Comparison Study of MARSSIM and EURSSEM Methodology for Final Status Survey

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1. Introduction

After decommissioning of nuclear facilities, the residual radiation and radioactivity survey method are required for performing regulatory clearance of decommissioning sites. Methods and guidance have been developed for evaluating environmental and facility radiological surveys conducted to demonstrate compliance with a dose- or risk-based regulation. This study compares the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) [1] developed by the multi US agency workgroup and European Radiation Survey and Site Execution Manual (EURSSEM) [2] developed by European Community.

2. Comparison of MARSSIM and EURSSEM

2.1 Background and Target Scope

The MARSSIM is a standardized approach for final status radiological survey for demonstrating compliance developed collaboratively by four Federal agencies having authority and control over radioactive materials: Department of Defense (DOD), Department of Energy (DOE), Environmental Protection Agency (EPA), and Nuclear Regulatory Commission (NRC). MARSSIM targets building surface and surface soil. We cannot apply MARSSIM to subsurface (>15cm) soil contamination.

The first edition of EURSSEM is not an abbreviation for the current European Radiation Survey and Site Execution Manual but for the European Radiation Survey and Site Execution Manual. It develop by “Co-ordination Network on Decommissioning of Nuclear Installations Project (2008-2008)” funded by the European Community. [3]

EURSSEM is a much wider range of manuals that closely matches MARSSIM with regard to the final status survey about surface soil. But it contains not only final status survey but also remediation, reuse, short-term and long-term stewardship on radioactively contaminated and potentially radioactively contaminated sites and/or groundwater. The remediation and reuse of site and groundwater is described on generic level. Most of the content related to characterization of radioactively contaminated sites is described in Chapter 3.

2.2 Data Quality Objectives (DQOs)

Both MARSSIM and EURSSEM are based on the Data Quality Objectives (DQOs) process. This is important concept in both manuals, minimizing the costs associated with data collection by eliminating redundant or overly precise data. In order for the collected data to be of sufficient accuracy and quantity, it is necessary to establish the criteria in advance and design the data collection process based on this. The development of such an efficient data collection design is called the DQOs process and has the following seven steps.

Table 1. The data quality objectives process

No	Step
1	State the Problem
2	Identify the Decision
3	Identify the Inputs to the Decision
4	Define the Boundaries of the Study
5	Develop a Decision Rule
6	Specify Limits on Decision Errors
7	Optimize the Design for Collecting Data

2.3 Sampling

When site characterization is performed the design of the site investigation procedures must be followed systematic review and strategy.

MARSSIM presents a statistical approach to detect a certain size of "hot spot" with a certain level of confidence. [1] If no contamination is present, it is assumed that there is no hot spot at least a certain size. In other words this means more sampling is needed for higher confidence.

The basic method is similar to MARSSIM, but EURSSEM uses more rigorous approach. The area to be sampled should be partitioned into regular sub-areas. Each sub-area should carry only one sampling point. Sampling points should be systematic and should not be aligned to improve detecting hot spot ability. Therefore we cannot use square grid in EURSSEM because sampling points are aligned. A herringbone pattern is considered to be the optimum type of non-targeted grid pattern in EURSSEM. [2]

2.4 Statistical Tests

Final status survey is performed to demonstrate that residual radioactivity in each survey unit satisfies release criteria. When the data clearly show that a survey unit meets or exceed the release criteria, the result is often obvious without performing statistical analysis. When we perform statistical tests the null hypothesis is set to baseline condition. MARSSIM assumes the residual radioactivity exceeds the release criteria as a null hypothesis. In contrast the null hypothesis recommended for use in EURSSEM is that the residual radioactivity in the survey unit does not exceed the release criteria.

3. Conclusion

A comparison study of MARSSIM and EURSSEM Methodology for final status survey was conducted. MARSSIM is the most widely used method and the related studies are being conducted in Korea. Since no actual cases of EURSSEM has been reported a comparative analysis with MARSSIM for application methods should be performed in the future. We would like to use this study as one of reference material for domestic application by comparing the other final status survey methods.

REFERENCES

[1] NUREG-1575, Rev1. EPA 402-R-97-106, Rev1. DOE/EH-0624, Rev1. "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)", August 2000.

[2] Co-ordination Network on Decommissioning, "European Radiation Survey and Site Execution Manual (EURSSEM), June 2009.

[3] Leo van Velzen, "European Radiation Survey and Site Execution Manual (EURSSEM)", ASME 2009 12th International Conference on Environmental Remediation and Radioactive Waste Management, October 11-15, 2009.