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From: Commanding Officer, Engineering Field Activity, West. Naval Facilities Engineering
Command

To: Distribution

Subj: SUBMISSION OF THE RESPONSES TO COMMENTS ON THE DRAFT RESULTS
OF THE SUBSURFACE RADIATION INVESTIGATION IN PARCELS B AND E.
ENGINEERING FIELD ACTIVITY, WEST. NAVAL FACILITIES ENGINEERING
COMMAND, HUNTERS POINT ANNEX. SAN FRANCISCO, CALIFORNIA

Encl: (1) Navy Responses to Comments on the Draft Results of the Subsurface Radiation
Investigation in Parcels B and E.

1. Enclosure (1) is forwarded for your review and comment. Please provide written comments
to Commanding Officer, EFA West, 900 Commodore Drive, Code 1832.3, Attn: Dave Song, San
Bruno, CA 94066 by February 11, 1996.

2. If you have any questions, the point of contact is Mr. Dave Song at (415) 244-2561.

Original signed by:

RICHARD E. POWELL
By direction of
the Commanding Officer

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**RESPONSE TO CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY (CAL/EPA),
DEPARTMENT OF TOXIC SUBSTANCES CONTROL
COMMENTS ON THE RESULTS OF SUBSURFACE RADIATION INVESTIGATION
IN PARCELS B AND E REPORT**

- Comment 1** **Section 1.2.2: it is important to establish the background values in San Francisco before comparing the elevated readings at HPA.**
- Response** Background radiation levels from non-impacted areas of HPA are more applicable for comparison to impacted areas than background radiation levels from elsewhere in San Francisco. The geological composition, and thus background radiation levels, are more comparable. The language used regarding background radiation at HPA will refer only to radiologically nonimpacted areas at HPA.
- Comment 2** **Section 1.3.2: it is important to explain how you can estimate the number of sources of 2700 with any degree of certainty.**
- Response** The value of 2700 radioluminescent point sources was estimated by taking the number of anomalies identified at and below the surface and establishing a ratio of the approximate number of point sources over the volume of soil excavated from trenches and test pits where radioactive material was encountered. Computer software (SURFER) was used to approximate the total volume of soil that encloses the test pits and trenches where radioactive material was detected. Based on the total volume of soil that may contain radioactive material, an estimate of the number of point sources was then calculated.
- Comment 2a** **How do you know that Cesium-137 mixed with sandblast did not get into the Bay? It is important to note that the Navy has not investigated the area for radioactivity yet. We believe it is inaccurate to state that there is no "scientific proof."**
- Response** The tidal area adjacent to the landfill area is being investigated in phase II of the radiation investigation at HPA. However, the sandblasting activities associated with Operation Crossroads that is referred to was documented by the Navy to have been conducted only within Drydock 4. This drydock was thoroughly radiologically surveyed by the Navy for mixed fission products and a confirmation radiation survey was performed by PRC Environmental Management, Inc. (PRC) in the summer of 1994. No Cesium-137 or any other mixed fission contamination were found. The survey results indicate that the contaminated sandblast material was properly removed from the drydock and properly packaged for disposal. Records indicate that the contaminated sandblast material was disposed of by deep ocean burial as this was a common and accepted practice at the time. The term "scientific proof" will be deleted.

Comment 3

Section 2: field operations needs to be expanded to be comprehensive. This section should contain information on the process and location of each investigation/trenching area.

Response:

The process of location selection, surveying test locations, digging test locations, and analyzing material within the trenches and test pits is presented in Section 2. Figure 6 provides the locations for each trench and test pit.

**RESPONSE TO CALIFORNIA DEPARTMENT OF HEALTH SERVICES (DHS) COMMENTS
ON THE RESULTS OF SUBSURFACE RADIATION INVESTIGATION
IN PARCELS B AND E REPORT**

General Comments: The reviewed draft report summarized the results of an investigation to characterize the nature and extent of radioactive materials at Parcels B and E. No risk assessment concerning the identified material has been performed. Thus, it is premature to establish any risk value.

Specific Comments:

Comment 1 **Page ES-1: Paragraph three indicates subsurface gamma emitting point sources that include illuminators, ship instruments, and dials "with an approximate activity of one microcurie each." Are these documents or tests that support the quote? Are ship instruments and dials also limited to one microcurie?**

Response Discussions with RASO indicated that most radium-containing materials that were used by the Navy ranged in activity from approximately 0.15 microcuries to 20 microcuries. Much of the material contained less than 1 microcurie of radium-226. Large objects such ship compasses might have contained multiple sources of radium-226 that totaled up to about 20 microcuries per device.

Comment 2 **Page 1, section 1.1: Paragraph two indicate that "Health risks from point sources of radium-containing devices and the application of remedial alternatives will be addressed in the Parcel E Remedial Investigation report." This is inconsistent with comment (1) above, whereas a one microcurie activity will in effect exceed Category B, as defined by a Public Health Assessment by the U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, (ATSDR) Public Health Hazard Conclusion. (This category is used for sites that pose a public health hazard as the result of long-term exposure to hazardous substances.) This is further indicated by soil samples in excess of cancer risk hazards of 10^{-5} as established by the U.S. Environmental Protection Agency.**

Response As stated in the text and in the response above to the general comments, the reviewed report does not attempt to address risk posed by the radium containing devices in Parcel E. EPA's Health Effects Assessment Summary Tables provide general risk slope factors for diffuse radioactive contaminants. The radium found at Parcel E was generally found not to be diffuse. The risk posed by radium containing materials found at Parcel E will be appropriately addressed in the Parcel E Remedial Investigation Report.

Comment 3

Page 2, sections 1.2.2: "Results indicate that concentrations of gross alpha and beta-emitting airborne particulates at HPA were similar to background levels normally found in the San Francisco Bay Area. What is the source of this information? How were they determined?"

Response

San Francisco Bay Area background air particulate levels have been erroneously referred to in this report. Several air particulate surveys have been performed over the past several years confirmed that no radioactive particulates associated with former operations at the facility were impacting the local community, civilian businesses on base, and consultants performing environmental investigations at HPA. The language will be modified to read, "Results indicated that concentrations of gross alpha and beta-emitting airborne particulates at HPA were within the range of ambient or normally expected background values."

Comment 4

Page 3, section 1.2.2: Paragraphs two and three reference a Surface Confirmation Radiation Survey (SCRS) from 1992, indicating that no mixed fission products are present in soils sampled at Installation Restoration (IR), IR-01 and IR-02. The soil sample results for phase two do not show tests for such products, which have been indicated as possibly having been dumped as sandblast waste.

Response

Gamma spectroscopy was performed on all subsurface soil samples sent to the laboratory for analysis. Cesium-137 was not detected in any of the 11 samples submitted for analysis. Only radium-226 and daughter products were detected in the soils. This is probable due to the fact that they are subsurface soil samples and subsurface soils would not be expected to have been exposed to fallout material associated with nuclear weapons testing.

Former naval operations regarding the use, storage, and disposal of sandblast materials generated during Operation Crossroads is well documented. Decontamination of naval vessels using sandblast material was only performed in Drydock 4. The drydock has been surveyed several times for fission products by Mare Island Naval Shipyard personnel and PRC Environmental Management, Inc. (PRC). All sandblast material was drummed and disposed of within an ocean disposal site near the Farallon Islands.

Comment 5

Page 3, section 1.3: Is this date accurate? Is this a possible typographical error? Item 1.2.1 on page 5 indicates the land was privately held until 1939.

Response

The reference to HPA supporting shipbuilding and maintenance since 1869 does not specifically reference those activities in conjunction with the Navy. The area has been used for shipping activities for quite a long time. The Department of Defense purchased the property in 1939 and leased it to Bethlehem Steel. At the start of World War II the Navy took possession of

the property.

Comment 6

Page 5, section 1.3.2: There is no distinction between point sources in the form of deck markers and other forms of dials for instruments. Certain sources were produced as sealed sources prior to 1960 and others as exempt quantities. Later it was determined that many that were originally considered as sealed were not adequately sealed and radium could be released. The marker point sources apparently have leaked as indicated by soil samples. The possibility of over 2700 of these devices having been disposed of in this area is considered to present a potential hazard, in contrast to the summary statement "Exposure to radium-226 posed no apparent health risk" as stated in the Public Health Assessment prepared by the Agency for Toxic Substances and Disease Registry (ATSDR).

Response

Radium-containing paint was applied to devices such as dials, gauges, and deck markers associated with naval instrumentation. These were not sealed sources. As would be expected, some of the radium-containing paint migrated off of the buried components or the component completely oxidized leaving the radium-containing paint unattached. Based on the investigation to date, it does not appear that any of the point sources are sealed sources and the migration within the soil surrounding the point source is minimal (few inches from the source). No risk assessment concerning the source terms identified has been performed. Any disagreement with the public health assessment from ATSDR should be directed to the Public Health Service and not to the Navy; however, until there is a validated alternative to ATSDR's public health assessments, the Navy will abide by its methodology and conclusions.

Comment 7

Page 17, 2.3.1: Point sources that were collected were not analyzed for activity or leakage. Only soil that exhibited diffuse gamma activity, was sampled for gamma spectroscopic analysis. The soil analysis results indicate elevated levels of Radium. Leakage from the point sources appears eminent. This needs to be identified by analysis of the point sources for leakage.

Response

As described in the response to comment 6 above, the buried radium-containing components would be expected to further degrade since most of the components are made of steel. Therefore, it would be expected and was confirmed during the trenching investigation, that there would be a minor amount of diffuse contamination surrounding the point source as it continues to decompose.

Comment 8

Page 17, section 2.3.2: Normal background count rate in excavations varied from 5,00 to 10,000 CPM. The report states "This is typical of San Francisco Area geology." If the general background gamma count rate range was determined "by gamma logging at a specific depth in the

entire trench", and determined as 5,000 to 10,000 CPM, explain how this is determined as typical of the San Francisco Bay Area. The "general background gamma count rate" appears to identify both normal background for the vicinity and for the inside of the trenches. What is normal background determined in adjacent areas?

Response

San Francisco Bay Area geology has erroneously been referred to in this report when discussing background count rates. The reference to San Francisco Bay Area geology will be removed from the text. The geology (soils) in noncontaminated areas of HPA has been surveyed and count rates ranging 5,000 to 10,000 count per minute (cpm) have been observed.

Comment 9

Page 18, section 2.4: "The phase II radiation investigation final field work plan listed specific wells to be gamma logged." The plan does not include well identification nor locations in figure 4 and 5, and there is no figure 6. This report contains no survey data of the downwell gamma logging at one foot intervals. These should be included.

Response

The monitoring wells that were surveyed for gamma activity are shown of figures 4 and 5. The list of wells that were logged was not included in the last draft of the report. A list of wells surveyed and corresponding count rates at one foot intervals will be provided in the final draft.

Comment 10

Page 21, section 2.8: Identification of the efficiency factor of the instrumentation is very beneficial for conversion from CPM to DPM.

Response

Manufacturers efficiencies are provided; however, a direct correlation between detector response and activity cannot be accurately made unless the depth and geometry of the source, and density of the soil is known. Surveys using hand held instrumentation were performed to quantify the number of radium-containing sources, not to directly assess activity. The identity of the source terms and their activities were established by soil sampling and laboratory analysis.

Comment 11

Page 23, section 3.0; There should be an additional table to identify the downwell gamma logging results at each increment.

Response

A table showing downwell gamma logging results will be provided in the final draft of the report.

Comment 12

Page 22; 3.1; The report states, "Consistent with expected background levels of approximately 7-12 microroentgen per hour (uR/hr) at 3 feet above the ground surface." Why was this expected? Is this normal background for the vicinity? How was it determined?

- Response** Exposure measurements collected at HPA determined that exposure levels at noncontaminated sites or background locations ranged between 7-12 uR/hr using a Victoreen 450P ion chamber.
- Comment 13** Page 25, section 3.1.2: "Table 2 lists the number of devices identified and their gamma count rate within IR-02 excavations as a function of depth." Table 2 does not indicate count rates. They are, however, indicated in Table 1, but not as a function of depth. Please clarify.
- Response** The text will be modified to accurately reflect the contents of the tables.
- Comment 14** Page 26, section 3.2: Due to the elevated gamma count rate indicated in well 175A, we recommend additional monitoring by water sampling.
- Response** The elevated gamma count rate in well 175A at 6.5 feet below the ground surface could be attributed to well construction material which may contain naturally occurring radioisotopes. Additionally, groundwater sampling and analysis for gross alpha and beta-emitting radionuclides was performed during the Surface Confirmation Radiation Survey and determined that there is no groundwater contamination associated with the disposal of radium-containing material in the landfill area. Therefore, the Navy does not plan to collect additional groundwater samples.
- Comment 15** Page 31, section 4.2.1: The identification of point sources in the area approximately 400 feet long and 250 feet wide, shown in Appendix B-1, Overlay B, indicates that it will be necessary to address their total remediation in phase III.
- Response** Potential remedial techniques that may be used to remediate the landfill will be discussed in the Parcel E Remedial Investigation Draft Report.
- Comment 16** Page 31, section 4.2.2: The assumption that no sources are located below one foot is now negated by these results. Will remediation now include the removal of all point sources in the affected area?
- Response** Potential remedial techniques will address all the radioactive material identified at the site.
- Comment 17** Page 31, section 4.2.2: The total estimated volume of soil that contains radioactive material is calculated to be 5,500 yd³, however, only point sources are addressed. Radium contamination in soil, as indicated in the soil analysis in Appendix A, has not been addressed as a contaminant. The emphasis seems to be placed only on point sources and the soil

contamination is only minimally addressed.

Response Most all radium-containing material observed in the landfill has been associated with a point source. Diffuse contamination has been limited to the few inches soil surrounding the point source. All radium-containing material will be addressed in the Parcel E Remedial Investigation Report whether or not it is attached to a particular component.

Comment 18 **Page 35, section 5.0: The first recommendation implies that the data provides an adequate characterization of the type and subsurface extent of radium-containing material. This recommendation is appropriate, however, the volume of soils within the IR-02 landfill will, as opposed to "may", require remediation.**

Response Remedial action alternatives will be assessed in the Parcel E Remedial Investigation Draft Report.

Comment 19 **Page 35, section 5.0: Item 2 recommendation regarding IR-07 and IR-18 has previously been addressed.**

Response The Navy concurs. Final results will be discussed in the Parcel E Remedial Investigation Draft Report.

Comment 20 **California Radiation Control Law, Title 17, Subchapter 4, specifies that radioactive materials must be licensed. Point sources such as those that are present at HPA would require that the City/County of San Francisco (if it becomes the owner of the property) obtain a Radioactive Material License from the Department of Health Services once the Department of the Navy has released the property. The owner of the property would become responsible for any remediation of radioactive materials thereafter.**

Response If there is such a requirement, it will be addressed during the remedial investigation.

**RESPONSE TO UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (EPA)
COMMENTS ON THE RESULTS OF THE SUBSURFACE RADIATION INVESTIGATION
IN PARCELS B AND E REPORT**

Comment 1 **Volume II, page B-2, section 1.2, paragraph 1: There are some minor typographical/grammatical errors which need correcting.**

Response The typographical and grammatical errors will be corrected in the final draft of the report.

Comment 2 **When the reports discusses "shells", the EPA assumes that in all cases this terminology refers to marine organism shells and not ordnance. It would probably be a good idea to reword the document where necessary to ensure that this terminology does not confuse the public and result in unnecessary concern over an ordnance problem that does not exist.**

Response The text will be modified in the final draft of the report that will clearly identify the shells as remains of marine organisms and not ordnance.

Comment 3 **Volume I, page 45, section 4.5: EPA strongly agrees with the interpretation in this section. There is ample evidence of burrowing activities by animals such as ground squirrels, feral cats and dogs, snakes, rats and other rodents at the Parcel E landfill. Radium devices buried below six inches could well be brought up to the surface by animals' activities. EPA believes that the effects of bioturbation on radium sources in the landfill should not be underestimated and should be considered by the Navy when a final cleanup action for Parcel E landfill is discussed.**

Response The Navy agrees with the EPA that the effects of bioturbation should not be underestimated and, as a result, bioturbation will be considered when remedial alternatives are addressed.

**RESPONSE TO ARC ECOLOGY ARMS CONTROL RESEARCH CENTER
COMMENTS ON THE RESULTS OF SUBSURFACE RADIATION INVESTIGATION
IN PARCELS B AND E REPORT**

General Comments: The Navy realizes that many people that review this document may not be familiar with health physics concepts or radiation detection instrumentation. However, in the final draft the Navy will provide a glossary of key definitions which should reduce potential confusion during public review of the document. The screening methodology used at the landfill area was to attempt to delineate the area where disposal of the radioluminescent material was likely to be. The background gamma count rate range (5,000 to 10,000) observed in the field was based on many factors. Field technicians have observed gamma count rates at the surface ranging from approximately 4,000 to 7,000 counts per minute (cpm). In areas where the Navy trenched and no debris was encountered, gamma count rates ranged 5,000 to 10,000 cpm. The difference in count rates between the surface and subsurface would be expected due to geometry changes when you lower the detector into the test pit. The final draft will include a more detailed explanation of the baseline information.

Specific Comments:

Comment 1 **What is the possibility that radionuclides are present which produce alpha but not gamma emission and therefore remain undetected?**

Response There is no evidence that a radionuclide that emits only alpha radiation was disposed of within the landfill area. Because of strict regulatory licensing of radioactive material, radium-226 associated with radioluminescent dials and gauges on ship instrumentation would be the only radioactive material that was not regulated by the Nuclear Regulatory Commission (NRC) that could have been disposed in the landfill area with other industrial debris. The disposal of this type of debris was common practice throughout the United States into the 1970's.

Comment 2 **As the gamma detection method limit is 1 μ Ci at a distance of 1 ft. in soil, what is the possibility that the figure quoted for the quantity of radioactivity at the site has been underestimated?**

Response Thirty four 15-foot test pits and three 100-foot trenches were dug within IR-02. The intent of the subsurface investigation was to attempt to determine the quantity and distribution of point sources below the those identified at the surface during the surface confirmation radiation survey performed in 1992. The amount of radioactivity (approximately 2,750 point sources) is based on the total estimated amount of soil (approximately 5,500 cubic yards) that would be required to be excavated to remove all the point sources from the landfill divided by the number of point sources detected in the field per cubic yard (2.2 cubic yards per point source). However, it must be understood that this is an estimate.

Comment 3

Is the detection method affected by soil moisture content?

Response

Radionuclide detection may be affected by soil moisture. The landfill area is comprised of a heterogeneous mix of clays, silts, gravel, boulders, and debris. Depending on soil type, soil moisture, and debris content the effective detectible area would vary. However, since most all of the radioactive material encountered in the field was in the form of a radium point source of approximately 1 μCi , it was generally observed to be detectible under a foot of soil.

Comment 4

What is the volume of soil sampled by the NaI detector when stationary?

Response

The volume of soil sampled by the NaI detector depends on the soil conditions surrounding the detector, the positioning of the detector relative to the media being surveyed, and the specifications of the detector. Typically, a 1 μCi radium point source could be detected in any direction within approximately 1 foot of the detector. Depending on whether the detector is in a half-sphere (at the surface) or full-sphere (below the surface) geometry, the total soil volume that could be surveyed will vary. Therefore, the effective detectible area (volume of soil) can be estimated by calculating the volume of a sphere (detector placed below the surface) with a radius of 1. The effective detectible area is approximately 4.20 cubic feet.

Comment 5

The use of the word "background" requires substantial clarification. If it refers to radiation levels found in regions of the site where no radioactive contamination is suspected, then the word "ambient" or something similar should be used. Use of the word "background" implies that this is the level of radiation that would be present if human activity had not taken place at the site. No case has been made for this in the report and no literature is cited to support the asserted background levels.

Response

The use of the word "background" to identify naturally occurring radiation levels is standard terminology used within the regulations and the radiation protection industry. According to 10 Code of Federal Regulations, Part 20.003, "background radiation" is defined as radiation from cosmic sources; naturally occurring radioactive materials, including radon (except as a decay product of source or special nuclear material); and global fallout as it exists in the environment from testing of nuclear devices. "Background radiation" does not include radiation from source, byproduct, or special nuclear materials regulated by the Nuclear Regulatory Commission. The word "ambient" has been used as a substitute for the word "background" in other radiological publications; however, "background" is commonly used throughout the industry. The use of the word "background" does not necessarily imply that no human activity has taken place (for example, it includes global radioactive fallout).

Average surface background activity levels and gamma count rates were

PAGE 3

NAVY RESPONSE TO COMMENTS ON THE
DRAFT RESULTS OF THE SUBSURFACE
RADIATION INVESTIGATION IN PARCELS B AND E

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ground surface." Does "all locations" refer only to IR-07 and IR-18? Please explain how the rate measurements made in the test pits are related to the "expected background." Has the radiation level at three feet above ground surface been measured? If not, what is the point of making a comparison between test-pit rate measurements and an estimate of radiation levels three feet above ground.

Response

Yes, the background exposure rate measurements collected at "all locations" refers to IR-01, IR-02, IR-07, and IR-18. The sentence will be moved to reduce confusion.

Exposure rate measurements were collected at test pit and trench locations at the ground surface only (three feet above the ground surface). Only gamma counts were obtained within the trench or test pit.

Yes, exposure rate levels were determined three feet above the ground surface at each trench or test pit location prior to excavation activities.

Comment 9

Investigation of Parcel E has revealed severe contamination with a variety of hazardous wastes. Cross sections of the areas investigated in Parcel E show that sands of a variety of grades and color are prevalent throughout this area. Given the lack of record keeping associated with dumping activities, it does not seem unlikely that radionuclide-contaminated sandblast grit could have been disposed of at this site. As a proportion of the sandy regions had elevated gamma counts, why was there no attempt to identify specific radionuclides? The NaI detectors used in the present investigation can be used in conjunction with spectral analyzers for identification of radionuclides.

Response

The Navy assumes the sandblast grit you are referring to is related to the decontamination of naval vessels in Drydock 4. The activities were known as "Operation Crossroads." The Navy has fully documented the generation, storage, and disposal of the contaminated sandblast grit. All the material was drummed and sent to an offshore disposal site near the Farallon Islands. The Navy has no reason to believe that sands associated with Operation Crossroads were disposed of at HPA.

The Navy sent all samples to a radiochemical laboratory for gamma spectroscopy. If any fission products were detected, they would have been reported. Only radium-226 and daughter products were detected in the samples analyzed.

During phase III of the radiation investigation the Navy will include in situ gamma spectroscopic techniques that will enable radionuclide identification be done in the field.