DEPARTMENT OF THE NAVY
NORTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
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IN REPLY REFER TO
5090
Ser 2576/1823/ME
AUG 18 1995

Mr. Mark R. Lewis
Connecticut Department of Environmental Protection
Bureau of Water Management
Permitting, Enforcement & Remediation Division
79 Elm Street
Hartford, CT 06106-5127

RE: NAVY RESPONSES TO CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION COMMENTS ON THE DRAFT HISTORICAL RADIOLOGICAL ASSESSMENT, NAVAL SUBMARINE BASE-NEW LONDON, DECEMBER 1994

Dear Mr. Lewis:

Please find enclosed the Navy's responses to your March 16, 1995 comments on the report entitled "Draft Historical Radiological Assessment, Naval Submarine Base-New London" dated December 1994. We appreciate your input.

If you have any questions or comments regarding the enclosed responses, please feel free to contact me at (610)595-0567 extension 162. If you prefer, you may contact Jeff Brann at Portsmouth Naval Shipyard at (207)438-1283, where the Draft Historical Radiological Assessment was prepared.

Sincerely,

Mark Evans

MARK EVANS
Remedial Project Manager
By direction of the
Commanding Officer

Encl:
(1) Navy Responses to Connecticut Department of Environmental Protection Comments/Questions on December 1994 Draft Historical Radiological Assessment for Naval Submarine Base New London

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Navy Responses to Connecticut Department of Environmental Protection Comments/Questions on December 1994 Draft Historical Radiological Assessment for Naval Submarine Base New London

Reference: February 24, 1995 enclosure to CT DEP letter of March 16, 1995 to Northern Division, Naval Facilities Engineering Command

A. Volume I

Question 1: Page 2-2, Section 2.3.1. "What type of gamma spectroscopy system has been utilized in this analysis?"

Response: Historical gamma spectroscopy systems are described more fully in section 6.1.2. Beginning in 1966, a sodium iodide scintillation detector with a multi-channel analyzer was used. Since 1979, a germanium high resolution detector has been used.

Question 2: Page 2-4, Section 2.2.3. "Have any non-naval personnel been interviewed?"

Response: Non-naval personnel were interviewed during preparation of: Reference 2 (1983 Initial Assessment Study); Reference 3 (Community Relations Plan); and this report. However, it should be noted that military personnel have historically performed most operational duties and therefore are the primary source of personal information.

Question 3: Page 3-15, Section 3.2.3. "Have any spills occurred during any off-hull resin discharges?"

Response: All documented spills which either released or had the potential to release radioactivity to the environment are summarized in Table 5-4. None of the spills described in Table 5-4 involved any off-hull resin discharges. The spill of 9/4/75 (page 5-12) did involve resin discharge "operations" in that dry radioactive material spilled to asphalt from a cover for a shipping cask containing a resin catch tank. Some spills have occurred during off-hull resin discharges performed in floating drydocks; however, no release of radioactivity to the environment occurred as a result of any of these spills (see footnote (b) to Table 5-4). The floating drydocks will warrant special sampling and surveying at the time they are to be released from radiological controls and/or be decommissioned.

Question 4: Page 3-16, Section 3.3.1. "Are the release surveys for bldg 174 available for review?"

Response: A copy of the Building 174 release report is attached. (Where the report discusses "Co-60 radioactivity" or "average Co-60 activity," this is cobalt-60 energy range activity as explained in the HRA.) Detailed surveys are available for on-site review, subject to document control requirements. Please call in advance to arrange a visit, if desired.

Enclosure (1)

Question 5: Page 3-24, Section 3.3.3.1. "What is the possibility of any radioactive material having been dumped in the Goss Cove landfill?"

Response: As stated in Section 5.2.1 of Volume I, on-site disposal of radioactive solid waste attributed to the Naval Nuclear Propulsion Program (NNPP) has been prohibited since the inception of the Program. Based on records, established policy, and interviews, the potential for NNPP radioactive material having been disposed of on-site is considered to be effectively zero. The possibility of general radioactive material having been disposed of on-site is addressed in Section 5.2.3, page 5-6, of draft Volume II: "Although unlikely, given what is known about the material used for fill, small amounts of G-RAM incorporated in consumer products (e.g., radioluminescent exit signs, smoke detectors, etc.) could have been disposed of with other industrial material in the DRMO, Area A Landfill, or Goss Cove areas." It is not expected that the potential for G-RAM radioactivity in these former landfills would vary substantially from that in commercial landfills due to normal civilian use.

Question 6: Page 3-31, Section 3.3.3.5. "Have any of the wells noted under glacial outwash aquifers been screened for radionuclides?"

Response: Yes. Fourteen of the thirty-eight wells which were screened for gross levels of radioactivity as part of the Phase I Remedial Investigation (RI) draw water from the glacial outwash aquifers: 4 of 4 at Goss Cove; 5 of 6 at DRMO (only 6MW5D is not); 3 of 8 at Area A Downstream (2DMW11S, 2DMW16S, 3MW12S);1 of 8 at Area A Wetland (2WMW6S); and 1 of 12 at Area A Landfill (2LMW8S). The radioactivity screening performed according to the approved Work Plan in Phase I was for gross alpha and gross beta radioactivity only. This gross analysis is not capable of determining the specific radionuclide(s) causing any positive result. By the approved Work Plan for Phase II, any Phase I location exceeding either the gross alpha or gross beta ARAR values were resampled in Phase II and analyzed by gamma spectroscopy, a method which does permit the identification of specific radionuclides. Conversely, any Phase I location which did not exceed either the gross alpha ARAR or the gross beta ARAR was, by the approved Work Plan, neither resampled nor reanalyzed during Phase II.

Five of the twelve monitoring wells which were screened via gamma spectroscopy for radionuclides as part of the Phase II RI draw water from the glacial outwash aquifers: 8GW1S and 4S at Goss Cove; 6GW1S at DRMO; 2DGW11S and 3GW12S (OBDA) at Area A Downstream. The other 7 monitoring wells screened in Phase II are: 2LGW7S, 2LGW9D, 2LGW12D, and 2LGW18S at Area A Landfill; 2DGW11D and 3GW12D at Area A Downstream; and 2WGW4D at Area A Weapons Center. No non-naturally-occurring radioactivity was detected in any of the Phase II samples.

Question 7: Page 3-34, "Groundwater Flow in the Vicinity of Subase". "Is any radionuclide analysis being conducted on the groundwater flow as part of the ongoing IR study?"

Response: No radionuclide-specific analyses were performed as part of the Phase I RI monitoring. Of the monitoring wells sampled for radionuclide-specific analysis during the Phase II RI monitoring, the only radionuclide identified was naturally-occurring potassium-40. See question 6 above.

Question 8: Page 4-5, Section 4.4, paragraph 4. "Have there been any spills associated with radiological controls barge YRR-14?"

Response: Yes. In Table 5-4, all reports located at "Piers 12/13 quay wall" are associated with the radiological control barge (YRRS-4 until March 1981, YRR-14 thereafter). Other spills, within the barge, in which no release to the environment occurred, are addressed in footnote (b) to Table 5-4, page 5-17.

Question 9: Page 5-3, "Policy Details". "Is a copy of 'Handbook 52' available for review?"

Response: A copy of National Bureau of Standards Handbook 52 (NCRP Report No. 11) is attached.

Question 10: Page 5-7, Section 5.1.2. "Is the value 1×10^{-9} μCi/ml for gamma, beta-gamma, beta, alpha?"

Response: It is the Navy's regulatory limit for occupational exposure of cobalt-60 if present in air (one-ninth of the (then applicable) 10 CFR 20 occupational maximum permissible air activity concentration for cobalt-60). The air activity concentration values discussed in Section 5.1.2 were determined as "cobalt-60 equivalent" activity concentrations, as discussed on page 2-3, second, third, and fourth paragraphs. They were determined either by gross beta or gross gamma analyses. The method of measurement determines whether it is a gross gamma or gross beta value. For gamma measurements, all counts representative of gammas within the energy range of 0.1 MeV to 2.1 MeV were summed. For beta measurements, all counts representative of betas with end point energies of about 0.1 MeV and greater were summed. In either case, the efficiency of cobalt-60 was assigned to all counts, resulting in either a gross gamma (equivalent cobalt-60) or a gross beta (equivalent cobalt-60) determination. For the NNPP, cobalt-60 is the most predominant radionuclide and has the most restrictive concentration limit in air and water of all the radionuclides identified in Naval reactor plants. As noted on page 2-3, this "equivalent cobalt-60" method provides a conservative determination of the actual amount of cobalt-60 in the sample.

Question 11: Page 5-10, Section 5.1.2. "Is a copy of the software program COMPLY available for review?"

Response: As noted on page 5-10, COMPLY is an EPA computer code. EPA Region I or EPA headquarters (Office of Radiation and Indoor Air) should be able to provide a copy to Connecticut, including appropriate documentation.

Question 12: Page 5-10, Section 5.1.3. "[Are] there any incident report documents for the time frame prior to 1968?"

Response: No such reports were identified for Subase New London during the extensive document review that was performed for this section.

Question 13: Page 5-18, Section 5.2.1. "Is a copy of 'Radioactive Waste Disposal From U. S. Naval Nuclear Powered Ships' Jan. '59 available for review?"

Response: A copy of this report is enclosed.

Question 14: Page 5-19, Section 5.2.2. "Is a copy of the aerial radiological survey conducted by EG&G available for review?"

Response: A copy of this report is enclosed.

Question 15: Page 5-21, Section 5.4. "Has any analysis for alpha or beta radiation or contamination been performed on these release surveys?"

Response: As indicated in the second paragraph of Section 5.4, beta-gamma frisk surveys are performed. These surveys do include analyses for beta radiation/contamination. An NNPP release survey typically would not require analysis for alpha radioactivity since there would have been no potential source of radioactivity that would be purely an alpha emitter. The Building 174 release survey did not include analysis for alpha radiation or contamination.

Question 16: Page 6-2, Table 6-1, 1970 - 1993. "The graph lists 'total bottom area with Co-60 energy range activity > 3 pCi/g per km^2.'

a) Is this to be interpreted as 1000 x 1000 meters?
b) How is that average value obtained?
c) Is there an allowance for hot spots?
d) What is the total number of samples per grid?"

The unit km^2 is a square kilometer (1000 x 1000 m), as you expected. The areas listed in this table did not involve "averages," but rather the estimated total area of the harbor bottom with

sediment concentrations above 3 pCi/g. These estimates typically were made by taking the annual average Co-60 concentration of each individual routine sediment sampling location and visually estimating the harbor area where the results were above 3 pCi/g. This estimation was rather crude; as the table indicates, the area was revised downward by factors of ten as the number of samples exceeding 3 pCi/g declined with time.

There was not an explicit allowance for hot spots. However, using the annual average of four quarterly samples for each sample location diminished the impact of any single sample whether above or below average for that location. (Thus, for example, the single sample above 3 pCi/g in 1985 did not result in any reported area greater than 3 pCi/g since the annual average for that sample location was still below 3 pCi/g.)

The convention of estimating the harbor bottom area >3 pCi/g was established in the NNPP annual report over two decades ago, and continued until samples greater than 3 pCi/g were so rare that it was no longer a useful means of following trends. The key trend at New London, as elsewhere, is that the area greater than 3 pCi/g declined until the entire harbor bottom was below this value.

Question 17: Page 6-6, paragraph 1. "Please define 'very long'."

Response: The re-analyzed sediment samples are each counted for 10,000 seconds. For comparison, the routine quarterly samples are each counted for 1,000 seconds. As stated in the footnote to Table 6-2, the minimum detectable activity concentration for the routine quarterly sediment samples is on the order of 0.10 to 0.15 pCi (specific Co-60) per gram of sample. From the "less than" values in Table 6-3 it can be seen that the minimum detectable activity concentration for the re-analyzed sediment samples is lower.

Question 18: Page 6-9, paragraph 4. "Is this activity attributed to past practices involving naval nuclear propulsion plants?"

Response: Yes. Page 6-9, paragraph number 4, is a conclusion of the EPA based on their 1989 survey of all NNPP facilities on the Thames River (Reference 1 of the December 1994 Draft Subase HRA). This activity is attributable to past practices involving Naval nuclear propulsion plants as described in Section 5.1.1, "Liquid Discharges." As noted on page 5-4, Section 5.1.1.2, since 1973 Naval Submarine Base New London has not intentionally discharged any radioactive liquids to the river. Table 5-1 documents the entire record of radioactive liquid waste discharges by all NNPP facilities to the Thames River. The second paragraph on page 6-10 is another Reference 1 conclusion of EPA relative to their 1989 survey and is repeated here: "Although Co-60 was observed in sediment at the Navy facilities, the concentrations present are very small, and have continued to decrease with time at a rate equal to or greater than the decay of Co-60. The small and decreasing quantities of Co-60 in the harbor sediments pose no radiological impact to the area."

Question 19: Page 6-17. "Is a copy of the most recent DAMOS available for review?"

Response: The regional Army Corps of Engineers office in Waltham, Massachusetts, telephone (617) 647-8373, may be able to provide the most recent information for the New London Off-Shore Disposal Site. (DAMOS is an acronym for the Army Corps of Engineer's Disposal Area Monitoring System.) The only New London Off-Shore Disposal site data in the HRA are the dredge spoils disposal volumes by year, in Table 6-12.

Regarding dredge spoils, the levels of cobalt-60 in the Thames River sediment are extremely small. Since cobalt-60 does not bioaccumulate or get into the food chain, there is virtually no exposure to humans. This conclusion was reached in the EPA's radiological environmental survey reports of Subase, the most recent one issued in 1991 (HRA Reference 1). It is also covered extensively in the recently published SEAWOLF homeporting Draft Environmental Impact Statement (EIS) and was the subject of a meeting among EPA Region I, the State of Connecticut, the Army Corps of Engineers, and the Navy on March 28, 1995, documented in a letter enclosed for your reference. The EPA, in commenting on that EIS and on the radiological evaluations therein (including the sediment), observed that the analyses were conservative and thorough; the EPA comment letter is also enclosed for your reference.

Question 20: Page 6-28. "How is a PRM-5N/SPA-3 calibrated to distinguish between natural and non-naturally occurring radioactivity?"

Response: The PRM-5N/SPA-3 is a gamma scintillation survey meter. The detector is a sodium iodide (NaI) scintillation crystal. The survey meter is equipped with "Gross" and "Pulse Height Analysis" (PHA) modes and different high voltages may be applied to these different modes of operation. For the shoreline monitoring, which is the subject of the section referenced in Question 20, the PHA mode is calibrated to record only those incident gamma photons having energies between approximately 1.0 MeV and 1.5 MeV. This "window" setting captures any gamma photons from Co-60 (1.17 MeV and 1.33 MeV) while discriminating against the most prevalent gamma photons that would be expected from naturally-occurring radioactivity (e.g., 0.61 MeV from Bi-214 and 0.35 MeV from Pb-214 for decay products of naturally-occurring Ra-226). These "naturally-occurring" gamma photons would be recorded in the Gross mode (approximately 0.1 MeV to beyond 3 MeV) but would have negligible impact in the PHA mode (the 1.12 MeV and 1.76 MeV gamma photons from Bi-214 appear only in about 17% of the disintegrations, compared to 47% for the 0.61 MeV gamma photon). Thus Co-60 will cause a proportionately greater response above background in the HV1-PHA mode than would a source of naturally-occurring radioactivity.

Question 21: Page 8-1, Section 8.1. "Has there been a study of the average depth of public consumption wells to the north and east to support the statement being 'upgradient'?"

Response: The direction of groundwater flow to the east of Area A will be investigated further as part of the ongoing RI. If results of that investigation are available, they will be incorporated into the final HRA. If they are not available, the final HRA will be revised to indicate the ongoing investigation of direction of groundwater flow in this section of the base. Support for the draft HRA statement "Public consumption and domestic wells to the north and east are upgradient" is in Table 3-1 of the 1992 Phase I RI (page 3-36), where some of these well depths are estimated, and on pages 8-15 and 8-16 of Section 8, Summary and Recommendations: "Of importance to this study is the direction of bedrock ground water flow in this area, due to the detection of cadmium in several offsite residential wells to the east of Route 12. Inspection of the bedrock ground water contour map indicates that residential wells along Route 12, Baldwin Hill Road and North Pleasant Valley Road are upgradient of Area A (the area of highest elevation among the Subase IR sites), and would not be affected by conditions at the site. Most of these wells had bedrock ground water elevations substantially higher than wells containing cadmium in Area A (2WMW3D, elevation 76 feet). However, residential wells near the NSB-NLON east gate, southeast of Area A, had bedrock water elevations (75-80') in the same range as 2WMW3D, the closest bedrock well in Area A. Therefore, based on the available data, it is indeterminate if these wells are upgradient or downgradient of the western portion of the Area A Landfill; however, cadmium does not exceed drinking water standards in these wells."

The potentiometric surface map for the Area A Landfill, Figure 6-4 in the February 1995 Draft Phase II RI Report (copy attached), indicates the direction of groundwater flow in the area of Route 12 to be westerly, i.e., from Route 12 toward Subase.

General Comment A): "Does subase participate in the federal facilities compliance act with the State of Connecticut?"

Response: Subase has been participating in the Federal Facilities Compliance Act with the State of Connecticut since 1992.

General Comment B): "Is subase claiming, that annual Department of Environmental Protection Thames River sampling in the vicinity of Electric Boat, be interpreted as a confirmatory survey for environmental monitoring around subase?"

Response: Yes, but only with respect to specific area samples. As noted in the third paragraph on page 6-10: "Connecticut has performed independent radiological monitoring of river water and bottom sediment since the beginning of NNPP activities along the Thames River. The most recent state data available to Subase are consistent with Subase and EPA results." The "most recent data" referred to are for 1988 (gamma spectroscopy analysis of river water and sediment, and tritium analysis of river water) and 1989 (data for river water analyses). Most of the points surveyed are in the vicinity of Electric Boat and further downstream to the mouth of the river. One sample for each of the analyses is listed as "SUB BASE," and according to the supplied map is located near Goss Cove at the Subase. The state sediment and river water samples for the Subase location are reported for 1988 as containing 0.00 ± 0.06 pCi Co-60/kg and 0 ± 8 pCi Co-60/L, respectively, and the tritium as 0 ± 323 pCi/L. The river water samples for the Subase location are reported for 1989 as containing 0 ± 5 pCi Co-60/L and 0 ± 270 pCi tritium/L. These state Co-60 results are consistent with both Subase and EPA results for sediment and water in the vicinity of Goss Cove. These state tritium results are consistent with EPA results for river water in the vicinity of Subase.

The EPA performed comparable analyses for surface water samples taken in 1989 in the vicinity of Piers 13, 15, and 31 at Subase. EPA additionally analyzed four surface water samples taken from the vicinity of Electric Boat in 1989. EPA reports in Reference 1 that for all seven of these surface water samples, "No radioactivity associated with nuclear-powered warships was detected in any of the water samples by the gamma-ray analysis. Tritium concentrations were below the limit of detection, 200 pCi/L." Although none of the EPA river water samples were taken in immediate proximity to Goss Cove, the Navy considers the "no detectable activity" results for river water samples taken from north and south of Goss Cove by EPA to be "consistent with" the state's "no detectable activity" results for their Goss Cove river water samples. The statement on page 6-10 is not meant to imply that the state monitoring is "a confirmatory survey" for the entire scope of radiological environmental monitoring around Subase; rather it is intended to convey the fact that CT results (for comparable analyses at comparable locations) are not at variance with Subase and EPA results.

B. Volume II

Question 1: Page 2-3, Section 2.3.3. "What was the total number of employee's interviewed and what was their affiliation?"

Response: The affiliation and total number of employees interviewed for the 1983 IAS and for the 1994 CRP are not readily available (both performed by contractors, see response to Volume I, Question 2). For this Volume II, two current civilian employees of the Naval Submarine Support Facility, one current civilian employee of the Naval Submarine Medical Research Laboratory, and four retired Naval personnel (one associated with ex-USS NAUTILUS, three associated with the Naval Undersea Medical Institute) were interviewed. In addition, several current employees, both civilian and military, of Subase and several of its tenant commands, have been consulted on an ongoing basis during the preparation of this HRA.

Question 2: Page 4-4, Section 4.4.1. "Are the surveys conducted for the release of these facilities available for review?"

Response: Specific facilities released are listed in Table 5-2; their release reports are attached. Buildings 86, 156, and 429 will be added to this table in the final HRA, based on recently discovered information; no release reports have been located for these three buildings.

Question 3: Page 4-6, Section 4.4.3. "Is there any possibility of G-RAM having been dumped on the site?"

Response: The possibility of general radioactive material having been disposed of on-site is addressed in Section 5.2.3, page 5-6, of draft Volume II: "Although unlikely, given what is known about the material used for fill, small amounts of G-RAM incorporated in consumer products (e.g., radioluminescent exit signs, smoke detectors, etc.) could have been disposed of with other industrial material in the DRMO, Area A Landfill, or Goss Cove areas." It is not expected that the potential level of G-RAM radioactivity in these landfills would vary substantially from that in commercial landfills due to normal civilian waste.

Question 4: Page 5-2, Section 5.1.3. "Are the surveys that were conducted to release NUMI available for review?"

Response: This survey is included among those addressed in the response to Question 2 above. The attached Building 438 release report refers.

Question 5: Page 5-4, Table 5-1. "Has the final disposition of the 'mock I-125' source ever been determined?"

Response: By 10 CFR 20, this was not a reportable incident at the time of the occurrence. The final disposition of the source has not been determined; it was likely disposed of in the Groton town landfill. The source is encapsulated within epoxy inside a test tube and the test tube cap is sealed with epoxy, making it highly unlikely that any of the radioactivity would escape beyond the encapsulation.

Question 6: Page 5-4, Table 5-1. "Has the final disposition of the 'spot markers' ever been determined?"

Response: By 10 CFR 20, this was not a reportable incident at the time of the occurrence. The final disposition of the spot markers has not been determined; they were likely disposed of in the Groton town landfill. The sources are each encapsulated within epoxy resin, making it highly unlikely that any of the radioactivity would escape beyond the encapsulation.

Question 7: Page 5-4, Table 5-1. "Who was the solid waste hauler at subase during the time frame when the above mentioned sources were discovered missing?"

Response: The identity of the solid waste hauler in 1981 is not known. The solid waste hauler in January 1989 was the F. E. Crandall company.

Question 8: Page 5-6. "Please define 'gross radiological screening parameters' and 'large quantities of gamma emitting radioactive material'."

Response: The first sentence of the first complete paragraph on page 5-6 is repeated: "During the Phase I Remedial Investigation, gross radiological screening parameters were exceeded in 14 of 38 ground water monitoring well samples (10 of 28 at Area A, 2 of 6 at DRMO, and 2 of 4 at Goss Cove)." The gross radiological screening parameters are defined in Table 4-2 (Applicable or Relevant and Appropriate Requirements, or ARARs) of the 1992 Phase I RI (Reference 3 of Volume II) on page 4-10: the gross beta screening level is 50 pCi/L; the gross alpha screening level is 15 pCi/L by EPA criteria and 5 pCi/L by Connecticut criteria. The page 5-6 analysis quoted above used the Connecticut gross alpha screening level for evaluation.

The second sentence of the third complete paragraph on page 5-6 is repeated: "The study concluded that there are no large quantities of gamma-emitting radioactive material buried in the areas surveyed." This sentence is a paraphrase of a conclusion stated in Reference 6 of Volume II. The entire "Conclusions and Recommendations" section (page 5) of Reference 6 is quoted ("DPDO" in Reference 6 is the same location identified in this HRA as DRMO; "Landfill" in Reference 6 refers to the Area A Landfill):

"All three areas were subjected to extensive surface radiation surveys. We found no gamma radiation levels in excess of 20 μR/hr which could not be accounted for by obvious

sources of naturally-occurring radioactive material. This leads us to conclude that there are no large quantities of gamma-emitting radioactive material buried in the areas surveyed.

However, it should be noted that asphalt covers most of Goss Cove and DPDO areas, and portions of the Landfill area. Asphalt has some shielding properties, and the possibility exists that radioactive materials buried under the asphalt may have gone undetected. We therefore recommend that, as a precaution, a representative sample of any sub-surface samples taken from under asphalt be screened for radioactivity."

"Large quantities of gamma-emitting radioactive material" is not defined further or quantified to any degree in Reference 6.

Question 9: Page 6-1, Section 6.1.1. "Is a copy of 'Disposal of Radioactive Waste From U. S. Naval Nuclear Powered Ships and Their Support Facilities' NT-67-3, available for review?"

Response: A copy of NT-67-3 is enclosed.

Question 10: Page 6-1, Section 6.1.1. "Why was weekly sampling required in 1964?"

Response: This requirement was instituted to standardize Program environmental monitoring protocols. Prior to this time, some facilities were sampling sediment more frequently than weekly and the experience then available showed that nuclear ships were having no significant effects on the radioactivity of the environment which warranted more frequent sampling.

Question 11: Page 6-6, Table 6-2. "Does 'Uranium Series' mean total uranium or the transuranics series?"

Response: "Series" refers to the parent radionuclide plus its radioactive decay products. The activity concentrations listed in Table 6-2 are for "uranium series average," and are for the most prevalent of the naturally-occurring uranium decay series; i.e., the uranium-238 series. As described in the third paragraph on page 6-8, these data are the weighted average activity concentrations for readily-detectable (via gamma spectroscopy) radionuclides within the naturally-occurring uranium-238 series. They do not represent "total uranium" insofar as total uranium refers to the sum of the activity concentrations of each isotope of uranium which is present in a given sample. "Transuranics" are those elements with atomic numbers greater than uranium's (i.e., 93 and up); they are not naturally-occurring.

Question 12: Page 6-6, Table 6-2. "Does thorium series mean total thorium or thorium plus its decay daughters?"

Response: "Series" refers to the parent radionuclide plus its radioactive decay products. The activity concentrations in Table 6-2 are for "thorium series average." As described in the third paragraph on page 6-8, these data are the weighted average activity concentrations for readily-detectable (via gamma spectroscopy) radionuclides within the naturally-occurring thorium-232 series. These data do not represent "total thorium" (the sum of the activity concentrations of each thorium isotope present in the sample).

Question 13: Page 6-9, Section 6.1.1. "Is subase assuming the environmental monitoring around Electric Boat can be used as confirmatory purposes around subase?"

Response: Please see response to General Comment B to Volume I.

Question 14: Page 6-12, Section 6.1.4. "Why wasn't Co-60 included in the core analysis?"

Response: Co-60 was included in the core analysis. The Co-60 core data are presented in draft Volume I, beginning on page 6-13.

(Attachments discussed above provided to addressee only)