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DATE: February 22, 2018

TO: Felicia Barnett, Director SCMTSC, EPA WAM

FROM: Donna Getty, SERAS Statistician

THROUGH: Richard Leuser, SERAS Deputy Program Manager/Task Leader

SUBJECT: EXPLORATION OF A POTENTIAL METHOD FOR ESTABLISHING A LEVEL OF CONFIDENCE ACROSS A PARCEL THAT RADIOACTIVITY LEVELS ARE BELOW ACTIONABLE LEVELS, HUNTERS POINT NAVAL SITE, SERAS-106, WORK ORDER #84

INTRODUCTION

United States (US) Environmental Protection Agency (EPA) Region 9 personnel requested the exploration of a potential method to establish statistical confidence that remediation goals were achieved for designated areas (Parcels) at the Hunters Point Naval Superfund Site (Site). The US Navy's current proposal determines achievement of remediation goals on a Survey Unit by Survey Unit basis, while the EPA would like to establish statistical confidence for all Survey Units of a specific category (building sites, trench units) for each Parcel. The Record of Decision (ROD) called for the excavation and assessment of all trench units and building sites. The Navy and EPA are currently in discussions regarding whether 100 percent (%) of the Survey Units need to be re-evaluated per the specifications in the ROD or if a smaller effort could establish the presence/absence of residual contamination given the extensive work that has previously been conducted on the Site.

Presence/absence sampling, also known as item sampling, was originally presented as an option to EPA Region 9 in the form of an email, to establish statistical confidence for the achievement of remediation goals. Visual Sample Plan (VSP) software was used to perform the scenario-specific calculations. Uncertainties associated with applying this methodology are also presented following the discussion of how the method could potentially be applied.

PRESENCE/ABSENCE SAMPLING

Presence/absence sampling can be used as a method for evaluating appropriate thresholds for clearance of a site for future reuse. In the case of Hunters Point Naval Shipyard, VSP software was used to compute some possible scenarios as a demonstration of how item sampling works. The population of Trench Units (TUs) (N=63) located on Parcel G is used as an example. In this design, each TU is considered to be an item. Sampling results are categorized as binary as per VSP:

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"...this design requires that each sample result be categorized as a binary outcome, such as 1) the presence or absence of a particular quality, 2) a sample result being acceptable or unacceptable as defined by an action level threshold, 3) contamination being detected or not detected, etc. "

Additionally,

"The objective of this design is to demonstrate, with high probability, that a high percentage of the decision area (or population) is acceptable, where none of the observed samples may be unacceptable."

For Parcel G, which has 63 TUs:

1) The 2 levels of confidence are set. For example, "I want to be 95% confident that 95% of the 63 TUs are acceptable."
2) A decision is made whether to include targeted TUs in addition to randomly selected TUs. This also requires, an input, how much more likely the targeted TUs are to be unacceptable as compared to the remaining TUs. For example: "I believe that a target TU is 2 times more likely to be unacceptable"
3) Based on the above two inputs, the number of targeted and the number of random TUs to be evaluated is computed using VSP.
4) Each of the TUs selected for evaluation (a subset of the 63 TUs) undergo a MARSSIM Class 1- based scan/sampling process.
5) If at the end of the Class 1 process for the subset of TUs, if any of the evaluated TUs is determined to be unacceptable, then the preset confidence levels will no longer hold, and it requires all TUs undergo a MARSSIM Class 1 process.

Some example calculations are presented below.

For a sampling design where all TUs for evaluation are targeted:

- If I believe that a targeted TU is 2 times more likely to be unacceptable, and I sample 21 (33% of 63 total) targeted TUs then I can be at least 95% confident that 95% of the TUs meet criteria. If I sample 16 (25% of 63 total) targeted TUs, then I can be at least 90% confident that 95% of the TUs meet criteria.
- In addition, Parcel G has 32 total Building Site Survey Units (SUs). If I believe that a targeted SU is 2 times more likely to be unacceptable, and I sample 16 (50% of 32 total) targeted SUs, then I can be at least 95% confident that 95% of the SUs meet criteria. If I sample 15 (47% of 32 total) targeted SUs, then I can be at least 90% confident that 95% of the SUs meet criteria.

For a sampling design where all TUs for evaluation are selected randomly:

- If one wants to be 95% confident that 95% of the 63 TUs are acceptable then 39 TUs selected randomly must meet criteria.

- If one wants to be 61% confident that 95% of the TUs are acceptable then 16 (25% of 63) TUs selected randomly must meet criteria.

For a sampling design with targeted and randomly selected TUs:

- If I believe that a targeted TU is 2 times more likely to be unacceptable and I want to sample 16 targeted TUs then I need to sample an additional 7 random TUs. If all of the combined (random and targeted) TUs meet criteria then I can be at least 95% confident that 95% of the TUs meet criteria.

UNCERTAINTIES

Item sampling is not included in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) and is not typically used in this manner. It applies to grid cells across a region (a wall, a floor, etc), a group of drums, etc. where a single sample (wipe sample) dictates the presence/absence of the contamination. For Hunters Point, the Class 1 MARSSIM approach requires scanning 100% of the region followed by multiple sample collection and statistical analysis. The final binary answer, acceptable or unacceptable, is based on multiple lines of evidence not a single sample. The variability associated with a decision based on multiple lines of evidence is not captured.

cc: Central File - WA # SERAS-106 (w/attachment)
Electronic File - I:/Archive/SERAS/106/D/TM/022118
Kevin Taylor, SERAS Program Manager (cover page only)

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