DEPARTMENT OF THE NAVY
ENGINEERING FIELD ACTIVITY, WEST
NAVAL FACILITIES ENGINEERING COMMAND
900 COMMODORE DRIVE
SAN BRUNO, CALIFORNIA 94066-5006

IN REPLY REFER TO:

5090
Ser 09ER1DS/L5091
27 Mar 1995

Mr. Cyrus Shabahari
Department of Toxic Substances Control
700 Heinz Avenue
Building F, Suite 200
Berkeley, CA 94710

SUBJ: TECHNICAL MEMORANDUM, NATURALLY OCCURRING RADIOACTIVE MATERIAL (NORM) IN SOILS AT IR-7 AND IR-18, PARCEL B AT ENGINEERING FIELD ACTIVITY WEST, HUNTERS POINT ANNEX, SAN FRANCISCO, CA, MARCH 20, 1995

Dear Mr. Shabahari:

As an action item from the radiation investigation meeting of February 2, 1995, enclosed is the subject document for your review and concurrence. The technical memorandum combines the results of the radiation investigations performed by PRC Environmental Management, Inc. (PRC) and the results of petrographic analysis of IR-7 and IR-18 soils by the U.S. Environmental Protection Agency. As requested by Mr. Claude C. Goode of California Department of Health Services, enclosed in the technical memorandum is a figure that shows the locations where soil samples were collected for analysis.

The concurrence being sought under this letter is for no further radiological investigations and no radiological remediation at the Submarine Base Area (IR-7) and the Waste Oil Disposal Area (IR-18) at Hunters Point Annex. The technical memorandum is provided as a justification for this concurrence.

Should you have any questions regarding this matter, the point of contact is Commanding Officer, Engineering Field Activity West, Naval Facilities Engineering Command (Attn: Mr. Dave Song, (Code 09ER1DS), (415) 244-3534).

Sincerely,

Richard Powell

RICHARD POWELL
Lead Remedial Project Manager
By direction of
the Commanding Officer

Copies to:
U. S. Environmental Protection Agency (Attn: Ms. Alydda Manglesdorf)
U. S. Environmental Protection Agency (Attn: Ms. Claire Trombadore)
California Regional Water Quality Control Board (Attn: Mr. Richard Hiett)
NAVSTA Treasure Island (Attn: LT Nanette Roberts)

5090
Ser 09ER1DS/L5091
27 Mar 1995

SUBJ: TECHNICAL MEMORANDUM, NATURALLY OCCURRING RADIOACTIVE MATERIAL (NORM) IN SOILS AT IR-7 AND IR-18, PARCEL B AT ENGINEERING FIELD ACTIVITY WEST, HUNTERS POINT ANNEX, SAN FRANCISCO, CA, MARCH 20, 1995

City and County of San Francisco (Attn: Ms. Amy Brownell)
National Oceanic & Atmospheric Administration (Attn: Ms. Denise Klimas)
U. S. Fish & Wildlife (Attn: Mr. Jim Haas)
U. S. Department of the Interior (Attn: Mr. Corville Nohava)
California Department of Fish & Game (Attn: Dr. Mike Martin)
Bay Area Air Quality Management District (Attn: Ms. Catherine Fortney)
ATSDR (Attn: Ms. Joan Davis)
San Francisco District Attorney (Attn: Mr. John Cooper)
Port of San Francisco (Attn: Ms. Karen Glatzel)
Bay Area Base Transition Coordinator (Attn: CDR Al Elkins)
California Office of Environmental Health (Attn: Ms. Margy Gassel)
California Department of Health Services (Attn: Ms. Alyce Ujihara)
RAB Member: San Francisco Redevelopment Agency (Attn: Mr. Byron A. Rhett)
RAB Member: Bay Conservation and Development Commission (Attn: Ms. Jennifer Ruffolo)
RAB Member: Business of Hunters Point Shipyard (Attn: Mr. Scott Madison)
RAB Member: Mayor's Hunters Point Shipyard Citizens Advisory Committee (Attn: Mr. Al Williams)
RAB Member: The New Bayview Committee (Attn: Mr. Samuel Murray)
RAB Member: SEED (Attn: Mr. Sy-Allen Browning)
RAB Member: ARC/Arms Control Research Center (Attn: Mr. Saul Bloom)
RAB Member: Law Offices of Leslie R. Katz (Ms. Leslie Katz)
RAB Member: Mr. Nicholas S. Agbabiaka
RAB Member: Ms. Carolyn Bailey
RAB Member: Ms. Silk Gaudain
RAB Member: Ms. Karen Huggins
RAB Member: Mr. Wedrell James
RAB Member: Ms. Ilean McCoy
RAB Member: Mr. Willie Bell McDowell
RAB Member: Mr. Jeffrey Shaw
RAB Member: Mr. David Umble
RAB Member: Ms. Julia Viera
RAB Member: Mr. Charlie Walker
RAB Member: Ms. Caroline Washington
RAB Member: Ms. Gwenda White
RAB Member: Mr. Michael Harris
PRC Environmental Management, Inc. (Attn: Mr. Jim Sickles)
Harding Lawson Associates (Attn: Mr. David Leland)

CLEAN

Contract No. N62474-88-D-5086

Contract Task Order No. 155

Navy Engineer-in-Charge: David Song
PRC Project Manager: David Preston
PRC Task Manager: David Martinez

ENGINEERING FIELD ACTIVITY WEST
NAVAL FACILITIES ENGINEERING COMMAND
HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

NATURALLY OCCURRING RADIOACTIVE MATERIAL IN SOILS AT IR-07 AND IR-18 PARCEL B

TECHNICAL MEMORANDUM

Prepared By

PRC ENVIRONMENTAL MANAGEMENT, INC.
135 Main Street, Suite 1800
San Francisco, CA 94105
(415) 543-4880

March 20, 1995

1.0 INTRODUCTION

PRC Environmental Management, Inc. (PRC) is conducting a three-phase environmental radiation investigation at Hunters Point Annex (HPA), San Francisco, California. This investigation is under the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract N62474-88-D-5086, Contract Task Order (CTO) Number 0155, on behalf of the Department of the Navy, Engineering Field Activity West (EFA WEST), Naval Facilities Engineering Command.

The purpose of this technical memorandum is (1) to address the presence of naturally occurring radioactive materials found in fill dirt at the Waste Oil Disposal area (IR-18) and the Submarine Base Area (IR-07) within Parcel B at HPA and (2) to provide justification for no further radiological investigation at the sites.

2.0 SUMMARY

Radiation surveys performed during the 1991 Surface Confirmation Radiation Survey (SCRS) at HPA, identified two areas within Parcel B that contain soils which emit elevated gamma count rates (PRC 1992). These areas include the Submarine Base Area (IR-07) and the Waste Oil Disposal Area (IR-18). Gamma count rates from soils there were measured to be more than one-and-one-half times that of expected facility-wide background. Soil samples collected from IR-18 contained approximately 5.0 picocuries per gram (pCi/g) radium-226 (^{226}Ra). The decay of ^{226}Ra produces radon (^{222}Rn) gas.

Radiation surveys performed during the SCRS indicate that the soil does not emit significant amounts of radon gas. Radon flux rates at the site were found to be consistent with HPA background levels. Gamma exposure rates at the site are consistent with facility-wide background gamma exposure rates at HPA.

In 1994, petrographic and radiometric analysis of the soil was completed by the U.S. Environmental Protection Agency (EPA), National Air and Radiation Environmental Laboratory (NAREL). The soil was found to contain minerals with naturally occurring radioactive isotopes of the uranium and thorium decay series. These radioactive materials, including radium-226, were naturally incorporated

into the mineralogy of monazite and zircon and have not been depleted or enhanced by any manufacturing process (EPA 1994). The soil does not contain fission products (plutonium and cesium) associated with decontamination related activities from Operation Crossroads. Based on its mineralogy, it appears that the soil was imported from another location in California for use as fill dirt at HPA.

3.0 PROJECT HISTORY

IR-07 and IR-18 were surveyed during the first phase of radiation investigations at HPA conducted in 1991. During the SCRS, facility-wide background levels for gamma count rates, ^{226}Ra soil concentrations, gamma exposure rates, and radon flux rates were established.

The SCRS identified areas within IR-07 and IR-18 that contained soils that emitted elevated gamma count rates. Gamma count rates from these soils were measured to be more than one-and-one-half times that of expected facility-wide background. Soil samples collected from these locations were found to contain approximately 5.0 pCi/g ^{226}Ra. The expected background level of ^{226}Ra for soils at HPA, in soils derived from the Franciscan Complex, and soils found in the San Francisco Bay Area, is approximately 0.5 pCi/g.

Gamma exposure rates measured at IR-07 and IR-18 ranged between 5 and 9 microroentgen per hour (μR/hr) at 3 feet above ground surface. Facility-wide background gamma exposure rates, established during the SCRS, ranged from 4.4 to 9.5 μR/hr with an average of 7.8 μR/hr using a Reuter/Stokes pressurized ionization chamber (PRC 1992).

Radon flux rates measured at IR-07 were less than 0.30 picocuries per square meter per second (pCi/m^2/sec) (PRC 1992). This level is over 60 times lower than EPA's maximum allowable radon flux rate standard of 20 pCi/m^2/sec (EPA 1978). This standard is applied primarily to regulate construction of residential buildings over uranium mill tailings that contain ^{226}Ra. The radon flux rates at HPA were representative of those found in typical soil in the San Francisco Bay Area. Facility-wide background radon flux rates at HPA, established during the 1992 SCRS, ranged from 0.01 to 1.12 pCi/m^2/sec (PRC 1992).

Soils that exhibit elevated gamma count rates in IR-07 and IR-18 are restricted to an area approximately 100 feet wide by 400 feet long on the hillside immediately northeast of building 916. The hillside is topped by Donahue Street. The level portions of IR-07 and IR-18 are adjacent to each other. They are approximately 25 feet below Donahue Street and are paved with asphaltic concrete.

During the 1940s and 1950s, the Navy created the flatland area of IR-07 and IR-18 by filling in the northern bay margin during its activities at the shipyard. Many buildings that were constructed on this fill have since been demolished. IR-07 was originally used by the Navy in support of submarine maintenance, as an area for sandblast grit disposal, industrial landfill operations, and painting. IR-18 was designated as a Triple A contamination site. Waste oil spread over the soil surface was paved over with asphaltic concrete. IR-18 was last used as a recreational vehicle campground and parking lot.

At the time the SCRS was conducted, concern existed that elevated gamma count rates at IR-07 and IR-18 were possibly the result of radioactive contamination from sandblast waste from decontamination efforts following Operation Crossroads. In late 1946, nuclear weapon tests were conducted near Bikini Atoll in the Marshall Islands. These tests were known collectively as Operation Crossroads (Cook 1988). Ships were returned to HPA drydocks after Operation Crossroads for decontamination studies after they were found to be resistant to radiological decontamination techniques that employed water blasting. Many methods of decontamination were tried before sandblasting was determined to be the only method that satisfactorily removed the contamination (Weisgall 1994). It has been postulated that fallout particles, including cesium-137 and plutonium-239, may have been mixed with sandblast wastes that were generated during Operation Crossroads decontamination activities. No scientific proof or documentation indicates these materials were disposed of at HPA.

Navy documentation has established that all radioactive sandblast waste material and radioactive hull scrapings, generated from decontamination, were properly packaged and disposed of by ocean dumping. During 1946 and 1947, radioactive wastes from these activities were dumped in an approved zone near the Farallon Islands, 25 to 40 miles offshore from San Francisco (U.S. Navy 1949). Soil samples collected during the SCRS were analyzed for mixed fission products and

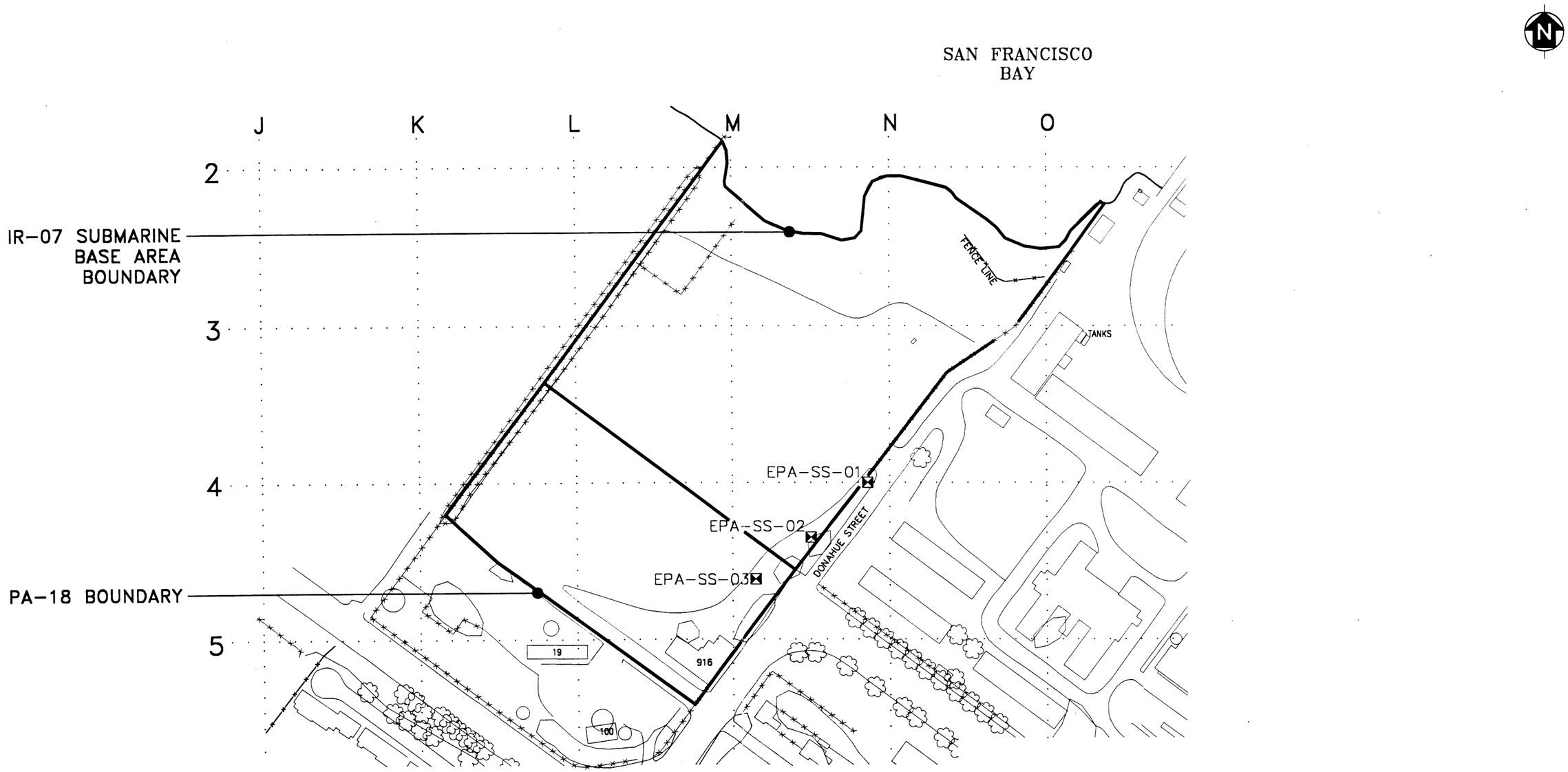
plutonium. Mixed fission products and plutonium in soils were not detected in concentrations above normally expected background levels associated with worldwide atmospheric fallout (PRC 1992).

4.0 EPA PETROGRAPHIC ANALYSIS OF SOILS AT IR-07 AND IR-18

In 1994, after the SCRS was completed, the EPA collected soil samples from IR-07 and IR-18 for petrographic and radiological analysis. The figure on the next page shows locations where the three samples were collected. The analyses were performed to identify the source of elevated gamma count rates emitted by soils at the site. Three soil samples were collected and sent to EPA NAREL, in Montgomery, Alabama. The soil's mineralogy (particle size, mineral type, and other physical characteristics) was established using petrographic analysis; its radioisotopic constituents were identified by gamma spectroscopic analysis. These two techniques, when used together, give a detailed classification of soil radioactivity by particle size, mineral type, and radioisotope.

EPA petrographic analysis shows that the soils contain background quantities of uranium, thorium, and radium. Based on the mineralogy of the sand fraction that was described in the EPA NAREL report, zircon and monazite appear to account for most of the observed radioactivity (EPA 1994). These minerals are somewhat distinctive and would not generally be associated with sands derived from serpentinite or other rocks that outcrop in the vicinity of Hunters Point. Both monazite and zircon tend to be associated with granitic intrusive rocks, particularly pegmatites (Deer, Howie, and Zussman 1966).

These distinctive minerals suggest that the sand is not of local origin and was imported, from another locality some distance away, for use as fill. Possible source areas for monazite-containing sands would be the Salinian basement rock on the west side of the San Andreas fault and the granitic intrusives of the Sierra Nevada.



LEGEND

EPA-SS-01 EPA SOIL SAMPLE LOCATION

0 100' 200' 300' 400'
SCALE 1" = 200'

FIGURE
LOCATION OF EPA SOIL SAMPLES
AT IR-07 AND PA-18
HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

WTL SF (044-0155)HPIR7RAD.DWG - 12/21/94

REFERENCES

Cook, C.S. 1988. The Legacy of Crossroads, Naval History (periodical). Fall.

Deer, Howie, and Zussman. 1966. An Introduction to the Rock-Forming Minerals.

PRC Environmental Management, Inc. (PRC). 1992. Surface Confirmation Radiation Survey, Naval Station Treasure Island, Hunters Point Annex San Francisco, California.

U.S. Environmental Protection Agency (EPA). 1978. Standards for Protection Against Uranium Mine Tailings, U.S. Code of Federal Regulations, Title 40, Subpart 192.

EPA. 1994. Hunters Point Annex - Parcel B. Radiological and chemical support center. EPA contract No. 68D20155. Sanford Cohen and Associates.

U.S. Navy. 1949. Radiological Decontamination of Non-target Vessels, Operation Crossroads Joint Task Force One, 3 vols. April.

Weisgall J.M. 1994. Bikini, Proceedings, Naval Institute Press Book Adaptation. February.