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LETTER REGARDING U S NAVY RESPONSES TO U S EPA REGION III COMMENTS ON THE DRAFT FINAL STATUS SURVEY REPORT SITE 1 THORIUM SPILL NON TIME CRITICAL REMOVAL ACTION NSWC INDIAN HEAD MD
9/26/2016
NAVFAC WASHINGTON

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND WASHINGTON
1314 HARWOOD STREET SE
WASHINGTON NAVY YARD DC 20374-5018

Alex Scott, P.E.
Environmental Restoration, Navy: Remedial Project Manager

Direct: 202-685-3064
NAVFAC Washington

Date: September 26, 2016

Robert Thomson, P.E.
Office of Federal Facility Remediation
US EPA Region 3, 3HS11
1650 Arch Street
Philadelphia, PA 19103

Re: Naval Support Facility-Indian Head (NSFIH), Indian Head, MD.
Site 1-Thorium Spill,
Response to the US Environmental Protection Agency's (EPA) review of the May 2016, Final Status Survey Report

Dear Mr. Thomson,

On behalf of the U.S. Navy, the Naval Facilities Engineering Command Washington (NAVFAC Washington) offers the following responses to EPA's comments from their review of the May 2016, "Draft Final Status Survey Report, IR Site 1 Non time Critical Removal Action, Naval Support Facility Indian Head" (FSS). This letter's attachment A1 contains those EPA's comments and is provided for reference. The responses provided below are numbered, corresponding to the numbered comments in EPA's comment letter. The responses are intended to reflect the Navy's understanding of the discussion and agreed-upon path forward determined in a meeting NAVFAC Washington had with the EPA Region 3 on September 7, 2016.

1. At this time, the Navy accepts the EPA's use of the 95% UCL statistical approach for this site as presented in their comments (Attachment A1), regarding this calculation of the average concentration of thorium-232 results over the site's area soils, and the background reference area.

2. At this time, the Navy's disagrees with the representativeness of the assumptions and modelling used in the Preliminary Remediation Goals for Radionuclides (PRG) calculator.

   At the time of the Engineering Evaluation and Coast Analysis (EE/CA), the Indian Head Installation Restoration Team (IHIRT)'s understanding of Site 1's conceptual site model (CSM) was used to develop assumptions that were considered representative and appropriate. These assumptions provided input parameters for the Argonne National Laboratory's "Residual Radioactivity" model (RESRAD), which was considered a realistic representation of Site 1's human health risk from the thorium-232 radionuclide. The runs of the model were used to calculate a concentration of thorium-232 in soil that was within the EPA's target acceptable risk range (1E-6 to 1E-4). The decision making Indian Head Installation Restoration Team (IHIRT) selected the RESRAD determined remediation goal of 3 pCi/g (picoCuries per gram), which was considered protective at the time.

   Regarding the outlier confirmation sample result, IHS1EB-D2: although it is significantly above background (over two standard deviations), it was below the IHIRT's remediation goal. Therefore, it was considered to be below the clean-up criteria threshold for the non-time critical removal action (NTCRA) at the time.

   In considering the potential risk posed by this sample result, it is possible that there are stochastic effects associated with the field sampling and radionuclide lab analysis which may have produced an elevated result when compared to other nearby confirmation samples. Furthermore, the sample location did not demonstrate significant radioactivity above

background levels per the health physics surveys. Another consideration is that this sample location was covered by at least 2-feet of clean soil. Soil cover has been demonstrated to mitigate emissions of α/β-particles and γ-rays from buried radioactive material.

Given the characteristics of the majority of confirmation soil samples taken over the aerial extent of the site and those exhibited by this sample location's result, it is appropriate to include the IHS1EB-D2 sample when considering the average contaminant concentration in the site's soils for the purposes of making risk management decisions. By including this sample result, the 95% UCL method provides a calculated concentration of 0.935 pCi/g for the NTCRA confirmation samples. This is below the concentration of thorium-232 measured in background soils, determined to be 1.186 pCi/g as calculated by the EPA using 95% UCL. Without IHS1EB-D2, the 95% UCL method results in a concentration of 0.794 pCi/g. Either way, the resulting average thorium-232 concentration for the site is below the concentration levels for background.

Based on the analysis in the FSS and the resulting EPA analysis in the comment letter, the Navy does not consider the IHS1EB-D2 sample result a significant risk to human health at the site. However, it is an important data point to consider in evaluating risks and making a risk management decisions regarding Site 1.

3. This comment has multiple issues the Navy would like to address as follows:

   Regarding the derivation of remediation goal in the EE/CA: Please see the response to comment #2 above. The Navy acknowledges that when using the PRG calculator, with the default assumptions per EPA's comment letter (see attachment A1), the 3 pCi/g remediation goal results in a unitless value for cancer risk (CR) of 8.27×10^{-4}. However, the assumptions and modelling of the PRG calculator do not reflect the IHIRT's understanding the site during the EE/CA in 2010. Additionally, the Navy prefers the modelling contained in RESRAD, and considers it a more representative and realistic model for evaluating risk.

   Regarding the discrepancy between the CRs calculated by RESRAD; where the EE/CA remediation goal of 3 pCi/g results in a CR of 9.0×10^{-5}, and the average concentration of the confirmation sampling results of 0.79 pCi/g results in a CR of 2.1×10^{-4}: When compared to the EE/CA, the post-NTCRA CR was calculated using much more conservative assumptions, and included the cumulative effects of background radiation in the RESRAD model (refer to conclusions section of the FSS). As this site uses the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) process to address site contamination, the Navy considered the guidance in the EPA Memorandum OSWER 9285.6-20, dated 13 July 2014 (2014 EPA memo), although it was dated after the EE/CA and the start of the NTCRA. The parameters used for the post-NTCRA CR calculation were reflective of the Navy's understanding of the 2014 EPA memo and the protective modelling and assumptions used in PRG calculator, instead of the parameters used in the 2010 EE/CA.

   The CR calculated by RESRAD of 2.1×10^{-4} using these assumptions practically matches the CR calculated by PRG of 2.19×10^{-4} in the EPA comments (see attachment A1). Although the Navy does not agree with these assumptions, the Navy chose to present this risk calculation in the FSS report to provide a line of evidence that Site 1's post-NTCRA residual risk was within EPA's target acceptable risk range while considering the 2014 EPA memo. Per the Navy's understanding of the 2014 EPA memo, the upper limit of EPA's target acceptable risk range may be elevated to 3×10^{-4} when considering risks from radionuclides, where site conditions are appropriate. This revised limit reflects an EPA proposed protection of human health criterion of a total effective dose equivalence (TEDE) of 12 mrem/yr (milirem per year).

   This would allow for a risk management decision to be made simply on the basis of a comparison to risk-based criteria. By using screening criteria, the site could remain within, and be closed-out through, the Site Screening Process (per the Federal Facilities Agreement), instead of requiring a more comprehensive and effort-intensive quantitative risk assessment as would be appropriate at sites requiring detailed remedial investigations to arrive to remedy selections and records of decision.

Based on the EPA's 95% UCL calculations in the comment letter, the PRG calculator results in a CR of $3.25x10^{-4}$ for the site's background soils, and a CR of $2.19x10^{-4}$ for the confirmation soil sample results which include the IHS1EB-D2 result (see comment #2 above). The Navy accepts the conclusion that the site has been remediated to below background levels. However the Navy does not agree with the CR values calculated by the PRG, and prefers the use of the RESRAD model in its evaluation of radiological site risks. Additionally, the Navy will not remediate sites to below background levels.

Given the Navy's understanding of the current site conditions, the Navy considers Site 1 at NSFIH to be protective of human health and the environment, and will take no further action at this site. Based upon the discussions that occurred on September 7, 2016 with the EPA, their consent with this decision is anticipated.

If you have any questions, please feel free to call me at 202-658-3064,

Sincerely,

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DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USN, cn=SCOTT.ALEX.E.1521494162
Date: 2016.09.26 13:06:56 -04'00'

Alex Scott, P.E.
NAVFAC Washington,
Environmental Restoration, Navy

Attachments:

A1 - EPA Comments on the Site 1 Final Status Survey Report (dated 07/12/2016)

CC:

Curtis Detore (MDE, Baltimore)
Joe Rail (NAVFAC Washington)
Andrew Louder (NAVFAC, NSFIH Installation Restoration)
Paul Leonard (EPA Region 3 [Tier 3])
Debora Goldblum (EPA Region 3 [Tier2])
Martin Gehlhaus (EPA Region 3, Toxicologist)
Dawn Ioven (EPA Region 3, Toxicologist)
Marcos Aquino (EPA Region 3, Office of Air and Radiation)
Paula Gilbertson (NAVFAC Washington [Tier 2])
Resha Putzrath (Navy-Marine Corps Public Health Center)
Allen Stambaugh (Navy Radiological Affairs Support Office)

Attachment A1

EPA Comments on the Site 1 Final Status Survey Report (dated 07/12/2016)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

Robert Thomson, P.E.
Office of Federal Facility Remediation

Direct Dial (215) 814-3357
Mail Code: 3HS11

Date: July 12, 2016

Alex Scott
NAVFAC Washington
Washington Navy Yard, Building 212
1314 Harwood Street, SE
Washington Navy Yard, DC 20374-5018

Re: Naval Support Facility, Indian Head, MD
Site 1 – Thorium Spill
Review of draft Status Survey Report

Dear Mr. Scott:

The U.S. Environmental Protection Agency (EPA) has reviewed the U.S. Navy's (Navy's) May 2016 draft *Status Survey Report* for the removal completion at Site 1, the Thorium 232 spill site, located at Naval Support Facility Indian Head NPL site. Based upon that review, EPA offers the following comments:

1. EPA recommends calculating 95% UCL background for Thorium 232. Also, EPA recommends the addition of a table in Section 14 presenting the risks at background and at the 95% UCL for the excavated bottom and sidewalls, along with the comparison to the OSWER 9285.6-20 protectiveness criteria. As an example, EPA has attached an Excel spreadsheet with the 95% UCL calculations for background and post excavation sampling using data from the draft *Status Survey Report*. Below is also a comparison of 95% UCL background and post excavation samples to risk based concentrations generated using the Preliminary Remediation Goals for Radionuclides electronic calculator. Additional discussion follows below.

2. Page 65, Table 13 – The Th-232 result at IHS1EB-D2 is a statistical outlier (i.e. hot-spot) and should be considered/discussed further: In comparison to background, this value presents site-related contamination greater than background and, according to PRG calculator, results in unacceptable risk. To illustrate this recommendation, EPA has attached the calculation of a 95% UCL for post excavation sampling results excluding the potential outlier.

3. The cleanup criteria established in the EE/CA was based on RESRAD software runs at 1, 2, 3 and 4 pCi/g. The cancer risks from the RESRAD software indicated that the DCGL of 3 pCi/g resulted in risks within the 1E-4 and 1E-6 risk

range (thus acceptable risk). In the draft *Status Survey Report*, the average Th-232 concentration after excavation (0.79 pCi/g) results in a cancer risk of 2E-4 based on RESRAD calculations, which now exceeds the EPA risk range. Why does the risk at 0.79 pCi/g exceed the risk at 3 pCi/g?" This seems to be a misstatement that needs further clarification. The DCGL of 3 pCi/g in soil does have a corresponding PRG calculated risk of 8.27E-04, not meeting CERCLA risk protectiveness. An analysis of risk based on concentration of Th-323 in soils compared to the estimated risk of Th-232 in background established earlier might be more appropriate.

EPA acknowledges the Navy use of RESRAD family code to develop a derived concentration guideline level (DCGL) as a cleanup goal, as this may satisfy other regulations and authorities. As a matter of policy, EPA recommends using the Preliminary Remediation Goals for Radionuclides electronic calculator as a means to calculate risk per CERCLA remedial program guidance. EPA utilized the PRG calculator in its review and analysis of the data and included the calculator output as attachments. The Navy can incorporate the PRG calculated risk values in their addressing the comments and recommendations.

EPA also calculated UCLs for the background data and the post excavation samples data. The Navy and their contractors should be able to replicate and verify these calculations. Attached, please find an Excel spreadsheet with these calculations. Based on the twenty-seven (27) samples collected by the Navy and EPA's calculations, the background UCL is 1.19 (1.186) pCi/gr in soil. Using the same methodology, EPA calculated the UCL for the post excavation twenty-four (24) samples, including the possible outlier 2.33 pCi/g, and a UCL was calculated at 0.935 pCi/g. Without the outlier data point, the UCL for post excavation data samples is 0.794 pCi/g in soil.

Using the PRG calculator, https://epa-prgs.ornl.gov/cgi-bin/radionuclides/rprg_search, with a residential scenario, soil media, and selecting output in risk, selecting Th-232+D for the radionuclide and its daughter products, EPA had the calculator generate estimated risk for the background and post excavation samples with and without the potential data outlier. A soil cover of 1 m and an area correction factor of 1000 m2 were used in the calculations. The corresponding total calculated risk was as follows: 3.25E-04 for background, 2.58E-04 for a post excavation 95% UCL including the 2.33 pCi/g and 2.19E-04 for a 95% UCL without the outlier data.

The remaining risk post excavation, without the data outlier would be estimated at 2.19E-04. This is below the risk estimated for soil concentrations in background samples. EPA believes the Navy may be able to justify, by including discussion in the *Status Suvey Report*, having met CERCLA criteria since the concentration of radionuclides in soils remaining after excavation is below background, even when the associated risk is "a few" above 10-4 risk. OSWER 9285.6-20 protectiveness criteria allows for risk slightly above 10-4 risk in

situations where site specific conditions may justify so. See Q34 of OSWER 9285.6-20, Page 27.

If you have any questions, please feel free to call me at (215) 814-3357,

Sincerely,

Robert Thomson, P.E., REM
Office of Federal Facility Remediation (3HS11)

Attachments (2)

Cc: Curtis DeTore (MDE - Baltimore)
Travis Wray (NSWC-IH)

Site-Specific

Resident Risk for Soil

DCGL = 3 pCi/g

Isotope	ICRP Lung Absorption Type	ICRP Lung Absorption Type	Inhalation Slope Factor (risk/pCi)	External Exposure Slope Factor (risk/yr per pCi/g)	Food Ingestion Slope Factor (risk/pCi)	Soil Ingestion Slope Factor (risk/pCi)	Concentration (pCi/g)	Particulate Emission Factor (m^3/kg)	Lambda (1/yr)	Halflife (yr)	1000 m^2 Soil Volume Area Correction Factor
Th-232+D	S	S	8.70E-08	4.04E-06	1.56E-09	2.17E-09	3.00E+00	1.36E+09	4.93E-11	1.41E+10	8.17E-01
Total Risk			-	-	-	-	-	-	-	-	-

100 cm Soil Volume Gamma Shielding Factor	Wet Soil-to-plant transfer factor (pCi/g-fresh plant per pCi/g-wet soil)	Ingestion Risk	Inhalation Risk	External Exposure Risk	Produce Consumption Risk	Total Risk
9.05E-05	1.83E-03	7.29E-06	3.09E-08	6.75E-05	7.52E-04	8.27E-04
-	-	*7.29E-06*	*3.09E-08*	*6.75E-05*	*7.52E-04*	*8.27E-04*

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Site-Specific
Resident Risk for Soil

Isotope	ICRP Lung Absorption Type	ICRP Lung Absorption Type	Inhalation Slope Factor (risk/pCi)	External Exposure Slope Factor (risk/yr per pCi/g)	Food Ingestion Slope Factor (risk/pCi)	Soil Ingestion Slope Factor (risk/pCi)	Background Concentration (pCi/g)	Particulate Emission Factor (m^3/kg)	Lambda (1/yr)	Halflife (yr)	1000 m^2 Soil Volume Area Correction Factor
Th-232+D	S	S	8.70E-08	4.04E-06	1.56E-09	2.17E-09	1.18E+00	1.36E+09	4.93E-11	1.41E+10	8.17E-01
Total Risk			-	-	-	-	-	-	-	-	-

100 cm Soil Volume Gamma Shielding Factor	Wet Soil-to-plant transfer factor (pCi/g-fresh plant per pCi/g-wet soil)	Ingestion Risk	Inhalation Risk	External Exposure Risk	Produce Consumption Risk	Total Risk
9.05E-05	1.83E-03	2.87E-06	1.22E-08	2.66E-05	2.96E-04	3.25E-04
-	-	*2.87E-06*	*1.22E-08*	*2.66E-05*	*2.96E-04*	*3.25E-04*

Site-Specific

Resident Risk for Soil

Isotope	ICRP Lung Absorption Type	ICRP Lung Absorption Type	Inhalation Slope Factor (risk/pCi)	External Exposure Slope Factor (risk/yr per pCi/g)	Food Ingestion Slope Factor (risk/pCi)	Soil Ingestion Slope Factor (risk/pCi)	Post Excavation Concentration (pCi/g)	Particulate Emission Factor (m^3/kg)	Lambda (1/yr)	Halflife (yr)	1000 m^2 Soil Volume Area Correction Factor
Th-232+D	S	S	8.70E-08	4.04E-06	1.56E-09	2.17E-09	9.35E-01	1.36E+09	4.93E-11	1.41E+10	8.17E-01
Total Risk			-	-	-	-	-	-	-	-	-

100 cm Soil Volume Gamma Shielding Factor	Wet Soil-to-plant transfer factor (pCi/g-fresh plant per pCi/g-wet soil)	Ingestion Risk	Inhalation Risk	External Exposure Risk	Produce Consumption Risk	Total Risk
9.05E-05	1.83E-03	2.27E-06	9.63E-09	2.10E-05	2.34E-04	2.58E-04
-	-	*2.27E-06*	*9.63E-09*	*2.10E-05*	*2.34E-04*	*2.58E-04*

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Site-Specific
Resident Risk for Soil

Isotope	ICRP Lung Absorption Type	ICRP Lung Absorption Type	Inhalation Slope Factor (risk/pCi)	External Exposure Slope Factor (risk/yr per pCi/g)	Food Ingestion Slope Factor (risk/pCi)	Soil Ingestion Slope Factor (risk/pCi)	PE w/o multiplier Concentration (pCi/g)	Particulate Emission Factor (m^3/kg)	Lambda (1/yr)	Halflife (yr)	1000 m^2 Soil Volume Area Correction Factor
Th-232+D	S	S	8.70E-08	4.04E-06	1.56E-09	2.17E-09	7.94E-01	1.36E+09	4.93E-11	1.41E+10	8.17E-01
Total Risk			-	-	-	-	-	-	-	-	-

100 cm Soil Volume Gamma Shielding Factor	Wet Soil-to-plant transfer factor (pCi/g-fresh plant per pCi/g-wet soil)	Ingestion Risk	Inhalation Risk	External Exposure Risk	Produce Consumption Risk	Total Risk
9.05E-05	1.83E-03	1.93E-06	8.18E-09	1.79E-05	1.99E-04	2.19E-04
-	-	*1.93E-06*	*8.18E-09*	*1.79E-05*	*1.99E-04*	*2.19E-04*

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background samples

	Number of samples	27
0.99	average	1.145
1.18	STDDEV	0.108
1.24	95 % Confidence	0.041
0.99	UCL	1.186
1.1		
1.14		
0.94		
1.28	median	1.17
1.17		
1.28		
1.12		
1.05		
1.25		
1.08		
1.24		
0.99		
1.02		
1.02		
1.18		
1.25		
1.28		
1.23		
1.3		
1.23		
1.06		
1.17		
1.14		

post excavation sample summary table

	Number of samples	24
0.636	average	0.7843
0.871	STDDEV	0.3778
0.972	95 % Confidence	0.1511
0.801	UCL	0.9355
0.717		
0.468		
0.751		
0.753	median	0.72
0.439		
1.22		
0.56		
0.647		
0.857		
0.689		
2.33		
0.725		
1		
0.694		
0.597		
0.724		
0.723		
0.688		
0.349		
0.613		

post excavation sample summary table minus outlier

	Number of samples	23
0.636	average	0.717
0.871	STDDEV	0.189
0.972	95 % Confidence	0.077
0.801	UCL	0.795
0.717		
0.468		
0.751		
0.753	median	0.717
0.439		
1.22		
0.56		
0.647		
0.857		
0.689		
0.725		
1		
0.694		
0.597		
0.724		
0.723		
0.688		
0.349		
0.613		

without 2.33 outlier