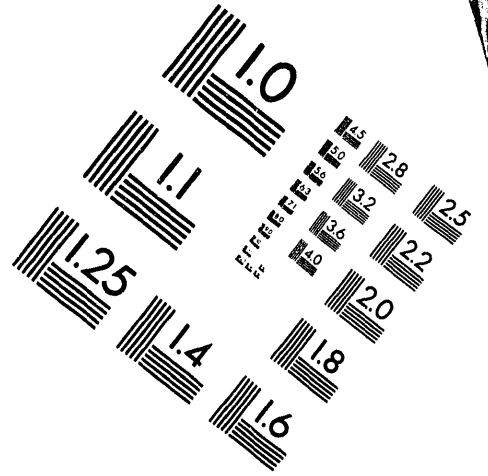
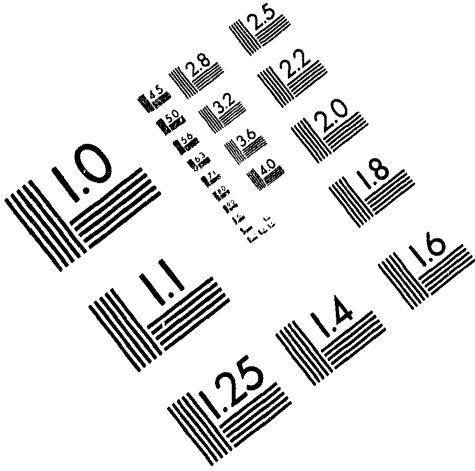




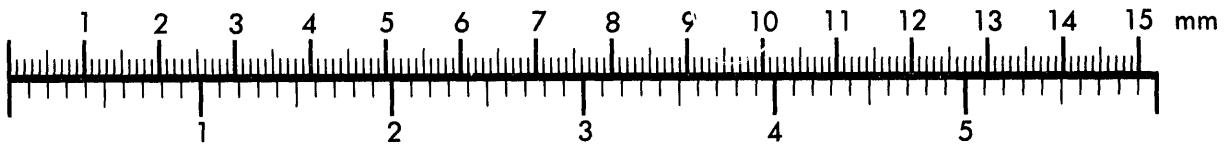
**AIM**

**Association for Information and Image Management**

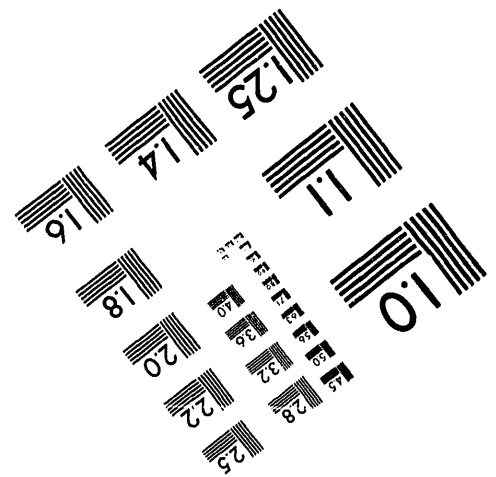
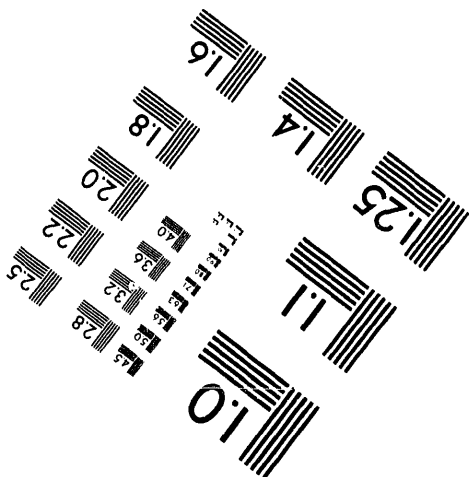
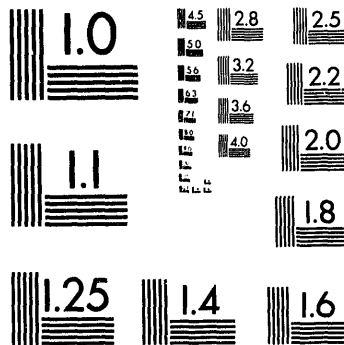
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Silver Spring, Maryland 20910  
301/587-8202



Centimeter



Inches



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**1 of 1**

In Search of BRC (Below Regulatory Concern)

Don R. Alexander  
Westinghouse Idaho Nuclear Co  
Idaho Falls, Idaho

RECEIVED  
JUN 11 1993  
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ABSTRACT

The development of a risk based clean up standard for low levels of radioactive soils has been initiated at the INEL using the methodology contained within the structure of the Federal Facility Agreement and Consent Order (FFA/CO) using section 120 (e) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986.

INTRODUCTION

A House of Representatives bill (HR 5857) has been proposed to provide standards for cleanup of domestic nuclear energy facilities and other radiologically contaminated sites. The bill states...."The administrator....shall by rule promulgate applicable standards for protection of the public health and safety and the general environment from the hazards of radiologically contaminated sites". The absence of a consistent policy for handling the low levels of radioactive soils associated with the bulk of the DOE sites, and a lack of an understanding of the risk associated with the low levels of contamination have resulted in the House of Representatives

MASTER

proposed bill. An administratively derived standard is likely to precipitate a level of cleanup that is not cost effective in determining an answer to the question of "How Clean is Clean"

The development of an acceptable de Minimus level for cleanup of low-level radioactivity in soils is imperative in order to provide a baseline of control for the regulatory guidelines in the RCRA/CERCLA process. The risk range of  $10^{-4}$  to  $10^{-6}$  as specified in EPA's Risk Assessment Guidance for Superfund is a key factor in establishing the cost benefit ratio between the present and future risk from the low levels of radioactively contaminated soil. The risk associated with exposure to levels of radiation associated with the EPA risk range must be communicated to the public through education programs in clear concise concepts that will enhance public understanding and recognition when compared with other risk.

The capabilities for disposal of low level radioactively contaminated soil in existing and planned waste disposal facilities is limited and prohibitively expensive.

From an environmental restoration and waste management perspective it would be prudent that radioactivity levels be established that would not require a soil clean up or removal actions at radiation levels where the risk would be evaluated

to be in the lower ranges of the EPA criteria. The radiation levels for contaminated material allowed to remain in place should be based on future risk to the individual working in the area during the period of operational and institutional control, and to the radiation dose to an individual that might inhabit the area after the land is returned to the public domain. This approach would establish the level at which the risk to the worker or a future resident would be both prudent and reasonable when compared with other societal risk.

Risk based studies that are being done as part of the Environmental Restoration program for non-radiological contaminants are apparently more acceptable in determining the extent of clean up and the approach appears to be both cost effective and appropriate. Clearly there should exist a level of risk for radiological contamination that would be acceptable when compared with non-radiological contamination.

Contaminated soils are considered a hazardous substance under The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended (P.L. 96-510)<sup>1</sup> and P.L. 99-499, The Superfund Amendments and Reauthorization Act of 1986 (SARA), and as such fall under the Federal Facility Agreement and Consent Order (FFA/CO) process. The high cost and logistical problems of remediating large volumes of soil with little or no added benefit to public health is a compelling reason for establishment of a "de Minimis" clean up

level. The frame work of the FFA/CO provides the opportunity for establishing criteria for dispositioning low level contaminated soils using the Record of Decision (ROD) process or an equivalent means. This process as it is presently being used provides a frame work for assessing the impact and establishing a criteria for making the decision for limiting the extent of clean up of a radiologically contaminated area. The factors to be included in an approach to establish a lower limit of cleanup level would include:

- 1) The evaluation and use of an appropriate pathway model using site specific parameters for the site to be evaluated. Included in the analytical tool would be the capability to determine the sensitivity of the selected parameters on the results of the analysis.

- 2) The establishment of the risk to a worker or a future occupant living or working on the site by comparison of the risk with current regulatory criteria as well as with recommendations of national and international standard setting organizations.

- 3) The development of a procedure or basis for determining the levels of soil radioactivity that may be acceptable based on the risk,

- 4) Provide defensible and practical radionuclide concentrations and their determined risk level that would be acceptable to the State, the DOE, EPA, and the public.

- 5) Provide a link between the available analytical codes and the specific site evaluation.
- 6) Provide a specific site evaluation that could be used in consideration of future cleanup activities.

Several national and international scientific advisory organizations exist that provide recommendations on radiation protection and radioactive waste management. While there is some action on the part of the National Council of Radiation Protection and Measurements to examine the need for establishing risk based standards for dealing with low level radioactive soil, no standards exist to this end. The work set forth by the NCRP and ICRP as well as the National Research Council's Biological Effects of Ionizing Radiation (BEIR) Reports, should provide the basis for establishing risk levels suitable for developing a management strategy for disposal of low level radioactivity contaminated material. A number of agencies have regulatory authority for cleanup of radioactivity contaminated sites including, the Department of Energy (DOE), the Environmental Protection Agency (EPA), the Nuclear Regulatory Commission (NRC) and state agencies. These agencies have promulgated regulations to control the allowable radiation exposure to workers and the general public. A review of existing standards indicates the risk from radiation exposure varies from  $6 \times 10^{-5}$  (4 mrem/year) from the Environmental Protection Agency National Primary Drinking

Water Regulations, 40 CFR Parts 141 and 142 to  $1.5 \times 10^{-3}$  (100 mrem/year) from the Nuclear Regulatory Commission; Below Regulatory Concern; Policy Statement, June 1990, and the U.S. Department of Energy Order 5400.5 Radiation Protection of the Public and the Environment, 2-8-90 standard for radiation protection. Allowable risk associated with radiation exposure for the current regulations is compatible with the upper limit of  $1 \times 10^{-4}$  established in the National Contingency Plan for a CERCLA response. Consistency in regulatory specification and the formulation of a risk policy would establish a level for environmental remediation activities that would be protective of the worker and the public and not pose a level of risk above currently prescribed standards.

In previous years of operations at the INEL the practice of using low level radioactively contaminated soils as backfill in a construction site was accepted, provided that a buffer zone of clean soil was used at the upper most level. Contaminated soil above a specified level (3 mrem at 1 foot) was placed in boxes for disposal at the Radioactive Waste Management Complex. Using this practice it was possible to conserve space at the waste disposal facility as well as providing a mechanism for handling low level contaminated soil. This however resulted in the present situation of having to determine the extent of the risk and the necessity of remediation actions under the RCRA/CERCLA clean up process. An additional area of concern is the general area of surface



contamination that has resulted from the years of stack releases of low level radioactivity. These "thumb prints" have additionally been identified using a remote sensing process of aerial gamma spectral analysis. The spectral survey indicated exposure rates principally from  $^{137}\text{Cs}$  and  $^{60}\text{Co}$  in a range from a few  $\mu\text{R/hr}$  up to as high as 3  $\text{mR/hr}$ . At the present time no site wide criteria exist for release or clean up of low level radioactively contaminated or mixed radioactive-hazardous contaminated soils. Hence, no matter how slight the contamination level the INEL may be required to remove and dispose large volumes of soil that pose little or no health risk to the public. With the signing of the FFA/CO each identified remediation area develops a risk evaluation based on the levels of contamination, (radiological as well as non-radiological) which is presented to the State and the Regional EPA for approval. A case-by-case justification for the clean up level is developed for each of the remediation areas. This requires an extended effort and the *ad hoc* approach can lead to inconsistent standards for how clean is clean. Such inconsistencies undermines the credibility needed in order to effect the acceptance of the clean up process. In addition, cost of a clean up can vary greatly, depending upon the choice of clean-up criteria.

As a result of these and other issues relative to the clean up process, a proposal has developed which could lead to the development of a uniform standard for clean up of the low

level radioactively contaminated sites. DOE standards most applicable to disposition of low level contaminated soils stem from Department of Energy Order, 5400.5 Radiation Protection of the Public and the Department of Energy Radiological Control Manual DOE N 5480.6. DOE Order 5400.5 Change 1, Chapter IV, Section 4.a indicates that:

"Guidelines shall be derived from the basic dose limits by means of an environmental pathways analysis using specific property data where available".

DOE guidance clearly envisions establishing site-specific limits, based on the unique characteristics of each site. The uniformity of the soil characteristics at the INEL and the similarity of the exposure pathways enhances the determination of a clean up standard applicable to the INEL.

The approach for development of a "risk-based" clean-up standard at the INEL centers around several key issues:

1. A comparison of the EPA methodology for establishing clean up levels as established in EPA/540/1-89/002, Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part A) and additional guidance contained in "Part B", and "Part C", and EPA/540/1-89/001 "Risk Assessment Guidance for Superfund, Volume II, Environmental Evaluation Manual".
2. The "Health Effects Assessment Summary Tables, Annual FY-1992; EPA's " OERR 9200.6-303 (92-1) and
3. A comparison of the EPA methodology and DOE/CH 8901 "A

Manual for implementing Residual Radioactive Material Guidelines". The DOE Residual Radioactivity (RESRAD)

code represents the DOE preferred methodology for analysis of clean-up activities associated with the Formerly Utilized Sites Remedial Action Program (FUSRAP) and the Surplus Facilities Management Program "SFMP"

4. Identification of key parameters and radionuclides associated with the clean up activities and the establishment of a generic Operable Unit (EPA designated area for remediation) for use as an analytical model for the development of the screening criteria and the development of a management strategy.

5. A number of studies will be undertaken to determine:

a. Which scenarios, pathways, and radionuclides may have a significant affect on the risk as determined from sensitivity studies.

b. Which parameters most influence the calculated residual radioactivity limits for each scenario and pathway.

c. Whether the range of values of the parameters studied covers the range of values found (or expected to be found) at the INEL.

d. Whether the results of those studies are useful to the current project.

6. The project will encompass the following, in order to determine which scenarios and pathways should be included

in the study.

- a. The number of pathways and scenarios needed to model the INEL realistically
- b. How much each pathway and scenario contributes to the total dose and
- c. How important is the radionuclide half-life in the risk computation. (i.e. depending on the degree of institutional control exercised, what time period will be used to determine release of the site for public access)

The outcome of the proposed study will be used to develop a site specific clean up criteria and a management strategy for use in the restoration process. Presentation and approval of the resulting findings and strategy will be made to the DOE, State and EPA for consideration. If the methodology and results are found to be acceptable the resulting management strategy will be established as a lower level of clean-up representative of a "de minimus" criteria.

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9 / 16 / 1993

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