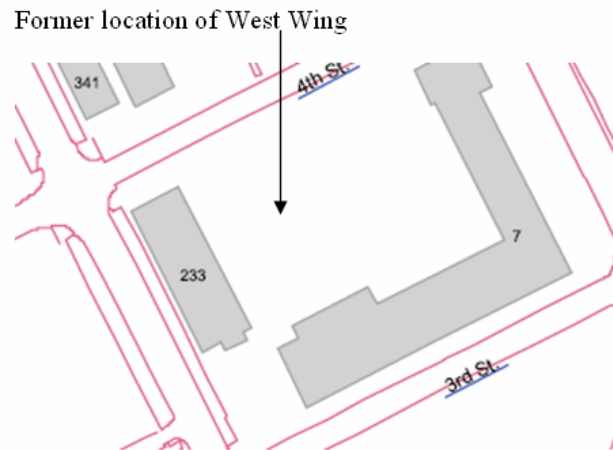
**Site Description** - Building 7 was constructed in 1938 and is one of the original buildings constructed on Treasure Island for the 1939 Golden Gate International Exposition. It was originally a “U” shaped structure of approximately 68,000 ft<sup>2</sup>. The east wing and the south wing were two-story structures and the west wing (destroyed by fire in September 1956) was a four-story structure. The footprint of the west wing is now a parking lot.

**Former Uses** - Federal Building South Half, various military schools, Radiation Safety School (fourth floor of west wing), and Director of Training. Radioactive source(s) were kept in a fourth floor storeroom when not in use for training conducted by the Radiation Safety School.

**Current Uses** - East and south wings vacant, west wing demolished.

**Potential Radionuclides of Concern** - None

**Designated** - Non-impacted. Only sealed sources were stored in storeroom on the fourth floor of the west wing (demolished in 1956). There were no reports of source leakage.



**Figure 8.3-15 Building 7 Location**

### 8.3.2.4 Building 461



**Figure 8.3-16 Building 461**

**Site Description** - Building 461 was constructed in 1970 and is part of the new Damage Control School complex that included Buildings 462 and 463 and the training ship mockup, USS Pandemonium, after it was moved from the northwest corner of NAVSTA TI.

**Former Uses** - Damage Control School classrooms. NTTC headquarters, Fire Training. RADIAC instruments with attached check sources were maintained in the building for use during decontamination exercises on USS Pandemonium (**TI-HRA-40**). There were no reports of leaking check sources.

**Current Uses** - None. Vacant

**Potential Radionuclides of Concern** - None

**Designated** - Non-impacted. Only instrument check sources were used in this building. There were no reports of check source leakage.





**Figure 8.3-17 Building 461 Location**

### 8.3.2.5 Building 462



**Figure 8.3-18 Building 462**

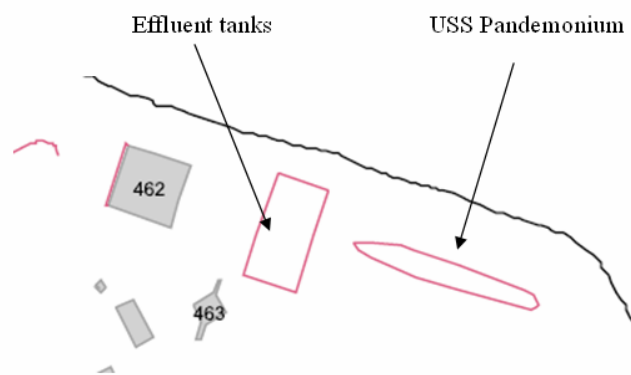
Site Description - Building 462 was constructed in 1970 and is part of the new Damage Control School complex that included Buildings 461 and 463 and the training ship mockup, USS Pandemonium, after it was moved from the northwest corner of NAVSTA TI. Building 462 is inside the compound containing the USS Pandemonium and the below-grade collection tanks for run-off water. Building 462 was the normal entrance to the compound and to the USS Pandemonium. RADIAC instruments with attached check sources were maintained in the building for use during decontamination exercises on USS Pandemonium (TI-HRA-40). There were no reports of leaking check sources.

**Former Uses** - Damage Control School tear gas decontamination building. Fire Training.

**Current Uses** - None, unoccupied.

**Potential Radionuclides of Concern** - None

**Designated** - Non-impacted. Only instrument check sources were used in this building. There were no reports of check source leakage.



**Figure 8.3-19 Building 462 Location**

### 8.3.2.6 USS Pandemonium Training Site Northwest Corner



**Figure 8.3-20 USS Pandemonium Training Site Northwest Corner—1969 (TI-HRA-100)**

**Site Description** - The USS Pandemonium training ship was ‘launched’ in 1956. The training ship was ‘commissioned’ for use in February 1957 and remained in service in the northwest corner until July 1969. The fenced off training area was approximately 400 feet by 600 feet and was gravel surfaced. The area enclosed eight buildings, two obsolete aircraft, the USS Pandemonium mockup and a paved road. During testing of the radioactive spreader device for short-lived isotopes, the radioactive water was allowed to soak into the soil. Later, radioactive water from the decontamination training was collected in two sub-grade concrete tanks and stored until the short-lived isotopes had decayed. When the radioactivity was within allowable limits, the water was discharged to the bay via a six-inch pipe. The USS Pandemonium was moved to the Northeast corner of NAVSTA TI in 1969. The area has since been converted into multiple family military housing units.

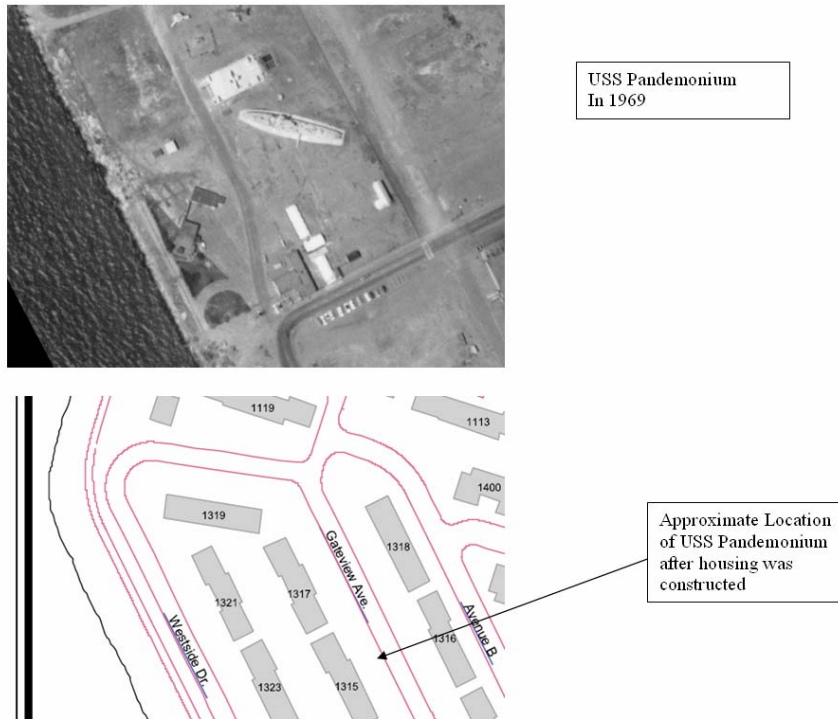
**Former Uses** - Nuclear, Biological, and Chemical Warfare School. Decontamination training area. Decontamination training initially used only Cs-137 sealed sources to simulate radioactive fallout. In 1963 a radioactive material license was granted by the AEC to also utilize short-lived liquid radioisotopes (Br-82, Br-80, Na-24, and K-42) to more realistically simulate radioactive fallout. Survey instruments containing radioactive check sources were used during the training

exercises. The Cs-137 sealed sources were leak tested and were demonstrated to be intact. The check sources were required to be leak tested on a periodic basis. No reports of leakage were issued. The short-lived isotopes were last used at this location in 1969, have decayed away and are no longer present.

**Current Uses** - Multi-family housing area.

**Potential Radionuclides of Concern** - None

**Designated** - Non-impacted. Sealed Cs-137 sources were used for fallout simulation. Leak test of the Cs-137 sources confirmed there was no leakage. The short-lived liquid isotopes decayed away within three months of last use (1969). There were no reports of instrument check source leakage.



**Figure 8.3-21 Former USS Pandemonium Location on Northwest Corner.**

### 8.3.2.7 USS Pandemonium Training Site Northeast Corner



**Figure 8.3-22 USS Pandemonium Training Site Northeast Corner**

**Site Description** - The USS Pandemonium training ship was moved to the northeast corner of NAVSTA TI in 1969 where it remained until it was demolished in 1996. The training ship was part of the new Damage Control School complex that included Buildings 461, 462, and 463. Access to the area was by the tear gas decontamination building (462). An eight foot high fence separated the training area from the rest of the island. Although the mock-up remained until 1996, the use of the mockup was ended in 1992. While in use, the training ship was used to simulate radioactive fallout using the short-lived isotopes discussed earlier and also using the fixed location Cs-137 sources. Two below grade concrete holding tanks were used to collect the washdown water when decontamination of short-lived isotopes was conducted. The washdown water was released to the bay via a 6-inch pipe after it had decayed away.

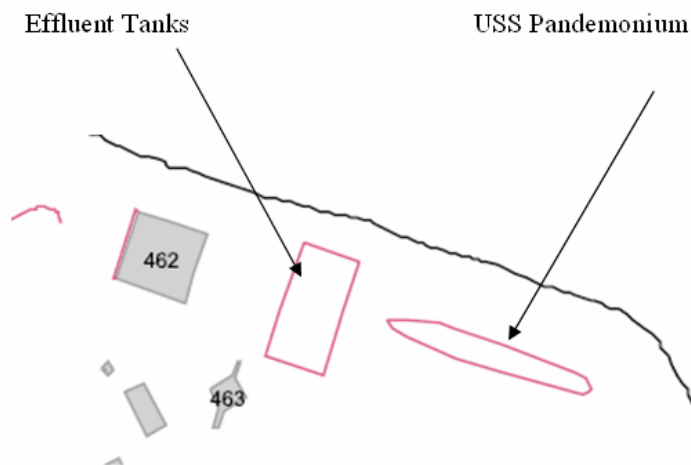
**Former Uses** - Damage Control School decontamination training area. (After July 1969) Although the mock-up remained until 1996, the use of the mockup was ended in 1992.

Decontamination training used Cs-137 sealed sources to simulate radioactive fallout and also utilized short-lived liquid radioisotopes (Br-82, Br-80, Na-24, and K-42) to more realistically simulate radioactive fallout. Survey instruments containing radioactive check sources were used during the training exercises. The Cs-137 sealed sources were leak tested and were demonstrated to be intact. The check sources were required to be leak tested on a periodic basis. No reports of leakage were issued. The short-lived isotopes were last used at this location in 1972, have decayed away and are no longer present.

**Current Uses - None**

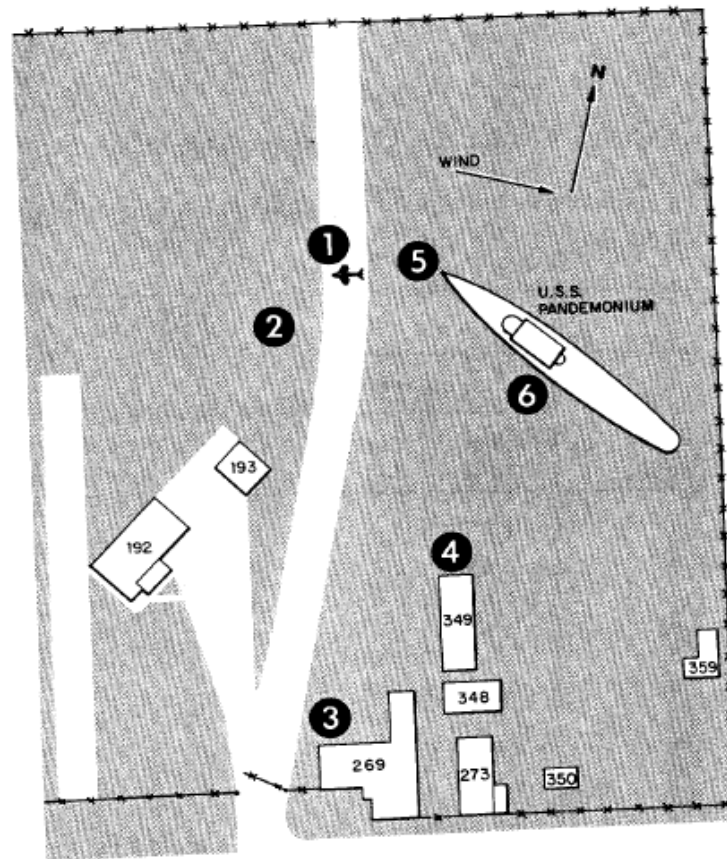
**Potential Radionuclides of Concern - None**

**Designated - Non-impacted.** Sealed Cs-137 sources were used for fallout simulation. Leak test of the Cs-137 sources confirmed there was no leakage. The short-lived liquid isotopes decayed away within three months of last use (1972). There were no reports of instrument check source leakage.



**Figure 8.3-23 USS Pandemonium Site Plan on Northeast Corner.**

### 8.3.2.8 Building 273



**Figure 8.3-24 Building 273 in the USS Pandemonium Training Area – Northwest (TI-HRA-78)**

**Site Description** - Building 273 is a small, single-story building (Quonset Hut type) on a concrete foundation with concrete and wood superstructure, and a corrugated iron roof. Building 273 was built in 1944 and covers approximately 1,100 ft<sup>2</sup>. It is identified on maps and Public Works Data as the Chemical Warfare School Decontamination Building. Building 273 was located inside the fenced compound on the northwest side of TI. As the designated Chemical Warfare School decontamination building, Building 273 was likely always set up to

accommodate decontamination operations including collection of decontamination materials and prevention of spread of contamination.

**Former Uses** - Chemical Warfare School Decontamination building. Was very likely used as the personnel decontamination center during the 1950 Building 233 Radium spill cleanup activities.

**Current Uses** - Building demolished approximately 1977. Currently multi-family housing area.

**Potential Radionuclides of Concern** - None

**Designated** - Non-impacted. If used as a personnel decontamination center, the building would have been prepared to contain any contamination without spread. Building has been demolished.

Approximate location of former Building 273



**Figure 8.3-25 Former Building 273 Location Map**



### 8.3.2.9 Pier 21



**Figure 8.3-26 Pier 21 Area 1975 Photograph (TI-HRA-101)**

**Site Description** - Previous location of multiple-finger piers on northeast side of Treasure Island. Pier 21 was built in approximately 1942. The pier had a 500 foot main stem, a 404 foot finger and 2-248 foot fingers on the north side of the main stem. It was intended to provide sufficient docking space for the destroyers and minesweepers based at TI. By 1945 additional fingers had been added to the south side of the main stem. Some fingers were demolished by the time the above photograph was taken in 1975. The pier was demolished after 1995.

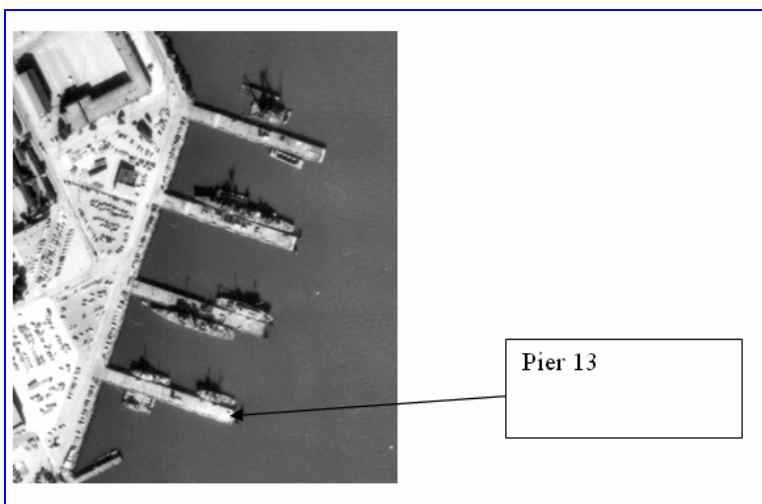
**Former Uses** - General ship's berthing, fuel pier. Briefly provided a pier for USS CEBU (ARG-6) in December 1946.

**Current Uses** - None. Pier demolished approximately 1995.

**Potential Radionuclides of Concern** - None

**Designated** - Non-impacted. The only OPERATION CROSSROADS ship berthed at pier 21 had been decontaminated before arrival at the pier.

### 8.3.2.10 Pier 13 Area



**Figure 8.3-27 Pier 13 Area 1969 Photograph (TI-HRA-100)**

**Site Description** - One of four piers formerly located on the southeast end of Treasure Island. Adjacent to Building 3. Pier 13 was built in 1938 and was demolished in 1991.

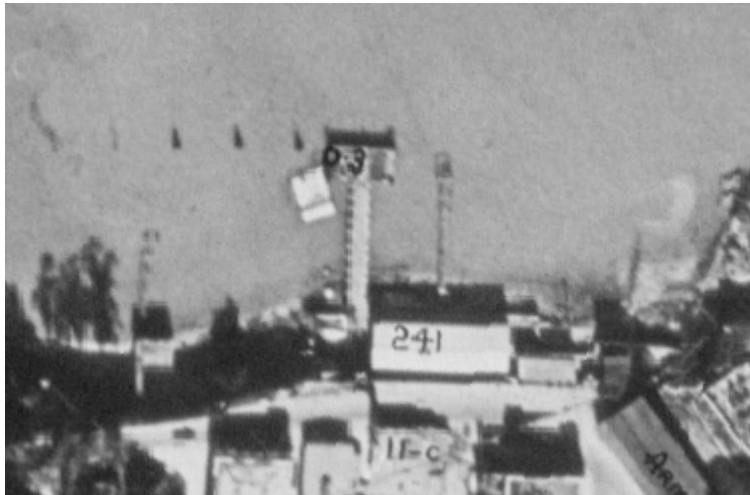
**Former Uses** - Maintenance pier. Briefly provided berthing for the tank landing ship LST-388 in December 1946.

**Current Uses** - None. Pier demolished approximately 1991.

**Potential Radionuclides of Concern** - None

**Designated** - Non-impacted. The only OPERATION CROSSROADS ship berthed at pier 13 had been decontaminated before arrival at the pier.

### 8.3.2.11 YBI Short Pier Area



**Figure 8.3-28 YBI Short Pier Area 1945 Photograph (TI-HRA-102)**

**Site Description** - A fueling pier on the north side of YBI. This pier was built in 1938 and was demolished approximately 1991.

**Former Uses** - Maintenance pier. Briefly provided berthing for the tank landing ship LST-388 in December 1946.

**Current Uses** - None. Pier demolished approximately 1991.

**Potential Radionuclides of Concern** - None

**Designated** - Non-impacted. The only OPERATION CROSSROADS ship berthed at the YBI Short Pier had been decontaminated before arrival at the pier.

### 8.3.2.12 Building 226



**Figure 8.3-29 Building 226 – 1945 Photograph (TI-HRA-102)**

**Site Description** - Building 226 was one of two identified Bachelor Officer's Quarters. It was a multi-story "E" shaped structure constructed approximately 1944. Building 226 was part of a three building group including Buildings 226, 227 (the officers dining hall), and Building 228 (an identical Bachelor Officer's Quarters). Building 226 was demolished by 1966.

**Former Uses** - Building 226 was an officers quarters from the time of construction in 1944 until it was demolished by 1966. During the investigation and follow-up surveys after the spill in building 233 the Bachelor Officers Quarters were both monitored (TI-HRA-47)

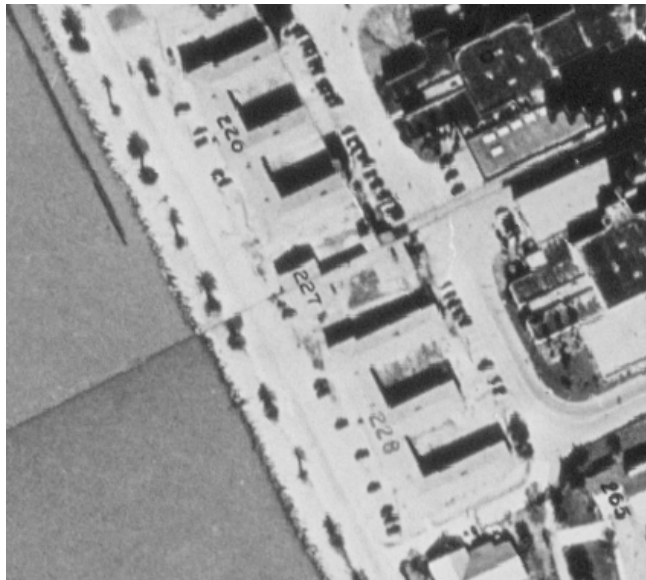
**Current Uses** - None. Building demolished approximately 1966.

**Potential Radionuclides of Concern** - None

**Previous Radiological Investigations** - Monitoring of Bachelor Officers Quarters took place during the week following the Building 233 spill. All monitoring and decontamination was completed within a week of the spill.

**Designated** - Non-impacted. The building was monitored and decontaminated as necessary within a week of the initial spill. There were no reports of residual contamination. The building has since been demolished.

### 8.3.2.13 Building 228



**Figure 8.3-30 Building 228 – 1945 Photograph (TI-HRA-102)**

**Site Description** - Building 228 was one of two identified Bachelor Officer's Quarters. It was a multi-story "E" shaped structure constructed approximately 1944. Building 228 was part of a three building group including Buildings 228, 227 (the officers dining hall), and Building 226 (an identical Bachelor Officer's Quarters). Building 228 was demolished by 1968.

**Former Uses** - Building 228 was an officers quarters from the time of construction in 1944 until it was demolished by 1968. During the investigation and follow-up surveys after the spill in building 233 the Bachelor Officers Quarters were both monitored (TI-HRA-47)

**Current Uses** - None. Building demolished approximately 1968.



**Potential Radionuclides of Concern** - None

**Previous Radiological Investigations** - Monitoring of Bachelor Officers Quarters took place during the week following the Building 233 spill. All monitoring and decontamination was completed within a week of the spill.

**Designated** - Non-impacted. The building was monitored and decontaminated as necessary within a week of the initial spill. There were no reports of residual contamination. The building has since been demolished.



## **SECTION 8**

### **TABLES**



**Table 8-1**  
**Impacted Sites at NAVSTA TI**  
**Current Uses**

<b>BUILDING/SITE NO.</b>	<b>FORMER USE</b>	<b>CURRENT USE</b>
Building 233	Classrooms; Radiation Safety School; ATF Laboratory; California National Guard	None, unoccupied.
Building 343	Naval Technical Training Center RADIAC instruction	None, unoccupied.
Building 344	Naval Technical Training Center Radium and RADIAC Vault	None, unoccupied.
IR Site 12	Ammunition bunkers; general landfill and waste disposal	Housing area.
Sanitary Sewer Drains associated with Building 233	Sanitary sewer drains	Sanitary sewer drains.





**Table 8-2**  
**Non-Impacted Sites at NAVSTA TI**  
**Current Uses**

<b>BUILDING/SITE NO.</b>	<b>FORMER USE</b>	<b>CURRENT USE</b>
Building 3	Palace of Fine and Liberal Arts; Port Control Office; Ship Repair Shops; Training School, Equipment repair	Leased to City. Building is occupied.
Building 7 West Wing	Federal Building South Half; various military schools; Director of Training Facilities	West Wing demolished by fire in 1956. Building unoccupied.
Building 273	Chemical Warfare Decontamination Building; Classrooms	None. Building demolished
Building 342	Naval Technical Training Center RADIAC instruction	None, unoccupied.
Building 461	Damage Control School classrooms; NTTC headquarters	None, unoccupied.
Building 462	Damage Control School decontamination building	None, unoccupied.
Pier 13	Maintenance pier	None. Pier demolished.
Pier 21	Berthing pier; fuel pier	None. Pier demolished.
YBI Short Pier	Fueling pier	None. Pier demolished.
USS Pandemonium site NW Corner	Radiation decontamination Training area	Housing area.
USS Pandemonium site NE Corner	Damage Control School training, Firefighting school; radiation decontamination training	None. The USS Pandemonium has been dismantled and removed.
Building 226	Bachelor Officers Quarters	None. Building demolished
Building 228	Bachelor Officers Quarters	None. Building demolished



## **9.0 CONCLUSIONS**

### **9.1 HISTORICAL RESEARCH**

Treasure Island was constructed in 1937 for the Golden Gate International Exposition. The Navy leased Treasure Island from the City of San Francisco in 1941 and acquired title to Treasure Island in 1942. During World War II, Treasure Island grew from a small base to a busy fully operational military facility processing as many as 13,000 men per day. The original buildings constructed for the exposition were for the most part demolished and replaced with barracks and training facilities during the war years. The first specifically identified use of G-RAM on NAVSTA Treasure Island took place during the Radiation Safety training course in Building 7 in 1947. Over the years following, G-RAM was used in support of training on calibration and maintenance of radiation survey instruments, and in support of training on survey, detection, and decontamination of radioactive fallout.

### **9.2 IMPACTED SITE ASSESSMENTS**

The preparation of the HRA was an extended process that involved review of hundreds of records from federal and private record repositories. Some electronic mail and telephonic contact with persons with knowledge of radiological operations at NAVSTA TI were also utilized. The information extracted from this process identified a total of 542 NAVSTA TI historic and current sites, including buildings, structures, defined open areas, and ship's berths. Of these, 18 sites were selected for further review, and five sites have been designated as "impacted". This indicates the site has a potential for radioactive contamination based on historic information or is known to contain radioactive contamination. These impacted sites include:

- One building with a documented spill (Building 233).
- One building with an investigation of loose contamination in a waste container (Building 344).
- One building that was part of the RADIAC Instrument School (Building 343).



- Four former solid waste disposal areas located within Installation Restoration Site 12.
- Sanitary Sewer Drain System associated with Building 233.

The potential for residual contamination at the five impacted sites was assessed using the following categories: Known-Restricted Access, Known-Continued Access, Likely, Unlikely, Unknown, and None. The assessment of potential contamination at the 5 impacted sites is summarized as follows:

0 - Known, Restricted Access

0 - Known, Continued Access

1 - Likely

4 - Unlikely

0 - Unknown

0 - None

The categories high, moderate, low, and none were used to assess potentially contaminated media for each impacted site. The highest level of potentially contaminated media at each of the 5 impacted sites is presented below.

High - 0 sites

Moderate - 0 sites

Low - 4 sites

None - 1 site

The categories of high, moderate, low, and none were also used to assess potential migration pathways for any radioactive contamination at each impacted site. The highest level of migration pathways assessed at each of the 5 impacted sites is presented below:



High - 0 sites

Moderate - 0 sites

Low - 3 sites

None - 2 sites

The categories of Emergency Action, Scoping survey, Characterization Survey, Remediation, Final Status Survey, Free Release, and No Further Action were used to recommend future actions at each of the impacted sites. The recommended actions for each of the 5 impacted sites are presented below:

Emergency Action - 0 sites

Scoping Survey - 1 site

Characterization Survey - 1 site

Remediation - 0 sites

Final Status Survey - 2 sites

Free Release pending review of Characterization or Final Status Survey Report - 0 sites

No Further Action - 0 sites

### **9.3 OVERALL CONCLUSIONS**

Using the above criteria, the HRA concludes that:

- The potential for residual radioactive contamination exists and needs to be addressed at 5 of the impacted sites.
- The potential for residual radioactive contamination is currently being addressed at 2 of the 5 impacted sites (Building 233 and IR Site 12). The need for additional action at these sites is pending completion of the assessments.
- Thirteen sites are designated as non-impacted sites.



- To date, no historical information about radiological operations or previous radiological investigations at any of the impacted sites presents a level of concern that would require any Emergency Action.
- To date, high-level contamination has not been found at the site nor is the potential considered a possibility by the HRA.
- To date, 0 impacted sites require restricted access due to known levels of undisturbed radioactive contamination.
- To date, no evidence for potential airborne contamination has been found.
- To date, potential pathways for contamination migration remain within the impacted site areas. No pathway has been identified for contamination to migrate off the NAVSTA TI site.

The overall conclusion of the HRA is, even though there is potential residual radioactive contamination at 5 impacted sites, the contamination, if any, is expected to be at low levels within the confines of each site on NAVSTA TI. Recommendations have been made to assess the identified areas of potential residual radioactive contamination and address its removal. The review of previous radiological activities, cleanup actions, and release surveys has not identified any imminent threat or substantial risk to human health or the environment of NAVSTA TI or the local community.



## 10.0 REFERENCES

File Name:	Title:
TI-HRA-1	1952-9-1 Property Record Card US Naval Station Treasure Island
TI-HRA-2	2005-3-28 Department of Toxic Substances Control website for Naval Station Treasure Island
TI-HRA-3	Multi-Agency Radiation Survey and Site Inspection Manual
TI-HRA-4	1988-4-1 Preliminary Assessment/Site inspection of Naval Station Treasure Island, Ca
TI-HRA-5	1992-9-29 Federal Facility Site Remediation Agreement for Treasure Island Naval Station
TI-HRA-6	2005-3-24 40CFR Part 302 Designation, Reportable Quantities and Notification
TI-HRA-7	no date website <a href="http://ludb.clui.org/ex/i/CA3119">http:// ludb.clui.org/ex/i/CA3119</a> Map of Treasure Island,
TI-HRA-8	no date aerial photograph of TI and YBI showing the connecting causeway
TI-HRA-9	2004-9-14 Website " <a href="http://www.navfac.navy.mil/brc/cf-bin/dispmap/activity.cfm">www.navfac.navy.mil/brc/cf-bin/dispmap/activity.cfm</a> " Naval Station Treasure Island at San Francisco, Ca
TI-HRA-10	2004-10-26 Website " <a href="http://www.epa.gov/fedfac/ff/treasure.htm">www.epa.gov/fedfac/ff/treasure.htm</a> " Federal Facilities Restoration and Reuse- Treasure Island Naval Station
TI-HRA-11	1996-3-1 Historical Study of Yerba Buena Island Treasure Island and their Buildings
TI-HRA-12	1966-4-1 Historical View Yerba Buena and Treasure Island
TI-HRA-13	2004-8-31 Final Historical Radiological Assessment, Volume II, History of the Use of General Radioactive Materials, 1939-2003, Hunters Point Shipyard (excerpt from Section 3)
TI-HRA-14	1990-8-31 Results of Field Exploration and Laboratory Testing Program
TI-HRA-15	2005 3 Final Remedial Investigation Report for Installation Restoration Sites 09 and 10
TI-HRA-16	1989 Liquefaction during Loma Prieta earthquake in 1989 website <a href="http://www.unh.edu/nges/images/photos">www.unh.edu/nges/images/photos</a>
TI-HRA-17	1998 -11-1 Climatic Wind Data for the United States, San Francisco airport, Summary of data from 1930 to 1996
TI-HRA-18	2003 Website " <a href="http://www.dof.ca.gov/HTML/DEMOGRAP/histtext.htm">www.dof.ca.gov/HTML/DEMOGRAP/histtext.htm</a> " California State Department of Finance, Demographic Research Unit
TI-HRA-19	2000-4-3 Website " <a href="http://www.baycrossings.com/Archives/2001/03_April/treasure_islands_seeks_ferry_funds.htm">www.baycrossings.com/Archives/2001/03_April/treasure_islands_seeks_ferry_funds.htm</a>
TI-HRA-20	2003-6 Final Environmental Impact Statement (EIS) For the Disposal and Reuse of Naval Station Treasure island, San Francisco , Cal
TI-HRA-21	1996-7 Draft NSTI Reuse Plan
TI-HRA-22	2005-3-10 Supplemental Environmental Baseline Survey Revised Draft Final
TI-HRA-23	2004-5-6 Website " <a href="http://orb.sfusd.edu/profile/prfl-852.htm">http://orb.sfusd.edu/profile/prfl-852.htm</a> " S.F.U.S.D. School Profiles 2003-04 (Fall 2003), Treasure Island Elementary School
TI-HRA-24	2005-5-23 Budget Squeeze Threatens school, the island's treasure SEIUCA article about TI Elementary School
TI-HRA-25	2004 website " <a href="http://www.kidango.org">www.kidango.org</a> "
TI-HRA-26	1945-6 Map of U.S. Naval Training Station (Treasure Island) showing conditions on June 1945
TI-HRA-27	1949-7-1 Map of U.S. Naval Station Treasure Island and Yerba Buena Island San Francisco, Cal Showing conditions on July 1, 1949
TI-HRA-28	1952-6-30 Map of U.S. Naval Station Treasure Island as of 30 June 1952
TI-HRA-29	1968-8-1 Map of U.S Naval Station Treasure and Yerba Buena Islands as of August 1, 1968
TI-HRA-30	1971-12-1 Map of U.S. Naval Station showing conditions on December 1, 1971



File Name:	Title:
TI-HRA-31	1973-6-1 Map of U.S. Naval Station Treasure and Yerba Buena Island showing conditions as of June 1, 1973
TI-HRA-32	2001-7-19 RADIOLOGICAL ASSESSMENT REGARDING FORMER NAVAL STATION, TREASURE ISLAND, SAN FRANCISCO, CALIFORNIA
TI-HRA-33	1947-4-7 Report on opening of Radiological Safety School, Treasure Island
TI-HRA-34	1959-8 U.S Naval School, Damage Control, Command History, 1945 -1959
TI-HRA-35	1944-1-4 PWC Drawings 85524 dated 1-4-1944 Federal Building Additions and Alterations
TI-HRA-36	1957-8-29 PWC Drawing 85531 dated 8/29/1957 titled Demolition of West Wing and Rehabilitation of Building 7
TI-HRA-37	2004-11-18 Former Naval Station Treasure Island Historical Radiological Assessment Fact Sheet #1
TI-HRA-38	1950-1-26 Geiger Counter Sleuths Go After Spilled Radium
TI-HRA-39	Not Used
TI-HRA-40	1989-6-30 Monthly Survey and Inventory Report of Radioactive Sources
TI-HRA-41	1982-10-28 Radiological Affairs Technical Assistance Visit
TI-HRA-42	1980-3-21 RASO Report of Technical Assistance Visit to Naval Technical Training Center, Treasure Island
TI-HRA-43	1960-12-15 By Product Material License 4-4346-1 Amendments 1 through 21
TI-HRA-44	1951-2-15 Radioactive Training Materials, shipment of
TI-HRA-45	1973-3-14 NAVSCOLCOM Instruction 5100.5C, Radioactive sources; safety and operating regulations
TI-HRA-46	2003-12-11 Record of phone interview with CDR James Winstanley (USNR) by William Morris (RASO)
TI-HRA-47	1950-1-30 Contamination of Building 233, U.S. Naval Damage Control Training Center, U.S. Naval Station, Treasure Island, California; report of
TI-HRA-48	1953-3-21 An Agreement between AEC and DOD for the Development, Production and Standardization of Atomic Weapons
TI-HRA-49	1942-1-31 General Safety Rules Section No. 9, Safe Handling of Radioactive Luminous Compounds
TI-HRA-50	1947-12-8 Radiological Safety Manual 1947
TI-HRA-51	1969-1-23 Source Material License No. SMB-473
TI-HRA-52	1979-1-31 NRC Materials License No. 08-00038-12 Amend 35 and 36
TI-HRA-53	1966 7-1 Radioluminescent Materials; hazards of
TI-HRA-54	1995-6 Aerial Photographic Analysis of Naval Station Treasure Island
TI-HRA-55	1985-12-10 Navy Radiation Safety Committee
TI-HRA-56	1988 4-1 Radiological Affairs Support Program
TI-HRA-57	1974-7-3 RASO Report of Technical Assistance Visit to Naval Schools Command Treasure Island of 15 April 1974
TI-HRA-58	1977-11-1 RASO Report of Technical Assistance Visit to Naval Technical Training Center, Treasure Island
TI-HRA-59	1986-5-15 RASO Report of Technical Assistance Visit to Naval Technical Training Center, Treasure Island
TI-HRA-60	1947-9-18 Photographs and Negatives Relating to Harbor Projects 1913-1938
TI-HRA-61	1939 Photograph of the site of the Golden Gate International Exposition before opening in 1939
TI-HRA-62	1941-6-27 TREASURE ISLAND AIRPORT MASTER PLAN PWC drawing 88122
TI-HRA-63	1942 Photograph of Treasure Island looking to the south- 1942



File Name:	Title:
TI-HRA-64	1946-12-10 U.S. Naval School (Damage Control) Command History
TI-HRA-65	1950-10-10 Hazard Evaluation and Control Following a Spill of 40 milligrams of Radium
TI-HRA-66	1950-8-9 Decontamination of Building 233, U.S. Naval Station, Treasure Island, California
TI-HRA-67	1950-9-11 Final radiological clearance; granting of
TI-HRA-68	1959-6-22 By-Product material License 04-4346-2 Initial Issue and Amendments
TI-HRA-69	1989-5-5 NAVY RADIOACTIVE MATERIAL PERMIT No. 04-62639-C1NP
TI-HRA-70	1988-3-21 Monthly Survey and Inventory Report of Radioactive Sources
TI-HRA-71	1990-11-9 Navy Radioactive Materials Permit 04-62639-C1NP Amendment #3
TI-HRA-72	1991-8-12 SUMMARY OF CLOSEOUT SURVEY ICO BUILDING 344 FOR NAVY RADIOACTIVE MATERIAL PERMIT NO. 04-62639-C1NP
TI-HRA-73	1992-6-15 Summary of Closeout Survey ICO Building 344 for NAVTECHTRACEN Treasure Island Navy Radioactive Material Permit (NRMP) No. 04-62639-C1NP
TI-HRA-74	1993-7-12 Correction for Closeout Survey ICO Building 344 for NAVTECHTRACEN Treasure Island Navy Radioactive Material Permit (NRMP) No. 04-62639-C1NP
TI-HRA-75	1998-9-23 US Atomic Veterans, John R. (Jack) Hensley, e-mail about participation in Operation Ivy
TI-HRA-76	1957-4-16 Operation Hardtack Radiological Safety Support
TI-HRA-77	2005-2-14 e-mail from Bob Sulit with pictures from Principles of Radiation and Contamination Control
TI-HRA-78	1963-6-26 Evaluation Tests of Radiological Trainer, Device X11F3, at USNAVSCOLCOM Treasure Island
TI-HRA-79	1963-12-31 Command History 1 Jan 1963 - 31 Dec 1963, US Naval Schools Command, Treasure Island, San Francisco, California, 94130
TI-HRA-80	1963-12-19 Byproduct Material license 4-4346-1; application for renewal of and amendment to
TI-HRA-81	1970-4-13 NAVSCOLCOM INSTRUCTION 5100.B Radioactive sources; safety and operating regulations
TI-HRA-82	1973-6 PWC Plan 79831 Drawing TI Sanitary Sewer System
TI-HRA-83	1993-8-25 Termination of Navy Radioactive Materials Permit (NRMP) No. 04-62639-C1NP
TI-HRA-84	1980-3-26 Report of Radioactive Source Leak Test
TI-HRA-85	1970 USS Pandemonium (371)
TI-HRA-86	1946-12-2 Crossroads Ships present in or expected arrivals in San Francisco Bay Area requiring radiological clearance
TI-HRA-87	1948 CROSSROADS ships known to have returned to San Francisco following OPERATION CROSSROADS
TI-HRA-88	2004-8-31 Selected Pages of Table 6-2 of HPS HRA
TI-HRA-89	2003-11-20 e-mail interview Capt. David Farrand
TI-HRA-90	2001-5-9 Radiological Screening at Site 12, Naval Station Treasure Island, California
TI-HRA-91	2003-7-28 Final Sampling and Analysis Plan Site 12
TI-HRA-92	1994-2-11 Naval Technical Training Center, Treasure Island navy Radioactive materials Permit No. 04-62639-C1NP
TI-HRA-93	1994-2-24 Navy Radioactive Materials Permit 04-62639-C1NP Amendment #6
TI-HRA-94	1993-7-27 Wipe Analysis
TI-HRA-95	1993 8-2 Follow-up Swipes for Closeout of Radiac Maintenance School, Treasure Island
TI-HRA-96	1993-8-18 Wipe analysis
TI-HRA-97	1993-7-23 Request for Alpha/Beta/Gamma counting service for Radiac Maintenance School Swipes





<b>File Name:</b>	<b>Title:</b>
TI-HRA-98	1993-8-2 Wipe Analysis
TI-HRA-99	1965-5-19 Application for renewal of license 4-4364-2 of May 19, 1965
TI-HRA-100	1969-12-30 Aerial Photograph-1969
TI-HRA-101	1975 Aerial Photograph -1975
TI-HRA-102	1945 Aerial Photograph 1945
TI-HRA-103	2003-12-11 e-mail interview LaMarr Beuchler
TI-HRA-104	2003-11-7 e-mail interview James Spahn
TI-HRA-105	1953-8 Hazard Evaluation and Control after a Spill of 40 mg of Radium
TI-HRA-106	1990-6-6 Navy Radioactive Materials Permit 04-62639-C1NP Amendment #1
TI-HRA-107	1990-8-16 Navy Radioactive Materials Permit 04-62639-C1NP Amendment #2
TI-HRA-108	1992-7-28 Navy Radioactive Materials Permit 04-62639-C1NP Amendment #4
TI-HRA-109	1993-7-7 Navy Radioactive Materials Permit 04-62639-C1NP Amendment #5



# APPENDIX A

## INTERVIEWS

### A1. GENERAL

Archival research conducted during preparation of the NAVSTA TI Historical Radiological Assessment (HRA) was intended to be augmented by contacts with people who had specific knowledge of radiological operations at NAVSTA TI.

To make contact with these people, the Navy posted a newspaper advertisement looking for personnel with knowledge of radiological operations at NAVSTA TI. The Navy advertised in newspapers surrounding the Bay Area in hopes of reaching former military or civilian employees. The following advertisement was published in the *San Francisco Chronicle*, *San Francisco Examiner*, *San Francisco Independent*, the *San Jose Mercury News*, the *Oakland Tribune*, the *Alameda Times Star* and several smaller papers affiliated with the *Oakland Tribune* and the *Alameda Times Star*.



**NAVAL STATION TREASURE ISLAND**  
**SEEKING INFORMATION**  
**FOR HISTORICAL RADIOLOGICAL ASSESSMENT**

**The Department of the Navy (Navy) is presently seeking to interview current and former Navy personnel, civilian employees, and contractors regarding radiological operations at the former Naval Station Treasure Island (NAVSTA TI), San Francisco, California.** The Base Realignment and Closure Program Management Office West is working with the Naval Facilities engineering Command, Southwest Division and the Navy's Radiological Affairs Support Office in the preparation of the Historical Radiological Assessment (HRA) for NAVSTA TI. The HRA will document the historical radiological operations of the Naval Station including former uses of radioactive materials and locations where radioactive materials were used or stored.

Radiological operations at NAVSTA TI may have been conducted by any of the following employers or their contractors: Naval Station Treasure Island, Naval Schools Command, or Naval Radiological Defense Laboratory.

**Face-to-face interviews as well as telephonic or e-mail interviews can be arranged.**

Information resulting from interviews will be used for preparation of the HRA. The Navy is interested in obtaining open and honest oral histories. The Navy is not interested in pursuing adverse action against interviewees based on information supplied during the interviews. **If you are a current or former member of the Navy, former civilian employee, or contractor and have information about past radiological operations at NAVSTA TI, please contact Robert O'Brien, Weston Solutions, Inc., at e-mail address [robert.obrien@westonsolutions.com](mailto:robert.obrien@westonsolutions.com) or call 1-800-538-9815.**



Only one response was forthcoming from the newspaper advertisements. A woman who worked in personnel in Building 367 was stationed on Treasure Island from 1980 to 1983. She did not remember the name of her military unit. She did not have any knowledge of the use or presence of radioactive materials.

The Navy Radiological Affairs Support Office (NAVSEADET RASO) provided some additional e-mail and telephone interviews conducted in late 2003. The substance of those interviews follows:

## **A.2 INTERVIEWS**

### **LaMarr Buechler**

Lt. Buechler was stationed at the Damage Control School from 1967 to 1971. He was the Radiation Safety Officer listed on the AEC radioactive material license. He recalls that during his tour of duty, the mockup training ship was moved (from the northwest corner) to make room for planned housing. The training ship was installed on a new site with a cement pad for the ship and retention tanks for the effluents that came from the pad. The ship mockup was used to train damage control personnel in survey and decontamination procedures.

He recalls that this was accomplished by dispersing a solution of Br-82 on the deck or by raising and lowering sealed sources stored in lead pigs within the ship.

He stated that a capsule containing a Bromine compound was taken to Vallecitos Nuclear Center in Pleasanton, California to be irradiated. Upon return to Treasure Island, the capsule was crushed and mixed in a container of about 5 gallons of water. The radioactive solution was spread at several locations on the surface of the training ship to simulate fallout. The trainees would then conduct surveys and perform decontamination using conventional shipboard methods. The students wore protective clothing during the training exercise.

The effluent from the decontamination operation was collected in the retention tank(s) and held until it met the criteria for disposal into the bay.

He recalls that during his tour of duty, the San Francisco Bay pollution regulations became more restrictive and the Damage Control School terminated the use of the Br-82 liquid dispersal. He



believes that the Br-82 dispersal was only used once or twice during his tour. The sealed sources (Cs-137) were in use when he was transferred in 1971 (**TI-HRA-103**).

### **Captain David E. Farrand**

At the time of the interview, Captain Farrand was Head, Radiological Controls and Health Branch, Office of Chief of Naval Operations. In 1982 to 1984, then Lt Farrand was the Radiation Safety Officer for the Naval Technical Training Center (NTTC) on NAVSTA TI. He was asked if the damage control mockup in Building 341 (USS Buttercup) might have been used for radiation training. (Note: The USS Buttercup was a mockup of a portion of a ship used to simulate flooding emergencies due to broken pipes or a hull breach). Captain Farrand stated that he had no knowledge of sources used in the Buttercup. He believes that sources would not have been used because the Buttercup was a wet trainer with water being sprayed around to simulate the flooding casualty.

Captain Farrand stated that the USS Pandemonium was the training mockup used for NBC training. All but one of the USS Pandemonium sources were disposed before he arrived in February of 1982. The one remaining source was stored in the RADIAC building (at that time Building 343) and was to be used for NBC training. He further stated that shortly thereafter, the NBC training course was revised and eliminated the need for the source.

Captain Farrand recalled that the only buildings beside the USS Pandemonium and the RADIAC buildings that had sources were Building 3 (HT "A" School), NTTC headquarters and maybe Building 323 (next to the Buttercup Building 341). They were only small check sources of exempt quantity used for instrument response demonstrations (**TI-HRA-89**). (Note: Building 323 is listed as a classroom that was demolished in 1961, and is not next to the Buttercup. The building next to Buttercup is Building 293.) Building 233 is across the street from the Buttercup building.



### **James Spahn**

Lt. James Spahn reported to Treasure Island in October 1961 and was there until 1963. He recalls working with Ed Leahy and Al Baietti both of NRDL on licensing of the radioactive spreader device used to disperse the radioactive liquid Br-82 solution. He was unable to provide any additional details (**TI-HRA-104**).

### **Commander James Winstanley (USNR)**

(Telephone interview between Cdr. Winstanley and William Morris)

Then Lt. Winstanley was the Radiation Safety Officer in 1979 for both the NBC School license and the RADIAC School license. He discussed how the sources were used in the Pandemonium mockup to simulate fallout levels. He stated that only one source was really used during his tour of duty. The use of short-lived isotopes had been discontinued long before his arrival at Treasure Island. He stated that he transferred eleven sources to the California Department of Health Services (**TI-HRA-46**). (Note: The sources in question are Cs-137 sources received in 1959. He actually transferred ten sources to the DHS. The remaining source was transferred to the RADIAC School.)



## APPENDIX B

### REFERENCES

(Note: This appendix is provided on compact disc only)



## APPENDIX C

Final Response to Comments on the

Naval Station Treasure Island

Draft Historical Radiological Assessment (HRA)

Dated January 2006



**Final  
Response to Comments on the  
Naval Station Treasure Island Draft Historical Radiological Assessment  
(HRA)  
Dated January 2006**

**The following agencies and organizations have commented to the Treasure Island Naval Station draft Historical Radiological Assessment. The responses to those comments are provided herein:**

1. California Department of Health Services (DHS) comments dated September 23, 2005.
2. California Environmental Protection Agency (Cal EPA) Department of Toxic Substances Control (DTSC) comments dated September 26, 2005.
3. ChemRisk (for Treasure Island Development Authority [TIDA]) comments dated September 22, 2005.
4. Naval Station Treasure Island (NAVSTA TI) Restoration Advisory Board (RAB) member Ms. Dale Smith comments dated September 27, 2005.

## **Response to California DHS Comments of September 23, 2005, to the Naval Station Treasure Island Draft Historical Radiological Assessment dated August 2005**

### **General Comments:**

- 1. Comment:** Current DHS staff are not very familiar with this site, so DHS is relying on this document to help us focus on the radiological issues.

**Response:** Comment acknowledged.

- 2. Comment:** DHS has noted that only 5 of the 18 sites designated as impacted are selected for further investigation. The other 13 sites should be either reclassified as nonimpacted based on justifications, including historical information or receive a MARRSIM final status survey. Examples are shown in the Specific Comments below.

**Response:** Navy agrees. The 13 sites that require no further action will be reclassified as non-impacted.

- 3. Comment:** The impacted areas that have been designated as having “no potential for contamination, so no further action is needed” will need at least a Class 3 final status survey or reclassification to non-impacted.

**Response:** Navy agrees. See response to comment # 2.

- 4. Comment:** Because the spills that occurred also involved spreading the contamination to unknown locations and housing, there should also be surveys of soil around the buildings that may have been involved.

**Response:** Navy does not agree with DHS’ comment for the following reasons. With the exception of Building 233, neither the location of buildings nor the levels of contamination in the buildings that were associated with the radium incident in Building 233 are known with any certainty. Therefore, any soil samples, other than from around Building 233, would be purely speculative. The Navy will conduct soil sampling around Building 233.

The HRA also documents a spill that occurred inside the vault in Building 344. Conservatively, this was called a spill, but was limited to contamination inside a Union Carbide Cesium/Barium Nucleonics kit.

The kit contained an NRC exempt licensed quantity of Cs-137. Two waste containers were also stored in the vault that had low levels of contamination inside, but nowhere on the outside. This is not a spill. Based on these facts, it is evident there is no need to do soil sampling around Building 344. Furthermore, the Navy apologizes if the HRA is misleading. Section 6.6.2 will be revised and a better description (descriptor) of the extent of contamination in the vault at Building 344 will be provided. That descriptor will not be “a spill.”

- 5. Comment:** **DHS will be reviewing and evaluating buildings and land designated to be transferred out of federal ownership. DHS will assess the site using dose models rather than using EPA’s risk analysis. If a site cannot be approved for unrestricted use, the regulatory branch, Radiological Health Branch, of DHS would determine if the site could be released for restricted use and determine if a license is required.**

**Response:** Comment acknowledged. The Navy has no intent of releasing any site on Treasure Island for restricted use.

**Specific Comments:**

- 1. Comment:** **Page 1-2: Buildings 233 and 344 would most likely need Class 1 final status surveys, because they were previously remediated.**

**Response:** The purpose of the HRA is to determine which areas are impacted, i.e., will require further investigation/surveys. Areas are normally classified based on results of scoping and characterization surveys that are not available at this time. Classification of areas will be addressed in the survey plans for the buildings.

- 2. Comment:** **Page 1-2: All of Building 343 should have final status surveys. The storeroom should receive a Class 1 survey, and the other rooms should receive Class 2 or 3 final status surveys and may need to be reclassified to Class 1, if contamination is detected.**

**Response:** Navy does not agree with DHS’ comment. The Navy considers, based on historical information and wipe test results, the storeroom is the only impacted area in Building 343 requiring further investigation. During the closeout of Building 343, the Navy took 267 wipes in the building and on miscellaneous pieces of equipment. Navy personnel wiped in every room in the building. Only two wipes exceed the release criteria of 20 dpm / 100 cm<sup>2</sup> (removable). The wipes that exceeded the release criteria were of a counter top in the storeroom. All other wipe results

were significantly below, less than half the release criteria. Additionally, the Navy wiped every radioactive source that was stored in the building before its removal. None of these wipes had results exceeding background radiation levels. The Navy will conduct a final status survey of the storeroom and the floor of the room outside the storeroom. The Navy is only recommending this area for final status surveys since there are no documented results of fixed and scan surveys of the storeroom. Should the survey of the storeroom or the floor of the adjacent room detect any radioactivity above background levels, additional surveys will be conducted.

Furthermore, Navy will not provide a survey classification for impacted areas identified by the HRA. Survey classification is part of the final status survey plan for each impacted area or survey unit (also see the response to specific comment # 1 above).

- 3. Comment:** **Page 4-4: If an area is only being considered impacted because sealed sources were stored or used at the location and there is no history of leaking sources, then DHS would not consider these locations impacted or to require a survey.**

**Response:** Such areas will be designated as non-impacted.

- 4. Comment:** **Page 5-11: For clarification of DHS' role, DHS does not defer to EPA for the release of property, either buildings or land. If the property is to be transferred out of federal ownership, then the Navy will need the property to be released by DHS.**

**Response:** The last sentence of Section 5.7.1 will be changed to read, "CDHS concurrence is required for release of all property being transferred from federal ownership to state, local or private ownership."

## **Response to Cal EPA DTSC Comments of September 26, 2005, to the Naval Station Treasure Island Draft Historical Radiological Assessment dated August 2005**

### **General Comment:**

- 1. Comment:** All of the areas/sites where debris disposal has occurred at NSTI should be addressed in the same manner that was recommended for Site 12, which is to perform radiation monitoring during soil excavation activities. And if removal activities for known debris disposal areas are not planned, then additional characterization work for radiation may be necessary prior to completing the Remedial Investigation process (this may apply at Sites 30, 31, and 33).

**Response:** There is no evidence that radioactive material was deposited in any debris disposal area on NAVSTA TI. NAVSTA TI's primary activities were training and not that of a shipyard or industrial maintenance facility that removed or repaired radioluminescent devices and disposed of them and associated waste in landfills. There is no supporting evidence to indicate NAVSTA TI disposed of any radioluminescent devices or generated associated waste. All known radiological material used for training and radiological waste from the two spills at NAVSTA TI has been transferred or disposed off the naval station.

The US EPA photographic analysis indicates that historical solid waste storage and disposal activities were confined to areas within Site 12. Since both historical documentation and actual trenching data, to date, support that radiological material was not disposed at NAVSTA TI, the Navy believes there is no need at this time to conduct additional radiological surveys at Sites 30, 31, and 33. Further discussion to support this conclusion is provided below:

An extensive historical radiological information search was performed to support the Historical Radiological Assessment (HRA). There is no documentation to suggest that radioactive materials were disposed in the solid waste disposal areas at Installation Restoration (IR) Site 12 (Site 12) or anywhere else on Naval Station Treasure Island (NAVSTA TI). The recommendation in the HRA to perform radiation monitoring during soil excavation activities was the result of an earlier recommendation from the California Environmental Protection Agency (Cal EPA) Integrated Waste Management Board (IWMB). The IWMB letter dated May 9, 2001, recommended precautionary field screening for radioactive material at the IR Site 12 solid waste disposal areas. The IWMB letter noted that "there is no direct evidence suggesting that radioactive

material was disposed of in the Site 12 disposal pits,” but recommended surveying them based on their experiences in finding low-level radioactive material associated with municipal solid waste burn dumps. The U.S. Department of the Navy's (Navy) Radiological Affairs Support Office (RASO), in response on July 19, 2001, agreed and recommended radiological surveys of these disposal areas.

Since the IWMB recommendation to screen the solid waste disposal areas at Site 12 for radiological material, 580 test trenches have been excavated throughout Site 12 to a depth of 4 feet below ground surface (bgs). The trenches were installed on a 60-foot triangular grid spacing covering 80 percent of Site 12, a 93-acre site. The Navy made the decision to conduct radiological surveying of the trench sidewalls and soil spoil with sensitive gamma scintillation detectors while collecting soil analytical data for the IR Site 12 remedial investigation for chemical and solid waste contaminated soil. No evidence of radioactive material disposal, either physical or measured, was identified (Shaw, 2004). Since the solid waste disposal areas (A&B, 1207/1209, and 1231/1233) at Site 12 were not included in the trenching activities and had been investigated prior to the IWMB recommendation, they have not yet been screened for radiological material. Although it is highly unlikely any radiological material would be found in the solid waste disposal areas given the extensive document search and the results of the trenching surveys, the HRA recommended future screening of the solid waste disposal areas to fulfill the 2001 IWMB recommendation.

The U.S. Environmental Protection Agency (EPA) reviewed aerial photographs from 1931 to 1975 to determine where disposal areas were located at NAVSTA TI (EPA, 1995). Although the Site 12 area has been reportedly used for trash disposal from about 1946 to 1963, according to the 1995 photographic analysis performed by the EPA, there is no evidence that similar activities, in the form of significant debris stockpiling and disposal pits, have taken place on any other areas of NAVSTA TI.

Trench logs for excavations at Site 30 and 31 indicate that the majority of the solid waste in the soil matrix are typical of demolition/construction debris and are commonly found in soils at construction sites with a history of previous land use and redevelopment. The solid waste observed at Site 31 included burned wood/ash, black or rusty soil, concrete, asphalt, and lumber with minor amounts of metal and clay pipes, small pieces of lumber and brick, and soil and wood with hydrocarbon odors. Burned wood/ash was observed in 10 trenches with individual 2 foot layers having concentration ranging from 10-100 % in soil, black rusty soil was observed in four trenches with individual 2 foot layers having concentration ranging from 10-20 % in soil, asphalt was observed in three trenches with individual 2 foot layers having

concentration ranging from 10-20 % in soil, concrete was observed in three trenches with individual 2 foot layers having concentration ranging from 10-20 % in soil, and lumber was observed in one trench at 0-2 feet below ground surface (bgs) having a concentration of 30% in soil. Soil from Site 30, 31, and 33 excavated during previous removal actions or remedial investigations were disposed of off the naval station at a Class I or Class II landfill. Two of the landfills used for disposal of excavated soil from TI, Allied Waste's Forward Landfill and Chemical Waste Management's Kettleman Landfill, were equipped to screen each truckload of soil for radioactive contamination before entering the landfill. The amount of soil screened for radioactivity from each site where soil excavation was performed is presented in Table 1. Excavated soil not passing the radioactive screening procedure would not be received by the landfills. There were not any detections of radioactivity from the excavated soil at TI.

**Table I. NAVSTA TI Excavated Soil Screened for Radioactivity at the Landfill (2003 to present)**

Site/Activity	Location Description	Quantity in Tons	Disposal Location
Site 6	Fire Fighting School located to the east of Site 12 In Parcels T108 and T112	6	Forward
Site 12	Housing Area location of Former Storage Bunker on the northern portion of TI, soil removed during 580 sampling trenches	1,100	Forward
Site 24	Dry Cleaning Facility located on the southeastern portion of TI	2	Forward
		73	Chem Waste
Site 30/31	Former South Storage Yard north of 11th Street and the Daycare Center soil excavated from these trenches included burnt debris and construction material.	184	Forward
Site 33 Parcels T005/T006, T065/T069, T066/T117, T098, T107, T111, T112, and T115	Soils excavated from trenches during the EBS Data Gaps Investigation were collected and stockpiled at Site 6 prior to disposal. Many of the trenches in Site 33 (Water Line Replacement Areas) exhibited burnt debris and construction material.	334	Forward
Petroleum Sites 14/22	New Fuel Farm /Navy Exchange Service Station located on the northeastern portion of TI	13,827	Forward
		254	Chem Waste
Petroleum Site D1B	Soil excavated during a pipeline investigation near 3 <sup>rd</sup> Street	5,194	Forward
Petroleum Site F2A/F2b	Soil excavated during a pipeline investigation near 5th Street	21,983	Forward

The HRA for Treasure Island identifies two known releases of radioactive material during the Navy operation of the naval station. Waste from both releases was disposed of off site. The 1950 spill of radium in Building 233 resulted in a large cleanup operation.

Decontamination and follow-up surveys required almost 9 months. More than 200 barrels of radioactive waste were generated and were stored aboard the USS Independence at Hunters Point Shipyard (HPS) prior to being disposed at sea in water deeper than 100 fathoms. In 1988, a release was detected in Building 344 (radiological material storage vault). The release was limited to contamination inside a Union Carbide Cesium/Barium Nucleonics kit. . The waste created during the cleanup of this release was disposed at a Nuclear Regulatory Commission (NRC) licensed disposal facility outside of the San Francisco Bay area.

The Navy understands that if future screening of the solid waste disposal areas in IR Site 12 detects non naturally occurring \_radioactivity greater than background levels, additional surveys, screening, or sampling will be evaluated not only in the IR Site 12 but in other known debris disposal areas such as Sites 30, 31, and 33.



## **Response to ChemRisk (for TIDA) Comments of September 22, 2005, to the Naval Station Treasure Island Draft Historical Radiological Assessment dated August 2005**

### **Comments and Questions:**

- 1. Comment:** Section 4.4.3.1 mentions a base-wide assessment that was performed to identify and assess sites potentially posing health threats from radioactive materials. Based on the citation in Section 10.0 References, this assessment was done around 1988. Very little is said about this assessment. Did it yield any data relevant to the assessment of potential contamination around Building 233, Building 273, or the USS Pandemonium sites?

**Response:** The 1988 base-wide Preliminary Assessment/Site Inspection (PA/SI) did not yield any data relevant to assessment of potential contamination around Buildings 233 or 273 (Dames and Moore, 1988). Records of the 1950 Building 233 spill and Building 273 associated decontamination operations were not available to Naval Station personnel during the 1988 base-wide PA/SI. The 1988 base-wide PA/SI identifies the USS Pandemonium radiation training area as IR Site 2 (the original location of the USS Pandemonium) and states “because the half-life of the radioactive material used (bromine-82) was on the order of 24-36 hours any remaining radiation level is expected to be below significant levels.” Residual radioactivity did not exist more than three months after the last operation with bromine-82 at USS Pandemonium (~1972). The 1988 base-wide PA/SI concluded no further investigation of the site was required.

- 2. Comment:** Regarding the Cs-137 sources used at the USS Pandemonium sites, there is said to be evidence that the sources were periodically leak tested and demonstrated to be intact. While it is said in Section 8.3.10 that “no reports of leakage were issued” for the Cs-137 sources, is there evidence that no such reports were issued, or is it simply a case that no reports of leakage were located during the document review done to support preparation of this draft HRA?

**Response:** The answer to both questions in the comment is yes. As noted in Section 6.3, there was a specific analysis of the leak tests (performed by NSTI) of the eleven Cs-137 sources used in the USS Pandemonium. The analysis of the leak tests was performed in February 1980. An official record of this test was in the files at NAVSEA DET RASO. No leakage was detected. Shortly thereafter, the Cs-137 sources, while still listed on the NRC License were no longer in use in the USS Pandemonium, and

were kept in the vault, Building 344. The historical review included the command administrative file of the AEC/NRC license, complete copies of the AEC/NRC license files, supplied by the NRC, that include inspection reports and would include reports of leaking sources had any been filed, and copies of the NTTC, Treasure Island files (at NAVSEA DET RASO) of AEC/NRC licenses, and Naval Radioactive Material Permit covering the period from 1974 to 1994. No reports of leaking sources were found.

- 3. Comment:** **It is said that radiological surveys were conducted following each training exercise. Were these radiological surveys limited in scope to areas of the ship mockup itself, or did they also include the underlying pad or nearby soil or gravel?**

**Response:** Although the radiological surveys conducted following the training exercise did not include the underlying pad or nearby soil or gravel, the surveys were comprehensive and not limited in scope to the ship mockup. Radiological surveys were performed in accordance with NAVSCOLCOM INSTRUCTION 5100.5B dated 4/13/1970, which required:

- Radiation surveys to be performed to identify and post Radiation Areas and High Radiation Areas.
- Daily survey of the Radiological Trainer Device after each use until the short-lived isotopes had decayed.
- Air sampling to be performed during each phase of the training exercise that utilized the short-lived isotopes.
- Sampling of the wash water (collected in the holding tanks) to determine when it had decayed to allow unrestricted discharge to the bay.
- Monitoring of all personnel and equipment exiting the area following an exercise.
- Monthly surveys of the exercise area.

- 4. Comment:** **Figure 8.3.12.1 includes an arrow that indicates that Building 273 was located to the east of Building 1312. Another map I was provided, “Figure 1 Map of HRA ‘Impacted Areas’ Treasure Island” indicates that Building 273 was between Buildings 1312 and 1313. Has the former location of Building 273 been determined with any certainty?**

**Response:** Former Building 273 was located approximately between the present Buildings 1312 and 1313. The arrow in Figure 8.3.12.1 will be changed to show the former location of Building 273 between Buildings 1312 and 1313. The 1945 and 1952 maps and photographs of Building 273 place

it about 250 feet from the edge of the island. The 1996 map of TI shows Building 1312 about 400 feet from the edge of the island.

- 5. Comment:** It is stated in Section 8.3.12 that Building 273 was “very likely” used as a center for personnel decontamination activities during cleanup after the 1950 radium spill in Building 233, and that Building 273 was “probably always set up to accommodate decontamination operations including collection of decontamination materials and prevention of spread of contamination.” Given the lack of knowledge about how decontamination fluids were actually handled, it is surprising that no further actions are recommended, even though it is said that no radiological investigations have been performed for this site. While the 2003 gamma monitoring of randomly selected locations outside of documented solid waste disposal areas within IR Site 12 appears to have included some excavations within the general area of former Building 273, results of those analyses have not been made available.

**Response:** As is noted in Section 6.2, the function of Building 273 was a decontamination building for the Chemical Warfare School. It was specifically identified as the ‘decontamination building’ as early as 1945 and continued in that role at least through 1950. The specific building utilized for decontamination during the initial recovery from the 1950 spill in Building 233 is not identified in the documents available. However, since Building 273 was known as the decontamination building, the conclusion is reached that it was employed during the Building 233 spill recovery. The initial incident report states after the 1<sup>st</sup> day of the spill, NRDL personnel conducted the spill recovery and utilized the Chemical Warfare School for monitoring and decontaminating students. Decontamination and radiological control procedures used by NRDL personnel are described in NRDL reports. NRDL personnel established standard contamination control procedures prior to student arrival and monitored the students carefully at the decontamination center (a building number is never specified). NRDL personnel decontaminated five students, the only operation involving fluid handling. Building 273 and the Chemical Warfare Office (Building 269) have since been demolished and replaced with housing. At least twelve trenches were excavated in the immediate vicinity of the demolished buildings (location of current Buildings 1312 and 1313). Gamma monitoring of the spoils removed from the trenches and of the trenches themselves did not show any significant difference between trenches in these areas and trenches in other areas in IR Site 12, i.e., background. See response to ChemRisk comment # 6 below for further discussion of the monitoring. Thus, there is no indication of a release of radioactivity in the vicinity of Buildings 273.

- 6. Comment:** Given the apparent importance of results of the 2003 gamma monitoring of randomly selected locations outside of documented solid waste disposal areas within IR Site 12 to the HRA, its results and the report of their evaluation (“to be documented in a separate report”) should be made available before the HRA is finalized so that the reasonability of arguments and conclusions presented in the Draft HRA can be evaluated.

**Response:** A draft technical memorandum titled “Treasure Island Site 12 Radiological Field Screening” dated March 1, 2004, and presented to the Base Realignment and Closure (BRAC) Cleanup Team (BCT) members at the April 2004 BCT meeting, has been finalized and entered into the administrative record as of November 2, 2005 (Shaw, 2005). In summary, the Technical Memorandum provides the following information: Investigation of 580 test trenches in IR Site 12 used a Ludlum survey meter with a sodium iodide scintillation detector and included four gamma radiation readings at each trench location. The trenches were monitored (scanned) first in a 2-foot deep trench and then in the lower half of the trench after it was excavated to 4-feet deep. The removed material (spoils) from each trench was also monitored (scanned) in two steps, first the spoils removed from the 2-foot deep trench and second the spoils removed from the bottom half of the trench. A total of 2,244 gamma radiation readings were recorded. The readings were initially compared to a surface background value of 6,500 counts per minute (cpm). The background was established in a location known to be radiologically non-impacted. An action level of twice background was used to evaluate the gamma readings. Only three gamma readings exceeded the twice-surface background criteria. Each of the three greater than twice background readings was taken at the 2 to 4 foot depth in a trench and would not have exceeded a background reading at that depth if one had been taken. In general, soil surrounding a detector in a trench produces a higher reading than when the detector is above ground. The spoils removed from the trenches did not have elevated gamma readings. Soil samples were taken from each of the three above twice background locations and analyzed for gamma emitting isotopes. None of the samples indicated elevated levels of radioactivity. Varying levels of natural radioactivity were measured that were not significantly different than a background sample obtained from a rock quarry.

An independent assessment of the trench and spoils gamma readings was performed by Tetra Tech EM Inc. In this assessment, each set of data (trench readings at two depths and spoils readings at the two depths) was analyzed separately. A mean and standard deviation were calculated for each data set and the gamma readings were compared to a criterion of the mean plus 3 standard deviations of that set. Readings that exceed the criterion identify locations, which are different than the average trench reading. Tetra Tech EM Inc findings are summarized below:

- The gamma readings from all trenches at the 0 to 2 foot level had two trenches that exceeded the criterion.
- The gamma readings from all trenches at the 2 to 4 foot level had five trenches that exceeded the criterion.
- The gamma readings of the first two feet of spoils removed from all trenches had four trenches that exceeded the criterion.
- The gamma readings of the last two feet of spoils removed from all trenches had five trenches that exceeded the criterion.

Only two of the locations had more than one reading exceeding the criterion. Description of the debris in the trenches and the description of the soil removed do not indicate a pattern or a correlation between any of the data. Shaw evaluation of all the data concludes that there is no data indicating the presence of radioactive contamination above ambient or that would warrant further characterization.

The Navy has reviewed the data and concludes the readings are variation of background concentrations. The debris descriptions do show a percentage of gravel, asphalt, macadam, and rock in most of the trenches that exceed the criterion. These materials can contain higher concentrations of natural radioactive materials than the soil in other trenches. No change is necessary to the HRA.

7. **Comment:** **The 2003 gamma monitoring of 580 excavations at randomly selected locations outside of documented solid waste disposal areas within IR Site 12 appears, based on information given, to be a reasonable step towards characterization of associated areas. Given the indication that wastes were spread across wide areas during subsequent grading and construction, have any walk-over or drive-over gamma surveys been conducted to ensure that radiation sources or areas of contamination are not missed?**

**Response:** Since there is no documentation to suggest that radioactive materials were disposed in the solid waste disposal areas at IR Site 12 or anywhere else on NAVSTA TI, no walk-over or drive-over gamma surveys were conducted at IR Site 12. See response to DTSC's comment # 1.

8. **Comment:** **It is appropriate that plans call for radiation monitoring during soil excavation of the known solid waste disposal areas within IR Site 12. Evaluation of whether such monitoring is satisfactory cannot be done based on the information contained in the Draft HRA, but must be based on review of the specific monitoring plan for those activities.**

**Response:** The Navy agrees with the comment.

9. **Comment:** **It is stated in Section 6.5 that trash and debris were “most notably” disposed of in four solid waste disposal areas within IR Site 12. How will other identified or potential waste disposal areas outside of IR Site 12 be evaluated for potential health hazard (such as Sites 31 and 33)? What is the justification for considering these other waste disposal areas as not impacted? The Navy apparently does not intend to remove debris from a waste disposal area beneath 11<sup>th</sup> Street in Site 31, and this debris could be a long-term liability for TIDA. We request justification for why the Navy has no concerns about potential disposal of radioactive material at this location.**

**Response:** NAVSTA TI’s primary activities were training and not that of a shipyard or industrial maintenance facility that removed or repaired radioluminescent devices and disposed of the devices and associated waste in landfills. There is no supporting evidence to indicate NAVSTA TI disposed of any radioluminescent devices or generated associated waste. All known radiological material used for training and radiological waste from the two spills at NAVSTA TI was transferred or disposed off the naval station. The US EPA photographic analysis indicates that historical solid waste storage and disposal activities were confined to areas within Site 12. Since both historical documentation and actual trenching data, to date, support that radiological material was not disposed at NAVSTA TI, the Navy believes there is no need at this time to conduct additional radiological surveys at Sites 30, 31, and 33. Further discussion to support this conclusion is provided in the response to DTSC’s comment # 1.

10. **Comment:** **With the surveys that have been conducted in the past and the planned or ongoing “Characterization Survey” and “Scoping Survey” of floors, sanitary drains, and crawl spaces, the assessments of Building 233 appear to satisfactory address radiological conditions after the 1950 radium dispersal incident.**

**Response:** The Navy appreciates the comment.

11. **Comment:** **With the surveys that have been conducted in the past and the planned or ongoing “Final status survey,” the assessments of Buildings 343 and 344 appear to satisfactory address radiological conditions after isolated contamination was identified and cleaned up in 1980s and 1990s.**

**Response:** The Navy agrees.

**12. Comment:** Throughout the draft report, there are several figures that are impossible to read (such as Figure 8.3.4.1). A better effort should be made to obtain clear images and present them in appropriate sizes so that the contained information is useful to the reader. Additionally, the figures provided in the report do not show the location of impacted areas relative to the entire island. The report needs an overview figure of Treasure Island that shows the location of all impacted areas, such as “Figure 1” that was distributed at the June 2005 BCT meeting.

**Response:** A larger than single page base-wide map will be inserted in the HRA. The map will show the location of all of the identified impacted and potentially impacted sites.

**13. Comment:** Throughout the draft report, there are acronyms and abbreviations used that are not included in the List of Abbreviations, Acronyms, and Symbols and are not defined when first used.

**Response:** The report will be reviewed for this problem.

**14. Comment:** Section 4.4.3.3 states that on-site visual inspections were conducted. The report should document who conducted these inspections, when were they conducted, and how they were documented.

**Response:** The author of the report, Robert O’Brien, visited Treasure Island multiple times during research in preparation for drafting the document. The observations are made as a result of those visits..

**15. Comment:** In Table 5-1, it is unclear what the letters in the comments refer to (e.g., “B through E added for use in Model 11F3A...” Please provide explanation. There does not appear to be a complete accounting of the deletion of all sources. For example, for license 4-4346-2, Amendment #1 documents 21 cobalt sources while the next amendment listed (#8) only documents 11 cobalt sources. Please provide a complete accounting for the removal of sources.

**Response:** Amendment #5 of NRC license 04-4346-1 added authorization for use of the short-lived isotopes used in the Model 11F3A radiological trainer. The format of the license utilizes the letters B through E to identify the added isotopes. Table 5-1 will be expanded to include all amendments to both NRC licenses and the NRMP.

**16. Comment:** Regarding the decontamination of Building 233 following the radium spill, the text indicates that some materials were disposed of (p. 6-8 refers to disposal of surfaces that could not be decontaminated and p. 6-21 refers to furniture, rubber floor mats, linoleum flooring). Please document where these materials were disposed of.

**Response:** More than 200 barrels of radioactive waste were generated and were stored aboard the USS Independence at Hunters Point Shipyard. The drums were weighted with concrete and sunk at sea at a depth of more than 100 fathoms. This information will be added to the Final HRA.

**17. Comment:** On page 7-6, the text states that there is no probable mechanism for transport of surface soil. Wind is a very probable transport mechanism for surface soil.

**Response:** The text cited is an example of how the assessment is performed. In this case the contaminant is slightly above background levels of Ra-226 on interior building surfaces. The assessment that there is no probable transport mechanism to cause detectable levels of contamination off-site is correct.

**18. Comment:** On page 8-14, (regarding Building 3), the text indicates that structures have a “low” potential to be a migration pathway. The reason for this designation is unclear given that the building itself was no potential to have contaminated media.

**Response:** The designation was in error. The potential migration pathways for Structures will be changed to “None”.



## **Response to RAB member (Ms. Dale Smith) Comments of September 27, 2005, to the Naval Station Treasure Island Draft Historical Radiological Assessment dated August 2005**

### **General Comment:**

- 1. Comment:** It would be helpful if there were a base wide map with the individual sites highlighted, so the reader could get a sense of the general location of each. This would be especially true for the USS Pandemonium, which had not been discussed at RAB meetings. The maps provided of each site show a very small portion of the island and don't provide context.

**Response:** A larger than single page base-wide map will be inserted in the HRA. The map will show the location of all of the identified impacted and potentially impacted sites.

### **Specific comments:**

- 1. Comment:** 3-12 The species cedar warring is not recognized as a bird species. Does the author mean cedar waxwing?

**Response:** Cedar waxwing is correct. The reference in Section 3 will be revised to read 'cedar waxwing'.

- 2. Comment:** 8-2 The connection between radon and radium is not understood. Does the release of airborne radon have anything to do with atomic decay or is this a function of ground disturbance? If it is the result of ground disturbance, why is this the only mention of it in any document including this one?

**Response:** Radium is a radionuclide formed by the decay of uranium and thorium which are present at very low levels in virtually all rock, soil, water, and plants. Most radium (radium-226) originates from the decay of uranium-238. Radium decays to form the radioactive gas, radon, which is chemically a non-reactive gas. Radon decays into other radioactive isotopes.

The radium in the source capsule continuously decayed to radon such that a significant amount of radon was present in the source capsule and was released when the capsule was crushed. The radium continued to decay to radon. The release of radon from the capsule and the continued production of radon created hazardous radioactivity levels in the building air until the radium was removed from the building.

**3. Comment: If direct surveys of the areas were not performed and gamma analysis of the above limits wipes was not performed, how can the survey be considered complete?**

**Response:** The Navy decision to conduct additional surveys in Building 343 and 344 is based on the fact that no direct radiation surveys of the storeroom were performed.

**REFERENCES:**

Dames and Moore, 1988. Preliminary Assessment/Site Inspection of Naval Station Treasure Island, CA, NEESA Document 13-092, April 1988.

Shaw, 2005. Treasure Island Site 12 Radiological Field Screening Technical Memorandum, November 2, 2005.