resource limitations, staff interactions with the ACNW, and recent Committee reports.

C. *Technical Training Center Developments*—The Committee will hear a presentation by representatives of the Technical Training Center (TTC) on TTC programs relevant to the Committee's areas of priority.

D. *Facility Decommissioning*—The Committee will hear a presentation by the NRC staff on the current disposition of a facility listed on the Site Decommissioning Management Plan (SDMP). A proposal for permanent on-site disposal, as well as performance assessment considerations, are among the relevant issues to be discussed.

E. *Residual Contamination Background Level Determination*—The Committee will hear a report from the Office of Research on its recent field study demonstration project intended to verify the efficacy of the background level determination process proposed in the draft Residual Contamination Level for Decommissioning rule.

F. *High-Level Waste Source Term*—The Committee will hear a consultant presentation on a high-level waste source term.

G. *Meeting with the Director, NRC's Division of Waste Management, Office of Nuclear Materials Safety and Safeguards*—The Director will discuss items of current interest related to Division of Waste Management programs. Among the topics which may be discussed are: A proposed high-level waste issue resolution process, an overview of a recent decommissioning exercise, and current activities related to the use of expert judgment in the licensing process.

H. *Committee Activities/Future Agenda*—The Committee will consider topics proposed for future consideration by the full Committee and Working Groups. The Committee will also discuss ACNW-related activities of individual members.

I. *Miscellaneous*—The Committee will discuss miscellaneous matters related to the conduct of Committee activities and organizational activities and complete discussion of matters and specific issues that were not completed during previous meetings, as time and availability of information permit.

Procedures for the conduct of and participation in ACNW meetings were published in the Federal Register on September 27, 1995 (60 FR 49924). In accordance with these procedures, oral or written statements may be presented by members of the public, electronic recordings will be permitted only during those portions of the meeting that are open to the public, and questions may be asked only by members of the Committee, its consultants, and staff. Persons desiring to make oral statements should notify the Chief, Nuclear Waste Branch, Mr. Richard K. Major, as far in advance as practicable so that appropriate arrangements can be made to allow the necessary time during the meeting for such statements. Use of still, motion picture, and television cameras during this meeting may be limited to selected portions of the meeting as determined by the ACNW Chairman. Information regarding the time to be set aside for this purpose may be obtained by contacting the Chief, Nuclear Waste Branch, prior to the meeting. In view of the possibility that the schedule for ACNW meetings may be adjusted by the Chairman as necessary to facilitate the conduct of the meeting, persons planning to attend should check with Mr. Major if such rescheduling would result in major inconvenience.

Further information regarding topics to be discussed, whether the meeting has been cancelled or rescheduled, the Chairman's ruling on requests for the opportunity to present oral statements and the time allotted therefor can be obtained by contacting Mr. Richard K. Major, Chief, Nuclear Waste Branch (telephone 301/415–7366), between 8:00 A.M. and 5:00 P.M. EDT.

ACNW meeting notices, meeting transcripts, and letter reports are now available on FedWorld from the ''NRC MAIN MENU.'' Direct Dial Access number to FedWorld is (800) 303–9672; the local direct dial number is 703–321–3339.

Dated: January 11, 1996.

Andrew L. Bates,

Advisory Committee Management Officer.

[FR Doc. 96–670 Filed 1–19–96; 8:45 am]

BILLING CODE 7590–01–P

Advisory Committee on Reactor Safeguards; Meeting of the Subcommittee on Individual Plant Examinations; Notice of Meeting

The ACRS Subcommittee on Individual Plant Examinations (IPEs) will hold a meeting on January 26, 1996, in Room T–2B1, 11545 Rockville Pike, Rockville, Maryland.

The meeting will be open to public attendance.

The agenda for the subject meeting shall be as follows:

Friday, January 26, 1996—8:30 a.m. until the conclusion of business.

The Subcommittee will discuss the extent to which the current spectrum of IPEs can be used in the regulatory process and other related matters. The purpose of this meeting is to gather information, analyze relevant issues and facts, and to formulate proposed positions and actions, as appropriate, for deliberation by the full Committee.

Oral statements may be presented by members of the public with the concurrence of the Subcommittee Chairman; written statements will be accepted and made available to the Committee. Electronic recordings will be permitted only during those portions of the meeting that are open to the public, and questions may be asked only by members of the Subcommittee, its consultants, and staff. Persons desiring to make oral statements should notify the cognizant ACRS staff engineers named below five days prior to the meeting, if possible, so that appropriate arrangements can be made.

During the initial portion of the meeting, the Subcommittee, along with any of its consultants who may be present, may exchange preliminary views regarding matters to be considered during the balance of the meeting.

The Subcommittee will then hear presentations by and hold discussions with representatives of the NRC staff, its consultants, and other interested persons regarding this review.

Further information regarding topics to be discussed, whether the meeting has been cancelled or rescheduled, the Chairman's ruling on requests for the opportunity to present oral statements and the time allotted therefor can be obtained by contacting the cognizant ACRS staff engineers, Dr. Medhat El-Zeftawy (telephone 301/415–6889) or Mr. Michael Markley (telephone 301/415–6885) between 7:30 a.m. and 4:15 p.m. (EST). Persons planning to attend this meeting are urged to contact the above named individuals one or two working days prior to the meeting to be advised of any potential changes in the proposed agenda, etc., that may have occurred.

Dated: January 11, 1996.

Sam Duraiswamy,

Chief, Nuclear Reactors Branch.

[FR Doc. 96–672 Filed 1–19–96; 8:45 am]

BILLING CODE 7590–01–P

Disposition of Cesium-137 Contaminated Emission Control Dust and Other Incident-Related Material; Proposed Staff Technical Position

AGENCY: Nuclear Regulatory Commission.

ACTION: Notice: Proposed Staff Technical Position.

SUMMARY: The Nuclear Regulatory Commission (NRC) is proposing guidance, in the form of a Technical Position, that may be used in case-by-case requests by appropriate licensees to dispose of a specific mixed waste. Mixed waste is a waste that is not only radioactive, but also classified as hazardous under the Resource Conservation and Recovery Act (RCRA). The specific mixed waste is emission control dust from electric arc furnaces and foundries that has been contaminated with cesium-137 (Cs-137). The contamination results from the inadvertent melting of a Cs-137 source, that: (1) has been improperly disposed of by an NRC or Agreement State licensee; (2) has been commingled with the steel scrap supply; (3) has not been detected as it progresses to the steel producing process; and (4) is volatilized in production process and thereby can and has contaminated large volumes of emission control dust and the emission control systems at steel producing facilities.

The proposed position, which has been coordinated with the U.S. Environmental Protection Agency (EPA), provides the possibility of a public health-protective, environmentally sound, and cost-effective alternative for the disposal of much of this mixed waste that contains Cs-137, in concentrations similar to values that frequently occur in the environment. The position provides the bases that, with the approval of appropriate regulatory authorities (e.g., State-permitting agencies) and others (e.g., disposal site operators), and with public input, could be used to allow disposal of treated (stabilized) waste at Subtitle C, RCRA-permitted, hazardous waste disposal facilities. NRC believes that disposal, under the provisions of the position or other acceptable alternatives, is preferable to allowing this mixed waste to remain indefinitely at steel company sites.

The proposed position has been developed through a very ''open'' process in which working draft documents have been routinely shared with EPA, and also placed in NRC's Public Document Room (Subject File: 204.1.23) to allow interested party access. In keeping with this process, NRC, rather than noticing the availability of the proposed position, is publishing the entire position for public comment.

DATES: Submit comments by March 22, 1996. Comments received after this date will be considered if it is practical to do so, but the Commission is able to assure consideration only for comments received on or before this date.

ADDRESSES: Send comments to Chief, Rules Review and Directives Branch, U.S. Nuclear Regulatory Commission, Washington, DC 20555. A final position will be issued following NRC staff review of the comments received.

FOR FURTHER INFORMATION CONTACT: W.R. Lahs, Division of Waste Management, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555, Telephone (301) 415–6756.

SUPPLEMENTARY INFORMATION:

Disposition of Cesium-137 Contaminated Emission Control Dust and Other Incident-Related Materials; Proposed Branch Technical Position

A. Introduction

Emission control (baghouse) dust and other incident-related materials (e.g., cleanup materials or recycle process streams) contaminated with cesium-137 (Cs-137) [1] are currently being stored as mixed radioactive and hazardous waste at several steel company sites across the country. At any single site, this material typically contains a total Cs-137 quantity ranging downward from a little more than one curie (37 gigabecquerels (GBq)) of activity, distributed within several hundred to a few thousand tons of iron/zinc-rich dust, as well as within much smaller quantities of cleanup or dust-recycle, process stream materials.[2]

The radioactivity is not evenly distributed among these materials. Typically, a small fraction (e.g., one-tenth) of the material contains most (e.g., 95 percent) of the radioactivity. Most of the material contains a small quantity of radioactivity at low concentrations and makes up most of the mixed-waste volume. This material is generally classified as hazardous waste under RCRA because it contains lead, cadmium, and chromium that are common to the recycle metal supply. The Cs-137 contamination of this hazardous waste, on the other hand, results from a series of three principal events: (1) the loss of control of a radioactive source by an NRC or Agreement State licensee; (2) the inclusion of the source within the recycle metal scrap supply used by the steel producers; and (3) the inability to screen out the radioactive source as it progresses along the typical scrap collection-to-melt pathway (e.g., including radiation detectors used at most furnaces and foundries). Consequently, irrespective of the quantity or concentration of the radioactivity, all the material is subject to joint regulation as mixed waste under RCRA and the Atomic Energy Act of 1954, as amended, or the equivalent law of an Agreement State.

The disposal options for these materials, specifically the large volumes of material with the lower concentrations of Cs-137, have been limited because of their ''mixed-waste'' classification and the costs associated with the disposition of large volumes of mixed or radioactive waste. Long-term solutions addressing the control and accountability of licensed radioactive sources are being considered by NRC and its Agreement States. Solutions addressing the disposition of mixed wastes are being considered by various Federal and State regulatory authorities and the U.S. Department of Energy. Nevertheless, the Commission believes that, pending decisions on improved licensee accountability and the ultimate disposition of mixed waste, appropriate disposal of the existing incident-related, mixed-waste material is preferable to indefinite onsite storage.

As a result, this technical position defines the bases that the NRC staff would generally find acceptable for: (1) authorizing a licensee, possessing Cs-137 contaminated emission control dust and other incident-related materials (e.g., the steel company or its service contractor), to transfer Cs-137 contaminated material, below levels specified in this position, to a Subtitle C, RCRA-permitted hazardous waste disposal facility; and (2) exempting the possession and disposal of these incident-related materials (e.g., by the RCRA-permitted disposal facility) from NRC or Agreement State licensing requirements. Because of its radioactivity (i.e., Cs-137 concentration levels), some of the incident-related material may not be suitable for disposal at a Subtitle C, RCRA-permitted disposal facility. This material may be disposed of either: (1) at a licensed low-level radioactive waste disposal facility following ''delisting'' (e.g., after appropriate treatment of its hazardous constituents) or (2) at a mixed waste disposal facility, if applicable acceptance criteria are met.

The regulatory basis for the first action is found at 10 CFR 20.2001(a)(1). This paragraph authorizes a licensee to

[1] The byproduct material Cs-137 does not include the Cs-137, from global fallout, that exists in the environment from the testing of nuclear explosive devices (See Footnote 3).

[2] The term, ''incident-related material,'' is frequently used in this position to refer to the total spectrum of Cs-137-contaminated materials resulting from an inadvertent melting event. Because of its widespread use in radioactive devices and its volatility when subjected to steel melting temperatures, the position is directed solely at incident-related materials involving this nuclide.

dispose of licensed material as provided in the regulations in 10 CFR Parts 30, 40, 60, 61, 70, or 72. Paragraph 30.41(b) states the conditions under which licensees are allowed to transfer byproduct material. Paragraph 30.41(b)(7) of Part 30 specifically provides that licensees may transfer byproduct material if authorized, by the Commission, in writing.

The regulatory basis for the second action is found at § 30.11 (''Specific exemptions''), which states that the Commission may, on its own initiative, grant exemptions (from the requirements of the regulations in 10 CFR Parts 30 through 36, and 39) as it determines are authorized by law and will not endanger life or property and are otherwise in the public interest. It should be noted that additional acceptance requirements, beyond those covered in this NRC position for disposal of Cs-137-contaminated hazardous waste at a Subtitle C RCRA-permitted disposal facility, may be established by: (1) an Agreement State; (2) the permit conditions or policies of the RCRA-permitted disposal facility; (3) the regulatory requirements of the RCRA disposal facility's permitting agency; or (4) other authorized parties, including State and local governments. These requirements may be more stringent than those covered in the guidance described in this technical position. The licensed entity transferring the Cs-137-contaminated incident-related materials should consult with these parties, and obtain all necessary approvals, before making the transfers defined in this technical position. Nothing in this position shall be or is intended to be construed as a waiver of any RCRA permit condition or term, of any State or local statute or regulation, or of any Federal RCRA regulation.

B. Discussion

Over the past decade, there has been an increasing number of instances in which radioactive material has been inadvertently commingled with scrap metal that subsequently has entered the steel-recycle production process. If this radioactive material is not removed before the melting process, it could contaminate the finished metal product, associated dust-recycle process streams, equipment (principally air effluent treatment systems), and the dust generated during the process. Some of the contaminant radioactivity is a result of naturally occurring radionuclides that deposit in oil and gas transmission piping. Other radioactivity may be associated with radioactive sources that are contained in industrial or medical devices. In this latter case, the commingling of the radioactive source with metal destined for recycling can occur if the regulatorily required accountability of these sources fails and a radioactive source is included within the metal scrap supply used by the steel producers. In cases where the radionuclide is naturally occurring, or is already present in the environment as a result of global fallout, the inadvertent melting of a radioactive source could increase the contaminant concentration above that caused by these background environmental levels.[3]

Although many of the steel producers have installed equipment to detect incoming radioactivity, this equipment cannot provide absolute protection because of the shielding of radioactive emissions that may be provided by uncontaminated scrap metal or the shielded ''pig'' that contains the radioactive source. Of special concern, because of the nature and magnitude of the involved radioactivity, are NRC- or Agreement State-licensed sources containing Cs-137.

When Cs-137 sources are inadvertently melted with a load of scrap metal, a significant amount of the Cs-137 activity contaminates the metal-rich dust that is collected in the highly efficient emission control systems that steel mills have installed to comply with air pollution regulations. Because of toxic constituents—specifically lead, cadmium, and chromium—electric arc furnace (EAF) and foundry emission control dust are subject to regulation under RCRA. If this dust becomes contaminated with Cs-137, the resulting material would be classified as a mixed waste. Emission control dust, generated immediately after the melting of a Cs-137 source with the scrap metal, can contain cesium concentrations in the range of hundreds or thousands of picocuries per gram (pCi/g) or a few to a few tens of becquerels (Bq) per gram of dust, above typical levels in dust caused by Cs-137 in the environment (e.g., 2 pCi/g or 0.074 Bq/g). Several thousand cubic feet (several tens of cubic meters) of dust could be contaminated at these levels. Dust generated days or weeks after a melt of a source (containing hundreds of millicuries or a few curies of Cs-137) will contain reduced concentrations, typically less than 100 pCi/g (3.7 Bq/g).

Even after extensive decontamination and remediation activities, newly generated dust may still contain concentrations greater than 2 pCi/g (0.074 Bq/g) background levels, but generally less than 10 pCi/g (0.37 Bq/g). When the melting of a source is not immediately detected, materials related to downstream processes have also been contaminated with relatively low concentrations of Cs–137 (e.g., 10 pCi/g (0.37 Bq/g)). In addition, materials used during decontamination may also be contaminated with dust containing Cs–137 concentrations at similar levels above background.

As the result of past inadvertent meltings of Cs–137 sources, a number of steel producers possess a total of over 10,000 tons of incident-related materials, most of which contains Cs–137 concentrations of less than 100 pCi/g (3.7 Bq/g). This material is typically being stored onsite because of the lack of disposal options that are considered cost effective by the steel companies.[4] It is the disposition of material at these concentration levels that is the subject of this technical position.

C. Regulatory Position

General

Because of the ''incident-related'' origin of the Cs–137 contaminated materials, the Commission has approved a course of action that includes: (1) exploration of approaches to improve licensee control and accountability to reduce the likelihood of sealed sources entering the scrap metal supply; (2) cooperation with the steel manufacturers and other appropriate organizations to identify the magnitude and character of the problem (with particular emphasis on improving the capability to detect sealed sources before their inadvertent melting); and (3) development of interim guidelines for the disposal of Cs–137 contaminated dust and other incident-related materials (the subject of this technical position).

Specific

Bases for Allowing Transfer and Possession of Cs–137 Contaminated Incident-Related Material. The bases for allowing transfer and possession of Cs–137 contaminated emission control dust and other incident-related materials, under the provisions of existing regulations, are as follows: (1) Any

[3] In a letter to William Guerry, Jr. from NRC's Executive Director for Operations, James M. Taylor, dated May 25, 1993, NRC made a preliminary determination that Cs-137 levels in baghouse dust can reasonably be attributed to fallout from past nuclear weapons testing, if concentrations are less than about 2 pCi/g (0.074 Bq/g).

[4] In April 1995, Envirocare of Utah, Inc., an operator of a mixed-waste disposal site, received authorization from the State of Utah and initiated operations to treat and dispose of Cs–137-contaminated incident-related (mixed waste) materials at concentrations not exceeding 560 pCi/g (20.7 Bq/g).

person at a Subtitle C, RCRA-permitted disposal facility involved with the receipt, movement, storage, or disposal of contaminated materials should not receive an exposure greater than 1 millirem (mrem) or 10 micro-sievert (μSv) per year (i.e., one-hundredth of the dose limit for individual members of the public as defined at 10 CFR 20.1301(a)(1)), above natural background levels;[5] (2) members of the general public in the vicinity of storage or disposal facilities should not receive exposures and no individual member of the public should be likely to receive a dose greater than 1 mrem (10 μSv) per year above background as a result of any and all transfers and disposals of contaminated materials; (3) handling or processing of the contaminated materials, undertaken as a result of its radioactivity, should not compromise the effectiveness of permitted hazardous waste disposal operations; (4) treatment of contaminated materials should be accomplished by persons operating under a licensee's radiation protection program; and (5) transportation of contaminated materials should be performed by hazardous material employees, as defined in U.S. Department of Transportation (DOT) regulations (49 CFR Part 172, Subpart H).

Definition of Contaminated Materials and Initial Incident Response. A melting event generally necessitates extensive decontamination and remediation operations at the EAF or foundry (e.g., replacing refractory bricks and duct work). Subsequent operations include the proper interim handling and management (e.g., accumulation and containment) of emission control dust and other incident-related contaminated materials. Based on a review of several recent incidents, the dust may contain Cs–137 concentrations up to hundreds or thousands of pCi/g (a few to a few tens of Bq/g), whereas the other generally limited-volume, incident-related materials typically contain lower concentrations. As a result, the initial cleanup and collection/treatment/packaging of the contaminated emission control dust and other materials at the EAF or foundry should be performed by an NRC or Agreement State licensee operating under an approved radiation protection program. The licensee would also be responsible for compliance with other non-radiological regulatory requirements (e.g., those of the Occupational Safety and Health Administration and RCRA Treatment Permitting requirements).

Provisions for Disposal at a Subtitle C, RCRA-Permitted, Disposal Facility. Once the decontamination/remediation and collection/treatment/packaging activities have been completed, one of two paths may be followed for the disposal of the incident-related materials, dependent on Cs–137 concentration levels and whether the final land disposal operation involves the burial of packaged or unpackaged materials.

1. *Packaged Disposal of Treated Waste.* On this disposal path, contaminated materials would be treated through stabilization to comply with all EPA and/or State waste treatment requirements for land disposal of regulated hazardous waste. The treatment operations would be undertaken by either (i) The owner/operator of the EAF or foundry (licensed by NRC or appropriate Agreement State to possess, treat, and transfer Cs–137 contaminated incident-related materials); or (ii) an NRC-or Agreement State-licensed service contractor. Based on the radiological impact assessment provided in the appendix, the licensee could be authorized to transfer the treated incident-related materials to a Subtitle C, RCRA-permitted, disposal facility, provided that all the following conditions are met:

(a) The Cs–137-contaminated emission control dust and other incident-related materials are the result of an inadvertent melting of a sealed source or device;

(b) The emission control dust and other incident-related materials have been treated (stabilized) to meet requirements for land disposal of RCRA-regulated waste, and have been stored (if applicable) and transferred in compliance with a radiation protection program as specified at 10 CFR 20.1101;

(c) The total Cs-137 activity, contained in emission control dust and other incident-related materials to be transferred to a Subtitle C, RCRA-permitted, disposal facility, has been specifically approved by NRC or the appropriate Agreement State(s) and does not exceed the total activity associated with the inadvertent melting incident. Moreover, NRC or the appropriate Agreement State should maintain a public record of the total incident-related Cs-137 activity, received by the facility over its operating life, to ensure that this total-disposed Cs-137 activity does not exceed 1 curie (37 GBq);[6]

(d) The RCRA disposal facility operator has been notified in writing of the impending transfer of the incident-related materials and has agreed in writing to receive and dispose of the packaged materials;

(e) The licensee providing the radiation protection program required in paragraph (b), notifies, in writing, the Commission or Agreement State(s) in which the transferor and transferee are located, of the impending transfer, at least 30 days before the transfer;

(f) The treated (stabilized) material has been packaged for transportation and disposal in non-bulk steel packagings as defined in DOT regulations at 49 CFR 173.213. (Note that this is a condition established under this technical position and is not a DOT requirement. Under DOT regulations, material with concentrations of less than 2 thousand picocuries per gram (74 Bq/g) is not considered radioactive);

(g) In any package, the emission control dust and other incident-related materials, that have been treated (stabilized) and packaged as defined in (b) and (f) above, contain pretreatment average concentrations of Cs-137 that did not exceed 130 pCi/g (4.8 Bq/g) of material;[7] and

(h) The dose rate at 3.28 feet (1 meter) from the surface of any package containing treated (stabilized) waste does not exceed 20 μrem per hour or 0.20 μSv per hour, above background.[8]

Note that, in defining the pretreatment Cs-137 concentration value stated in paragraph (1)(g), a factor of 1.5 has been included as a regulatory margin. This factor adds further

[5] The use of 1 mrem (10 μSv) has no significance or precedential value as a health and safety goal. It was selected only for the purpose of analysis of the levels at which the referenced materials could be partitioned to allow the bulk of the material to be transferred to unlicensed persons. It does not represent an NRC position on the generic acceptability of dose levels. Such levels are established only by rule.

[6] The 1 curie (37 GBq) value represents a reasonable bounding activity, associated with several incidents, that could be transferred to an RCRA-permitted facility under the provisions of this position. It also represents a quantity that would be less than the activity disposed of over the operating life of the RCRA-permitted facility, if the facility routinely disposed of non-incident-related emission control dust containing background concentrations of Cs-137.

[7] The 130 pCi/g (4.8 Bq/g) value is the concentration, based on the analysis in the appendix and including a regulatory margin of 1.5, that would result in a calculated potential exposure less than 1 mrem (10 μSv). The disposal of incident-related materials in packaged form allows compliance with this position to be demonstrated through measurement of Cs-137 concentrations, as well as direct radiation levels external to the package. Notwithstanding the redundant approaches to ensure compliance with the exposure criterion, the regulatory margin of 1.5 has been included in determining the acceptable measurables defined in the position.

[8] At this exposure rate, for the exposure period as defined in the appendix, total exposure would not exceed 1 mrem (10 μSv) with a regulatory margin of 1.5.

assurance to the certainty in protection provided by the licensee's (1) Sampling of Cs-137 concentrations in contaminated materials, (2) measurements of dose rate external to the disposal (and transportation) packagings, and (3) other assumptions included in the radiological impacts assessment.

2. *Disposal of Unpackaged (i.e., Bulk) Treated Waste.* On this disposal path, contaminated materials would also be treated through stabilization to comply with all EPA and State waste treatment requirements for land disposal of RCRA-regulated hazardous waste. The treatment operations would be undertaken by either (i) The owner/operator of the EAF or foundry (licensed to possess, treat, and transfer Cs-137-contaminated incident-related materials), or (ii) a licensed service contractor. Based on the radiological impact assessment provided in the appendix, the licensee could be authorized to transfer the treated (stabilized) incident-related materials to a Subtitle C, RCRA-permitted, disposal facility, provided that all the following conditions are met. (Note that conditions (a) through (e) are identical to those applicable to packaged disposal of treated waste):

(a) The Cs-137 contaminated emission control dust and other incident-related materials are the result of an inadvertent melting of a sealed source or device;

(b) The emission control dust and other incident-related materials have been treated (stabilized) to meet requirements for land disposal of RCRA-regulated waste, and have been stored (if applicable), and transferred in compliance with a radiation protection program as specified at 10 CFR 20.1101;

(c) The total Cs-137 activity, contained in emission control dust and other incident-related materials to be transferred to a Subtitle C, RCRA-permitted, disposal facility, has been specifically approved by NRC or the appropriate Agreement State(s) and does not exceed the total activity associated with the inadvertent melting incident. Moreover, NRC or the appropriate Agreement State should maintain a public record of the total incident-related Cs-137 activity, received by the facility over its operating life, to ensure that this total disposed Cs-137 activity does not exceed 1 curie (37 GBq);[9]

(d) The RCRA disposal facility operator has been notified in writing of the impending transfer of the incident-related materials and has agreed in writing to receive and dispose of these materials;

(e) The licensee providing the radiation protection program required in paragraph (b) notifies, in writing, the Commission or Agreement State(s) in which the transferor and transferee are located, of the impending transfer, at least 30 days before the transfer; and

(f) The emission control dust and other incident-related materials, that have been treated (stabilized) as defined in (b) above, contain pretreatment average concentrations of Cs-137 that did not exceed 100 pCi/g (3.7 Bq/g) of material.[10]

Note that, in defining the pretreatment Cs-137 concentration value in paragraph (2)(f), a factor of 2 has been included as a regulatory margin. The factor adds further assurance to the certainty of protection provided by the licensee's (1) sampling of Cs-137 concentrations in contaminated materials; and (2) other assumptions included in the radiological impacts assessment.

Treatment, Storage, and Transfer of Emission Control Dust or Other Incident-Related Materials with Cs-137 Concentrations Indistinguishable from Background Levels (i.e., 2 pCi/g (0.074 Bq/g) or Less). The EAF or foundry licensed to possess and transfer Cs-137 contaminated emission control dust or a licensed service contractor is authorized to transfer emission control dust and other incident-related materials as if they were not radioactive, provided that the Cs-137 concentration within the emission control dust and other incident-related materials is 2 pCi/g (0.074 Bq/g) of material or less.

Aggregation of Cs-137 Contaminated Emission Control Dust and Other Incident-Related Materials. Aggregation of Cs-137 contaminated emission control dust and other incident-related material, before stabilization treatment, is acceptable if performed in compliance with a radiation protection program, as described at 10 CFR 20.1101, and provided that:

(1) Aggregation involves the same characteristic or listed hazardous waste and the wastes must be amenable to and undergo the same appropriate treatment for land-disposal restricted waste;

(2) Aggregation does not increase the overall total volume nor the radioactivity of the incident-related mixed waste; and

(3) Materials, when aggregated, are subjected to a sampling protocol that demonstrates compliance with Cs-137 concentration criteria on a package-average[11] basis.

Determination of Cs-137 Concentrations and Radiation Measurements. Cs-137 concentrations may be determined by the licensee by direct or indirect (e.g., external radiation) measurements, through an NRC- or Agreement State-approved sampling program. The program should be sufficient to ensure that Cs-137 contamination in stabilized treated emission control dust and in other incident-related materials, on a package-average basis, is consistent with the concentration criteria in this technical position. The sampling program should provide assurance that the quantity of Cs-137 in any package (see footnote 11) does not exceed the product of the applicable concentration criterion times the net weight of contaminated material in a package.

Appendix—Assessment of Radiological Impact of Disposal of Cs-137 Contaminated Emission Control Dust and Other Incident-related Materials at a Subtitle C RCRA-Permitted Disposal Facility

Background

In the normal process of producing recycled steel, scrap steel is subjected to a melting process. In this process, most impurities in the scrap steel are removed and generally contained within process-generated slag or off-gas. Typically, the off-gas carries dust, containing iron and zinc, together with certain heavy metals, through an emission control system to a ''baghouse,'' where the dust is captured in ''bag-type'' filters. Hazardous constituents within the dust, principally lead, cadmium, and chromium, cause the dust to be designated by EPA as a hazardous waste, under RCRA, often as the listed waste K061.

Typically, when the scrap consists largely of junk automobiles, the dust contains a high percentage (greater than 20 percent) of zinc, which can be a valuable recovery product. Moreover, the zinc recovery process produces slag and other byproducts that have recycle potential. If economic (e.g., low zinc content) or process considerations

[9] See footnote 6.

[10] The 100 pCi/g (3.7 Bq/g) value is the concentration, based on the analysis in the appendix and including a regulatory margin of 2, that would result in a calculated potential exposure of less than 1 mrem (10 μSv). The disposal of incident-related material in unpackaged (bulk) form dictates that compliance with this position would be demonstrated through measurement of Cs-137 concentrations. Without the redundant approach to ensure compliance with the exposure criterion inherent with the packaged-disposal approach (see Footnote 7), the regulatory margin, included in determining the acceptable measurables defined in the position, has been increased to 2.0.

[11] The term package, as used here, refers to packages used by the licensee to transfer the material to the disposal facility, irrespective of whether this package is also the disposal container.

preclude these recycle options, the dust may be treated and disposed of in a hazardous waste disposal facility. Treatment standards for the various hazardous constituents of the dust have been specified by EPA in 40 CFR 268.40. Solidification is the treatment process typically used to meet these standards.

Because the recycling of steel involves the addition of natural materials (primarily lime and ferromanganese), very low levels of radioactivity, ubiquitous in the environment, are involved in the production process. One of these radionuclides is Cs-137 which now occurs in the environment as a result of global fallout from past weapons-testing programs.

Cs-137 has a 30-year half-life (i.e., a quantity of this radionuclide and its associated radioactivity will decrease by half every 30 years). The decay of Cs-137 and its very short-lived daughter produces emissions of beta particles and gamma rays.

The principal hazard from the beta particles can only be realized when it enters the human body. The principal hazard from the gamma rays is as an external source of penetrating radiation similar to the type of exposure received from an X-ray. Because of its volatility in the very high-temperature (typically 3000 degrees fahrenheit) steel-making process, Cs-137 is volatilized and transported in the furnace off-gas and, as it condenses, becomes a constituent of the emission control (baghouse) dust. Normal background Cs-137 concentrations in dust have been measured at picocurie per gram levels (0.024 to 1.23 pCi/g)[12] or thousandths of a becquerel per gram (Bq/g). This concentration is consistent with the general range of background levels measured in soils within the United States whereas concentrations of 10 pCi/g (0.37 Bq/g) are relatively common in drainage areas.[13] As a result of this information, NRC has determined that Cs-137 concentrations in emission control dust below 2 pCi/g (0.074 Bq/g) can be attributed to fallout from past weapons testing.[14]

Statement of Problem

The inadvertent melting of a licensed Cs-137 sealed source with scrap steel at an EAF or foundry typically results in the contamination of the steel producer's emission control system and the generation of potentially large quantities (e.g., of the order of 1000 tons) of Cs-137 contaminated emission control dust. Facility cleanup operations will produce an additional quantity of contaminated material and, depending on the effectiveness of cleanup operations, further generation of contaminated dust or cleanup-related materials can occur. Furthermore, if the occurrence of the melting event is not immediately detected, contamination can unknowingly be carried forward with the dust into zinc-recovery process streams. In one case, for example, this has led to Cs-137 contamination of the zinc-rich, splash condenser dross residue, referred to as SCDR material. In the incidents to date, total quantities of these contaminated materials have not exceeded 2000 tons per event. The Cs-137 concentration in all these materials can vary, but in typical past events, much of the material is contaminated at levels ranging from 2 pCi/g (0.074 Bq/g) to a few hundred pCi/g (most below approximately 100 pCi/g or 3.7 Bq/g). Smaller volumes (typically less than 5 percent of the total volume) have included concentrations at nanocurie/gram levels (thousands of pCi/g or a few tens of Bq/g).

The intent of this analysis is to characterize the potential radiological impacts associated with the alternative options for disposal of Cs-137 contaminated emission control dust and other incident-related materials at a Subtitle C, RCRA-permitted facility. Because these RCRA hazardous wastes must be treated to comply with the requirements for land disposal of restricted waste, the potential radiological impacts associated with treatment processes required consideration. To protect against these radiological impacts, the position includes the provision that treatment of Cs-137 contaminated emission control dust and other incident-related materials be performed by an NRC or Agreement State licensee. The licensee would operate under an approved radiation protection program, as well as any required RCRA treatment permit. Such controls are necessary because of the wide range of contaminated materials and their physical forms, together with the variability in EPA-approved treatment processes. Under this decision, the Subtitle C, RCRA-permitted disposal facility would be receiving the emission control dust and other incident-related materials after their treatment to stabilize the RCRA-hazardous constituents (specifically, lead, cadmium, and chromium) in a non-dispersible,[15] solid (e.g., cement-type) form. As a result, the potential radiological hazard from the ''treated'' material during disposal operations is associated with its characteristic as an external source of radiation.

After disposal, Cs-137 could only become a hazard through water pathways if a sufficient quantity and concentration of Cs-137 were to: (1) become available, (2) be leached from its solid form, (3) be released from the disposal facility, and (4) enter a drinking water supply. No significant radiological hazard would be expected to result from inadvertent intrusion into the disposed waste after facility closure. Notwithstanding the hazard to the intruder from the hazardous waste constituents, constraints placed on the total Cs-137 activity and concentration, and the waste form, can ensure that radiological exposures would not exceed those that would be received from residing over commonly-measured background Cs-137 concentrations in the United States (see discussion under ''Intruder Considerations'').

The following analyses will therefore be directed at an evaluation of the potential direct, water pathway, and intruder hazards and will provide a perspective on their significance.

Direct Exposure

After the inadvertent melting of a Cs-137 sealed source at an EAF or foundry, the relatively volatile Cs-137 will leave the furnace as an offgas and be commingled with the normal emission control dust. As a result, concentrations of Cs-137 contained in this dust (and other materials associated with furnace cleanup operations or subsequent dust recycle process streams) will increase. Thus, the rate of radiological exposure from this material will be similar in type, but different in magnitude, than that received from the typical background levels of Cs-137. Any change in magnitude of the exposures to workers at the disposal facility from this contaminated material when compared to the exposure received from typical emission control dust would depend on: (1) differences in Cs-137 concentrations; (2) variations in the physical/chemical properties of the materials disposed of; and (3) changes in worker time-integrated interactions with contaminated materials.

[12] A picocurie is one-trillionth of a curie and represents a decay rate of one disintegration every 27 seconds or 1/27 of a becquerel.

[13] Letter to William Lahs, Nuclear Regulatory Commission, from Andrew Wallo III, Department of Energy, dated May 20, 1993.

[14] Letter from James M. Taylor, Nuclear Regulatory Commission, to William Guerry, Jr., Collier, Shannon, Rill, and Scott, dated May 25, 1993.

[15] In the context used, the term ''non-dispersible'' means that any radiological impacts from resuspended material are inconsequential in comparison to the impacts from direct external exposures resulting from the emission of gamma radiation in the Cs-137 decay process.

The three key variables above are particularly important in the development of this technical position. Of significance to all three variables, the approach defined in the position calls for treatment (stabilization) of incident-related materials (to comply with requirements for land disposal of restricted waste) to take place ''under license,'' at the location where the material was generated, or at the site of a service contractor permitted for stabilization treatment of the material. Complying with the ''Treatment Standards for Hazardous Wastes,'' defined at 40 CFR 268.40, will result in a solid waste form from which exposure rates will be smaller than those originating from the hazardous waste form (e.g., dust) before treatment. More importantly, treatment of the contaminated materials, under license, will obviate the need to specifically address potential radiological exposures at unlicensed, RCRA-permitted, treatment facilities. Thus, under the approach of this technical position, any minimal exposure to workers who have not been trained in radiation safety would be limited to disposal operations.

Furthermore, because the origin of the Cs-137 contaminated materials is the result of a melting incident, upper bound values can be established for the volume, weight, radioactive material concentration, and total activity of the contaminated material, on an incident basis. The base case analysis in this appendix presumes that the contaminated material involves a volume of 40,000 cubic feet (1132 cubic meters), a weight of 2000 tons, and a total activity content of less than a 1 curie (37 gigabecquerels (GBq)) of Cs-137. These values are generally consistent with the particulars from the incidents that have occurred to date.

Within these constraints, the starting point in the direct exposure calculation is to estimate the radiation dose rate at a distance of 3.28 feet (1 meter) from the surface of a semi-infinite volume (i.e., infinite in areal extent and depth from the point of exposure) of solidified contaminated material.[16] The calculations assume that the initial Cs-137 contamination in all untreated dust is 100 pCi/g (3.7 Bq/g). Direct exposure results scale linearly for other concentration levels, if the waste configuration is unchanged.

Stabilization treatment,[17] conducted under a licensed radiation protection program, is achieved by mixing moist dust with additives (e.g., liquid reagent to adjust oxidation potential and portland cement/fly ash).[18] These additives (typically presumed to add 30 parts by weight to 100 parts of dust or contaminated material) would result in a solidified product that would contain Cs-137 concentrations at about 77 percent of initial concentrations (e.g., 77 pCi/g (2.84 Bq/g)). Because of allowable variations in the solidification processes (e.g., from the production of granularized aggregate to solidified monoliths), the bulk density of the solidified material can range from about 1.4 to 2.5 g/cm^3. A representative dose conversion factor[19] under these conditions (calculated at a density of 1.5 g/cm^3) would typically be less than 49 microrem/hour (µrem/hr) or 0.49 microsieverts/hour (µSv/hr), at a distance of 3.28 feet (1 meter) from the surface of a hypothetical semi-infinite volume of the solidified material.[20]

Because the quantities of treated dust and other incident-related materials are not semi-infinite in volume, the actual dose rate/distance relationships from finite volumes of contaminated materials will be less. The reduction can be calculated for various volumetric sources through the use of shape factors. Shape factors have been calculated for several configurations that are likely to occur during operations from the time the contaminated treated material is received at the RCRA-permitted disposal facility through its disposal. The shape factors can be determined from Figures 1 through 6 for various distances between a specific source configuration and an exposed individual. Typically, at a distance of 3.28 feet (1 meter), these factors range from about 0.03 to 0.5 (Figures 1 through 5), and have been calculated without accounting for the limited shielding provided by any packaging. As the distance from the contaminated materials increases to 9.84 feet (3 meters), the shape factors for these similar geometries become smaller, ranging from about 0.004 to 0.2. The largest *likely* dose rate potentially experienced by an individual involved in the disposal process, measured at 3.28 feet (1 meter), would be from the sides of large containers or shipments of contaminated materials, and would be expected to range from about 10 to less than 14 µrem/hour (0.14 µSv/hr) above background (typically 8 to 12 µrem/hr (0.08 to 0.12 µSv/hr).[21] From an open trench (Figure 4), filled with contaminated materials, the calculated dose rate would also be somewhat less than 13 µrem/hr (0.13 µSv/hr) measured directly over the trench at a 3.28 feet (1 meter) distance. Again, these values represent 0.77 of the respective values indicated on the figures because of solidification additives. Figures 6 and 7, respectively, show the variation in dose rate with the width of the trench and depth of the waste. Figure 8 is provided to show the change in dose rate versus the distance offset from the side of the trailer-type container considered in Figure 3.

A typical disposal rate at a trench within an RCRA-permitted facility would typically exceed 500 tons per shift.[22] Assuming this disposal rate of 500 tons per shift applies to the disposal of treated, Cs-137-contaminated, incident-related material (approximately 20 to 25 truckloads in 8 hours), it would require approximately 4 times this period of time to dispose of 2000 tons. (Note that the rate of arriving material would likely be dictated by transportation arrangements, so that the 32 hours required to dispose of the contaminated material could be spread over several days or weeks.) Facility workers, therefore, would, on average, only be exposed to finite volumes of contaminated material for a maximum period of 32 worker-hours. Applying the highest likely dose rate (approximately 13 µrem/hr (0.13 µSv/hr) from the side of a trailer containing the contaminated materials), and presuming exposure at a 3.28-ft (1-meter) distance for the entire 32-hour period, a worker would receive

[16] This assessment is generally consistent with the approach employed in ''Risk Assessment of Options for Disposition of EAF Dust Following a Meltdown Incident of a Radioactive Cesium Source in Scrap Steel,'' SELA–9301, Stanley E. Logan, April 1993.

[17] In the context of this position, stabilized treatment does not include either onsite or offsite high-temperature metals recycling processes.

[18] This treatment may include the addition of special stabilization reagents, such as clays, or involve other RCRA-approved stabilization technologies, that reduce the leachability of Cs-137, although the radiological impacts analysis indicates that such processes are not necessary to protect public health and safety, and the environment.

[19] A dose conversion factor represents a value that allows a radionuclide contamination level to be converted to an estimated exposure rate.

[20] The dose rates in this appendix have been calculated through use of the Microshield computer program, Grove Engineering, Inc., version 4.2, 1995. The value of 49 µrem/hour represents 0.77 of the 62.9 value shown on Figure 1.

[21] The two-thirds loading of the 30-cubic yard box is related to the typical maximum payload weight that can be transported by truck without an overweight permit. If the boxes referred to in Figures 1 and 2 were full, the dose rate would increase by less than a factor of 1.5. Similarly, if the assumed additive weight percent (i.e., 30 percent) is varied over a reasonable range from 20 to 40 percent, the resulting dose rate would change in an inversely proportional manner.

[22] Note that if treatment at an RCRA-permitted facility were required, the limiting operational handling rate for the treated materials may be limited to 100 to 200 tons per shift.

a dose of less than 0.5 mrem (5 μSv) above background.

Qualitatively descriptive time and motion data gathered from three RCRA-permitted disposal facilities indicate that the above-calculated dose is conservative for two principal reasons: (1) the workers having the most significant exposure to materials, from receipt to disposal, are effectively at greater distances than 3.28 feet (1 meter); and (2) their exposure is over time periods significantly less than the assumed receipt through disposal time period of 32 hours. As a result, actual exposures are expected to be significantly less than 0.5 mrem (5 μSv).

This conservative estimate of potential exposure is based on the aforementioned time-distance assumptions and is expected to bound reasonable interactions of disposal facility workers with the treated (stabilized) incident-related materials. For example, incident-related material could be stored at the disposal site or samples of the treated material could be subjected to sampling activities. In the first case, if a 90-day storage period is presumed, the average exposure distance over the entire period needed to ensure a dose less than the position's exposure criteria would be on the order of 10 to 20 meters (see Figures 1 through 3 which illustrate the decrease in dose rate as a function of distance from the source). In the second case, the typical activity in a 100 gram sample would be no greater than about 10^{-2} μCi (370 Bq). The dose rate from such a sample would be less than 0.1 μrem/hr (0.001 μSv/hr) at a distance of 1 foot (0.3 meters).

To place the significance of this calculation into perspective, an estimate can be made of worker exposure from the presumed handling, treatment, and disposal of normal emission control dust (i.e., dust that has not been contaminated with Cs-137 from a melted source). This dust would contain background levels of Cs-137 (approximately 1 pCi/g (0.037 Bq/g)). Therefore, a worker interacting with this material at an effective distance of 3.28 feet (1 meter) over about 300 8-hour shifts (a little more than a working year) would receive a total maximum exposure about 0.5 mrem (5 μSv). The magnitude of this exposure is in the same range as the exposure calculated for the disposal of the contaminated materials from a single melting event. Moreover, the potential exposure from the ''melting event'' was estimated under the extremely conservative assumption that all materials were contaminated at levels of 100 pCi/g (3.7 Bq/g).

The imposition of a 1-curie (37 GBq) criterion on the total incident-related activity that could be disposed of at any one Subtitle C, RCRA facility (see following discussion on water-pathway considerations) should further ensure that worker exposures from Cs-137 contaminated emission control dust and other incident-related materials will not exceed 1 mrem/year (10μSv/year) integrated over the lifetime of the facility.

Water-Pathway Considerations

The proposed approach to manage Cs-137 contaminated emission control dust and other incident-related materials presumes licensee treatment of these materials to comply with requirements for land disposal of restricted waste. Thus, the hazardous radiological and chemical constituents of these materials will be incorporated into a stable, solid (e.g., cement-type) form, similar to that required for routine RCRA-permitted disposal of emission control dust. As a result, the possibility of Cs-137 presenting a hazard through a water pathway requires consideration of: (1) the quantity of Cs-137 available; (2) the degree to which the Cs-137 could be leached from its waste matrix; and (3) the extent that any leached Cs-137 could migrate into a water supply.

The disposal of Cs-137 in treated emission control dust and other incident-related materials would be constrained by this policy to a total activity of 1 curie (37 GBq). In the previous reference-basis analysis, an effective concentration, in the treated waste, of 77 pCi/g (2.84 Bq/g) was evaluated—the originally assumed contaminated material concentration reduced by 30 percent as a result of the added mass associated with treatment. Both the quantity and position-defined concentration values place bounds on any potential water pathway hazard. In the actual wastes that are subject to potential disposal under the provisions of this position, the concentration of Cs-137 averaged over all the treated waste would typically be significantly less than the defined concentration criteria.

Furthermore, because the Cs-137 is contained in a solid matrix and buried within a facility in which the amount of water infiltration is minimized, any Cs-137 removal from its final disposal location would be limited while these conditions remain in effect. The chemistry of any water interacting with the solidified, Cs-137-contaminated waste would also be expected to limit the leaching process (e.g., avoidance of acidic environments), because of the controlled nature of the Subtitle C, RCRA-permitted disposal site and the types and nature (e.g., no liquids) of the wastes accepted for disposal. Any water that leached Cs-137 from the waste would normally be collected in a leachate collection system at volumetric concentrations expected to be far less than that existing in the treated waste. The chemistry of the fill materials used at the disposal site could also provide a sorbing medium if any Cs-137 leached from the solidified waste. Finally, the location of Subtitle C, RCRA-permitted disposal sites is such that the source of any water supply would typically be some distance from the disposal site.

These chemistry and distance factors are also likely to be major factors in delaying the arrival of Cs–137 at a receptor well because of retardation effects. This retardation, in terms of its effect on the time required, under a worst-case scenario, for the Cs–137 to reach a water supply, is such that significant radioactive decay of the Cs–137 inventory is likely (the radioactive half-life of Cs–137 is 30 years) before this pathway could potentially pose a hazard.

Although qualitative in nature, and based on considerations that can vary among Subtitle C, RCRA-permitted disposal sites, the discussion has focused on the factors that are likely to prevent any significant water-pathway hazard. The following, more quantitative assessment, is provided to conservatively bound any water-pathway hazard that could potentially occur under extremely unlikely conditions, and provides the technical basis for NRC's position.

The leachability of Cs–137 from any solid waste form that allows compliance with the land disposal restrictions for the waste's non-radiological hazardous constituents is likely to be extremely limited after initial waste placement. After the end of operations and a post-closure care period of 30 years, a worst-case scenario presumes that processes take place to degrade the site so that infiltrating water from the surface passes unimpeded through the contaminated waste. In predicting the dissolution of Cs–137 under these conditions, a critical process is the partitioning of the Cs–137 that takes place between the waste, soil, and infiltrating water. Conservatively assuming that the partitioning from the solid waste form is similar to that from the interstitial backfill soil to water, an estimate can be made of the amount of Cs–137 that can leach into the infiltrating water.

The most important parameter in estimating this transfer, as well as the subsequent movement of the Cs–137 in groundwater, is the distribution

coefficient, K_d. This parameter expresses the ratio at equilibrium of Cs–137 sorbed onto a given weight of soil particles to the amount remaining in a given volume of water. The higher the value of the distribution coefficient, the greater the concentration of Cs–137 remaining in the soil. The K_d value can be affected by factors such as soil texture, pH, competing cation effects, soil porewater concentration, and soil organic matter content.[23] For the non-acidic, sand/clay/soil environments presumed to represent the RCRA-permitted disposal facilities, a K_d value of 270 milliliter (ml)/g was selected from the Footnote 23 reference as being appropriate for the subsequent bounding, conservative analysis.

To model the potential groundwater impacts, the RESRAD[24] code was used. For the representative case, the bounding 40,000 cubic feet (ft^3) or 1132 cubic meters (m^3) of treated material were presumed to be disposed of in a volume measuring 100-ft (30.4–m) length x 20-ft (6.09–m) width × 20-ft (6.09–m) depth. All this material was assumed to contain a Cs–137 concentration of 77 pCi/g (2.84 Bq/g). Notwithstanding the actual layouts of Subtitle C, RCRA-permitted facilities, a well was presumed to be located and centered at the downgradient edge of this specific volume of waste. To maximize the hazard as calculated by the RESRAD model, the hydraulic gradient was considered to be parallel to the length of the disposed volume. Infiltration representative of a humid site was presumed and a minimal unsaturated zone thickness of 3.28 ft (1 m) was assumed to separate the contaminated zone from the saturated zone. The value assigned to K_d in the unsaturated zone was 270 ml/g. Assessments beyond this representative case evaluation are subsequently discussed.

The results from this bounding analysis indicate that drinking water dose rate would be insignificant (e.g., far less than a microrem (10^{-2} μSv) per year). This result is not surprising because the retardation provided, even in the 3.28-ft (1–m) deep unsaturated zone and the saturated zone, are sufficient to preclude drinking water doses for almost 700 years. During this period, the activity of Cs–137 would decay (i.e., be reduced by radioactive decay) by a factor of about 10 million.

Note that, although it is considered an unrealistic scenario, the drinking of the leachate directly from the disposal trench after a period of 30 years would only result in a calculated exposure of about 7 mrem/year (70 μSv/year).[25]

To consider the effects of a range of parameters, including other K_d values, on the results of this bounding analysis, the following analyses are presented. Based on the typical existing volumes and Cs–137 concentrations of incident-related materials, the imposition of a constraint on Cs–137 concentration effectively bounds the total activity that could be disposed of at a Subtitle C, RCRA-permitted facility from a single steel company site to a few tens of millicuries.[26] Material at higher concentrations would require disposal at either a mixed-waste disposal facility or a licensed low-level radioactive waste disposal site. Thus, for the potential disposals at the Subtitle C, RCRA-permitted site to approach the 1 curie (37 GBq) incident-related material constraint in this position, disposals of materials from several incidents would have to occur. The total volume of material, in this case, would still represent only a small fraction of a RCRA-permitted facility's disposal capacity. Repeating the RESRAD analysis discussed above under these assumptions, but respectively considering lower K_d values in the contaminated, unsaturated, and saturated zones, would still result in drinking water doses of less than 1 mrem (10 μSv) per year unless the K_d values in all zones approach single digit values. Even in these cases (e.g., K_d equal to 2.7), separation of the hypothesized well location from the disposed material by about 100 meters (328 ft) would reduce dose rates below 1 mrem (10 μSv) per year because of the decay of Cs–137 brought about by the increased retardation times.

The concentration constraints in this position, coupled with the limited number of inadvertent melting situations to which this position could be applicable, and the case-by-case NRC or Agreement State approval of the proposed material transfers are believed to provide a sufficient basis to ensure protection of public health and safety, and the environment from water-pathway considerations. Nevertheless, to provide further protection, should a single Subtitle C, RCRA-permitted disposal facility accept incident-related material from more than one incident, the position includes a total Cs–137 incident-related activity constraint of 1 curie (37 GBq). The magnitude of this constraint is based on the typical bounding activity associated with an inadvertent melting of Cs–137 sources that have occurred to date at EAFs or foundries. In large measure, it has been included to provide assurance that the position is only directed at the ultimate disposition of radioactive material that exists in the environment as a result of specific inadvertent melting incidents. However, it also provides a constraint on the extent of volumetric contamination as a function of concentration. The practical effect, as previously alluded to, is to limit the disposal volumes of incident-related contaminated materials to a small fraction of total disposal site capacity for hazardous waste. As a result of this volumetric limit, the constraint would further ensure that any exposures occurring offsite over the operating life of the Subtitle C, RCRA-permitted facility would be equal to or less than 1 mrem/year (10 μSv/year), if integrated over the facility's operating life.

Again, the activity constraint and the water pathway considerations can be placed in perspective by evaluating the potential normal disposal of EAF emission control dust at a Subtitle C, RCRA-permitted facility. If this dust includes a background Cs–137 concentration of 1 pCi/g (0.037 Bq/g), and the facility can treat 200 tons of dust per day, the total quantity of Cs–137 disposed of annually would be about 50 mCi (1.85 GBq). Thus, over a facility operating period of about 20 years, the total quantity of Cs–137 disposed of could equal the 1-curie (37 GBq) incident-related material activity constraint.

Intruder Considerations

In the development of its licensing requirements for land disposal of radioactive waste in 10 CFR Part 61, NRC considered protection for individuals who might inadvertently intrude into the disposal site, occupy the site, and contact the waste. In the context of this position, this possibility has been considered although the greater risk to the intruder would likely result from the non-radiological hazardous constituents at the site.

In the intruder scenarios applied in the development of NRC's low-level

[23] "Default Soil Solid/Liquid Partition Coefficients, K_ds, for Four Major Soil Types: A Compendium," M. Sheppard and D. Thibault, *Health Physics*, Vol. 59, No. 4, October, 1990, pp. 471–482.

[24] RESRAD, Version 5.0, Argonne National Laboratory, September 1993.

[25] This dose estimate is based on comparing leachate concentrations with the water effluent concentration in 10 CFR Part 20, Appendix B.

[26] For example, the total activity contained in 2000 tons of material, contaminated at a level of 77 pCi/g, would be about 0.14 curies (5.2 GBq). It would be unlikely that all the material from a particular incident would be at the maximum concentration defined in the technical position.

waste standards,[27] an inadvertent intruder was assumed to dig a 3-meter (9.9 ft) deep foundation hole for construction of a house. The top 2 meters (6.6 ft) of the foundation were assumed to be trench cover material and the bottom 1 meter (3.28 ft) was assumed to be waste. Based on the details of the scenarios, which included these and other considerations, the intruder interacted with material whose concentration had been reduced from the waste concentration by a factor of 10. Presuming similar scenarios and assuming intrusion occurs immediately after a post-closure care period of 30 years, the intruder would be exposed to a Cs–137 concentration of about 4 pCi/g (0.15 Bq/g); that is, 77 pCi/g (2.84 Bq/g) reduced by the factor of 10 and an additional factor of 2 to account for radioactive decay). Even for this worst-case situation in which all the incident-related waste was presumed to have initial Cs–137 concentrations of 77 pCi/g (2.84 Bq/g), the projected intruder exposure would range from 0.8 to 3.8 mrem (8 to 38 μSv/year).[28] As noted above, the average concentrations over large volumes of incident-related material would be expected to be far less than 77 pCi/g (2.84 Bq/g).

Conclusions

These bounding analyses indicate that some significant volume of Cs–137-contaminated emission control dust and other incident-related materials from an inadvertent melting of a sealed source can be disposed of at a Subtitle C, RCRA-permitted facility with negligible impacts to public and worker health and safety and the environment. This method for disposal, if implemented according to the limitations stipulated in this position, is very unlikely to cause worst-case exposures that exceed 1 mrem (10 μSv) to any worker at the disposal facility or to any member of the public in the vicinity of the facility. The design, operations, and post-closure activities that take place at Subtitle C, RCRA-permitted facilities will ensure that radiological impacts from Cs–137 will also be negligible in future timeframes. Proper disposal of these materials would protect public health and safety, and the environment to a greater degree than the alternative of indefinitely storing these materials at a steel company facility. The calculated public health and safety and environmental impacts of disposition of specified incident-related materials at a Subtitle C, RCRA-permitted facility can also be used to determine an optimum course for disposal, if disposition alternatives exist.

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[27] See NUREG–0782, vol. 4, Draft Environmental Impact Statement on 10 CFR Part 61, ''Licensing Requirements for Land Disposal of Radioactive Waste,'' September 1981.

[28] These estimates are based on the concentration to dose conversion values in NUREG–1500, ''Working Draft Regulatory Guide on Release Criteria for Decommissioning: NRC Staff's Draft for Comment,'' August 1994. Appropriate adjustments of the tabulated information were made to reflect the occupancy and shielding assumptions made in NUREG–0782 (see Footnote 24).

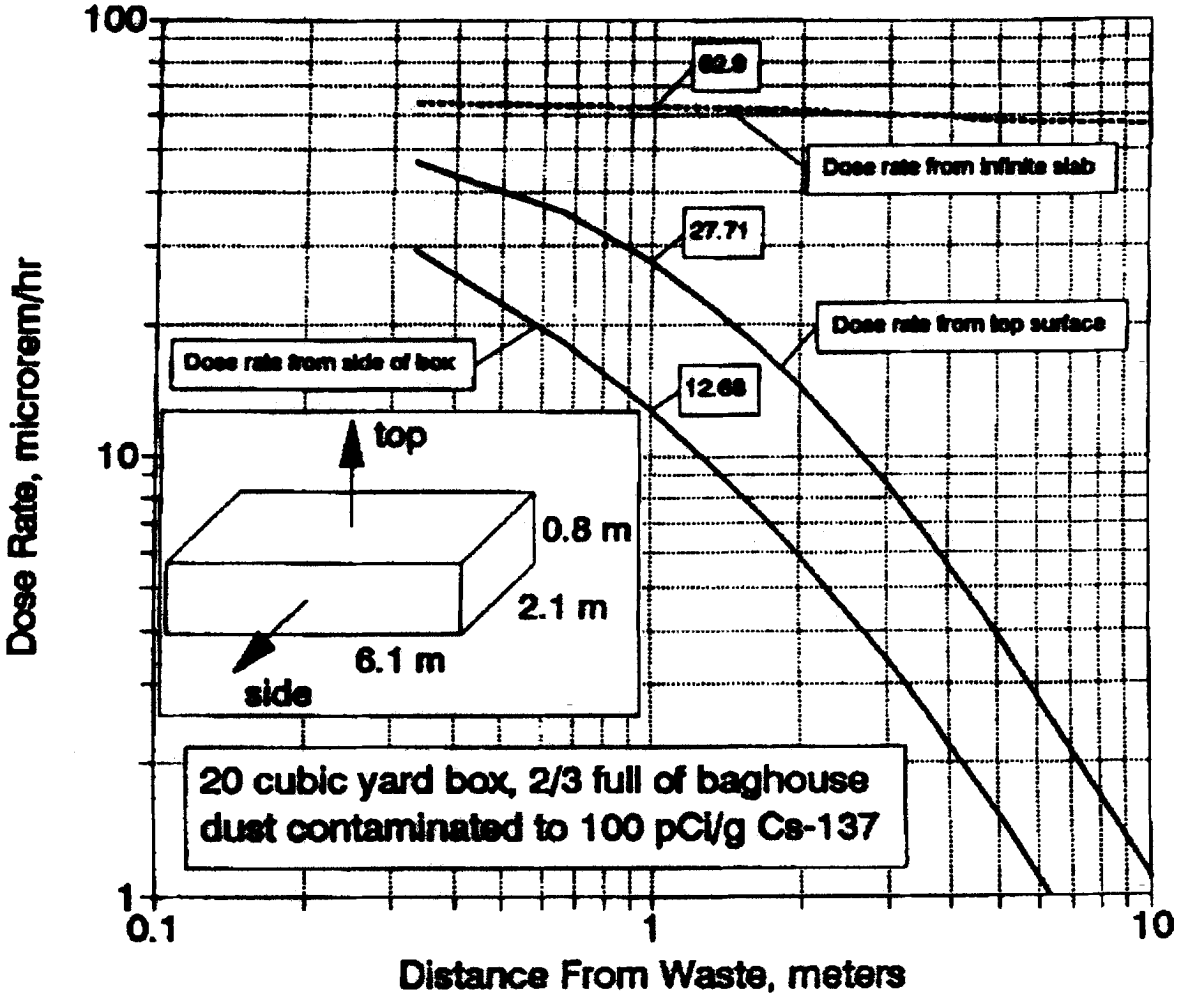

Figure 1. Shape Factor Plot for 20 Cubic Yard Container

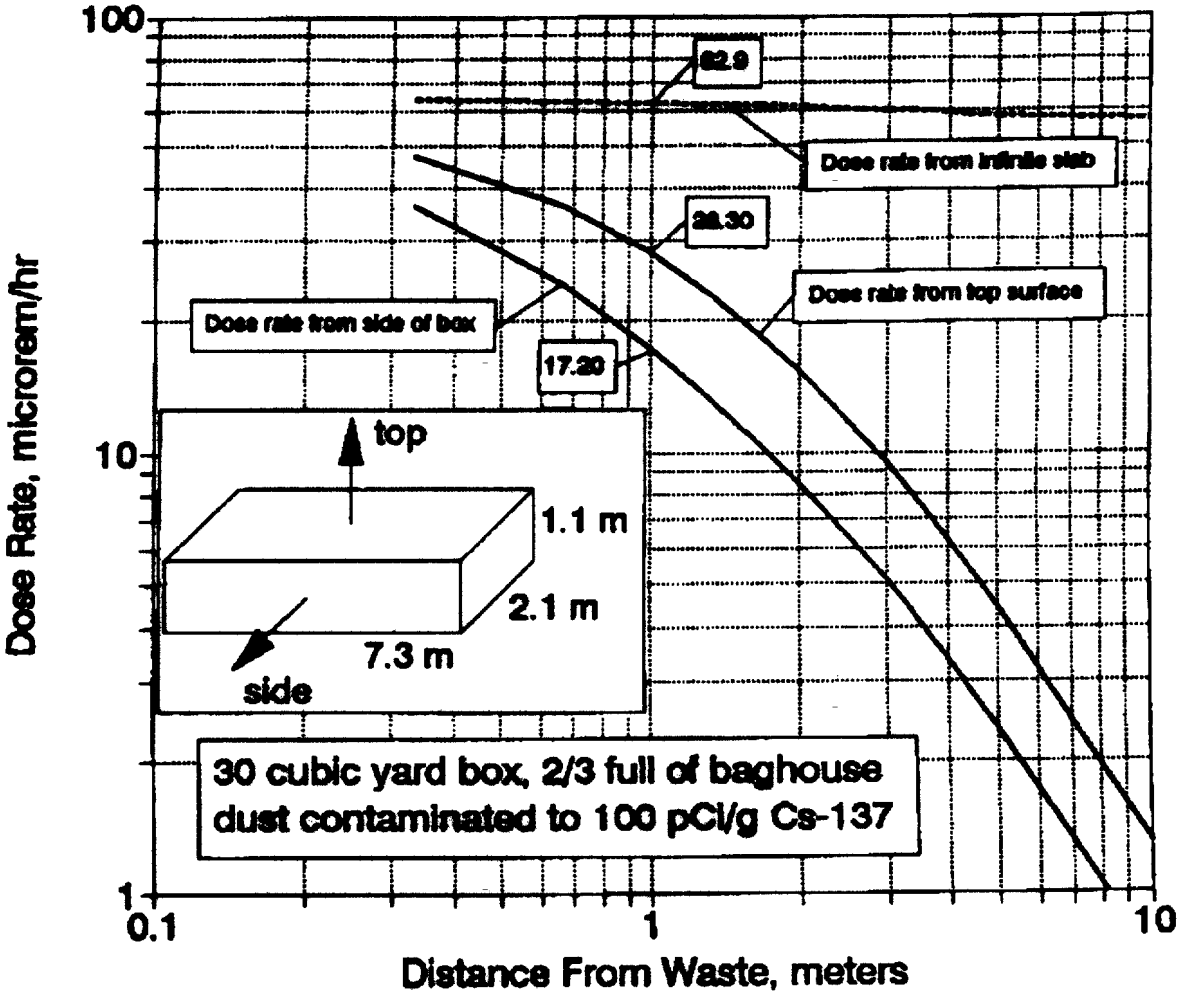

Figure 2. Shape Factor Plot for 30 Cubic Yard Container

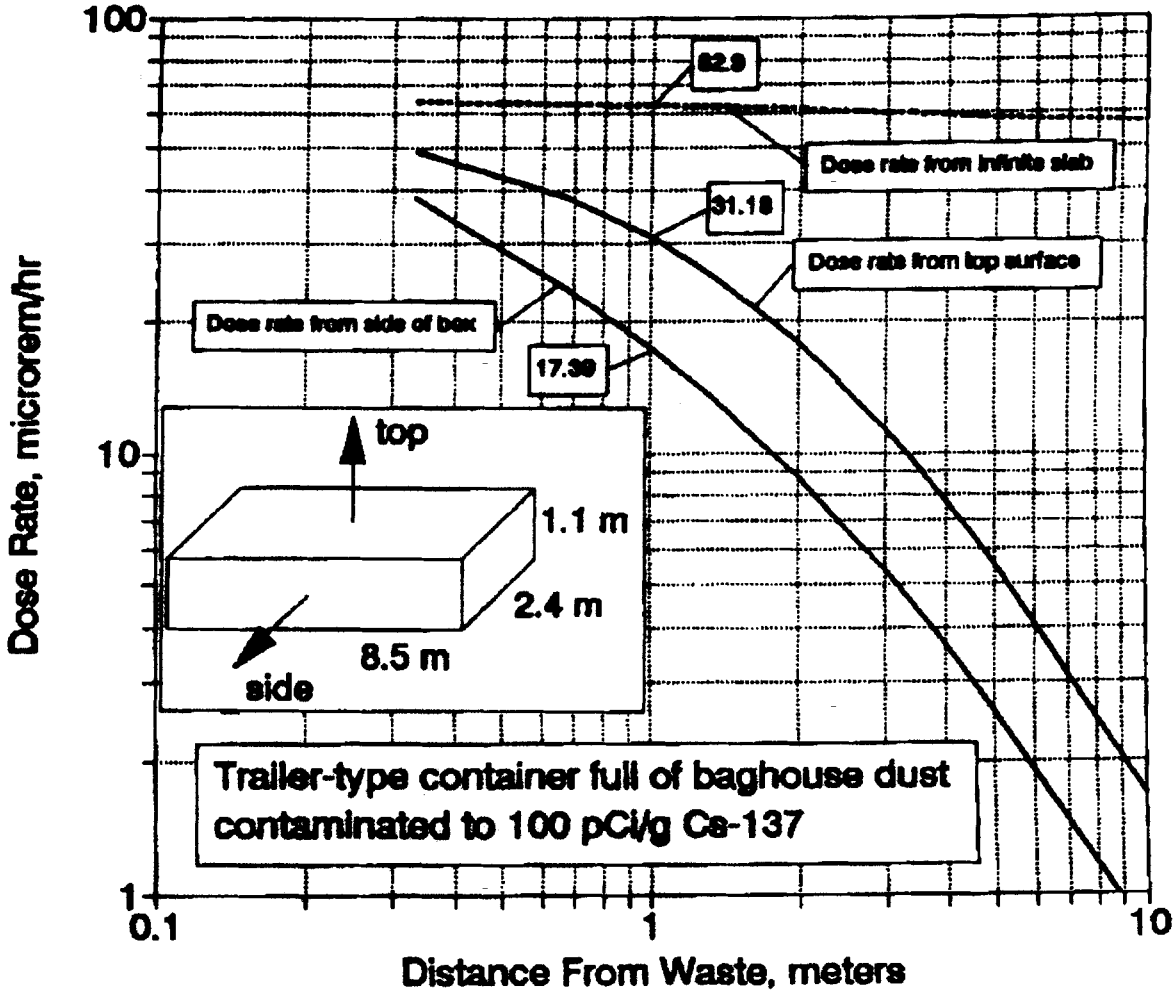

Figure 3. Shape Factor Plot for Trailer-Type Container

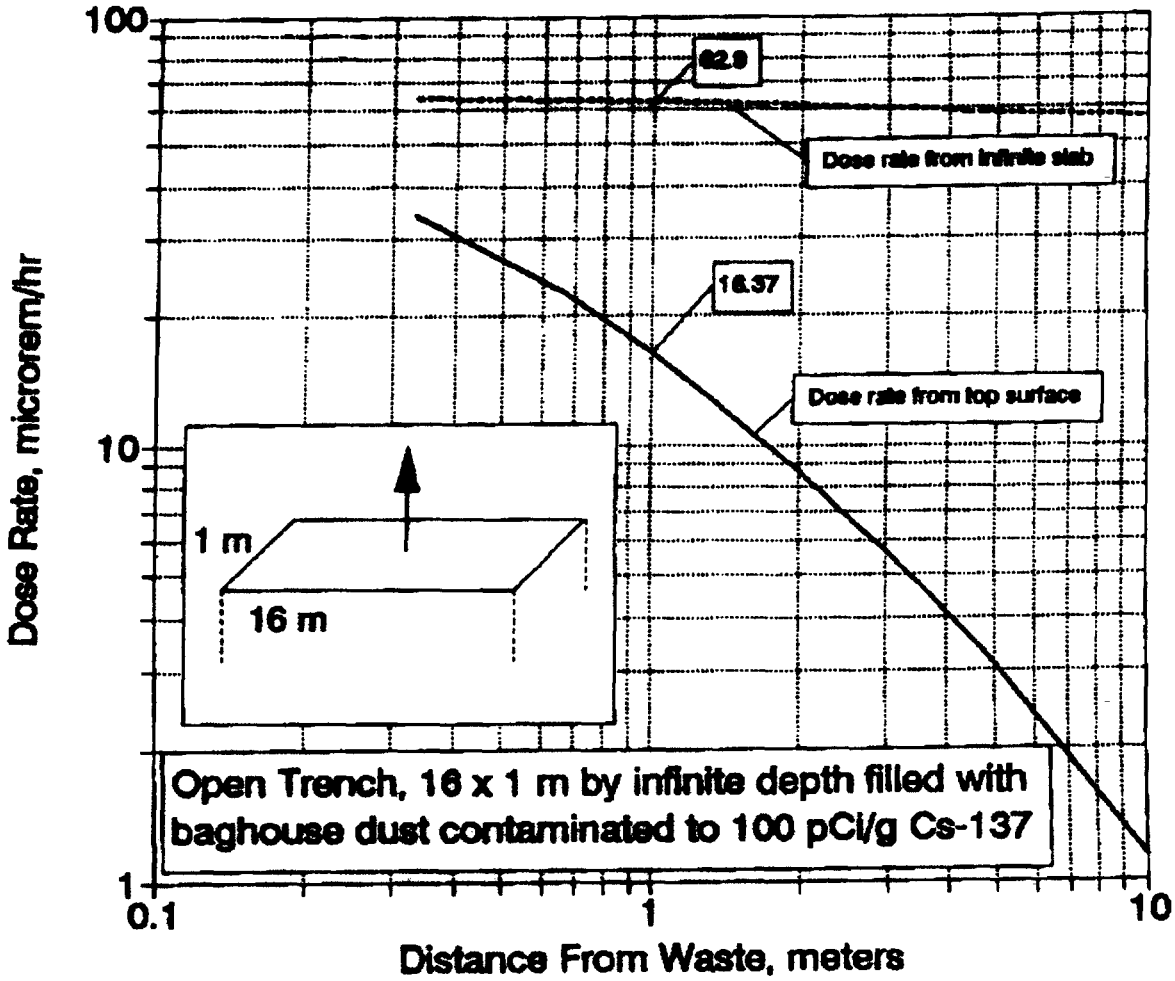

Figure 4. Shape Factor Plot for Reference Open Trench

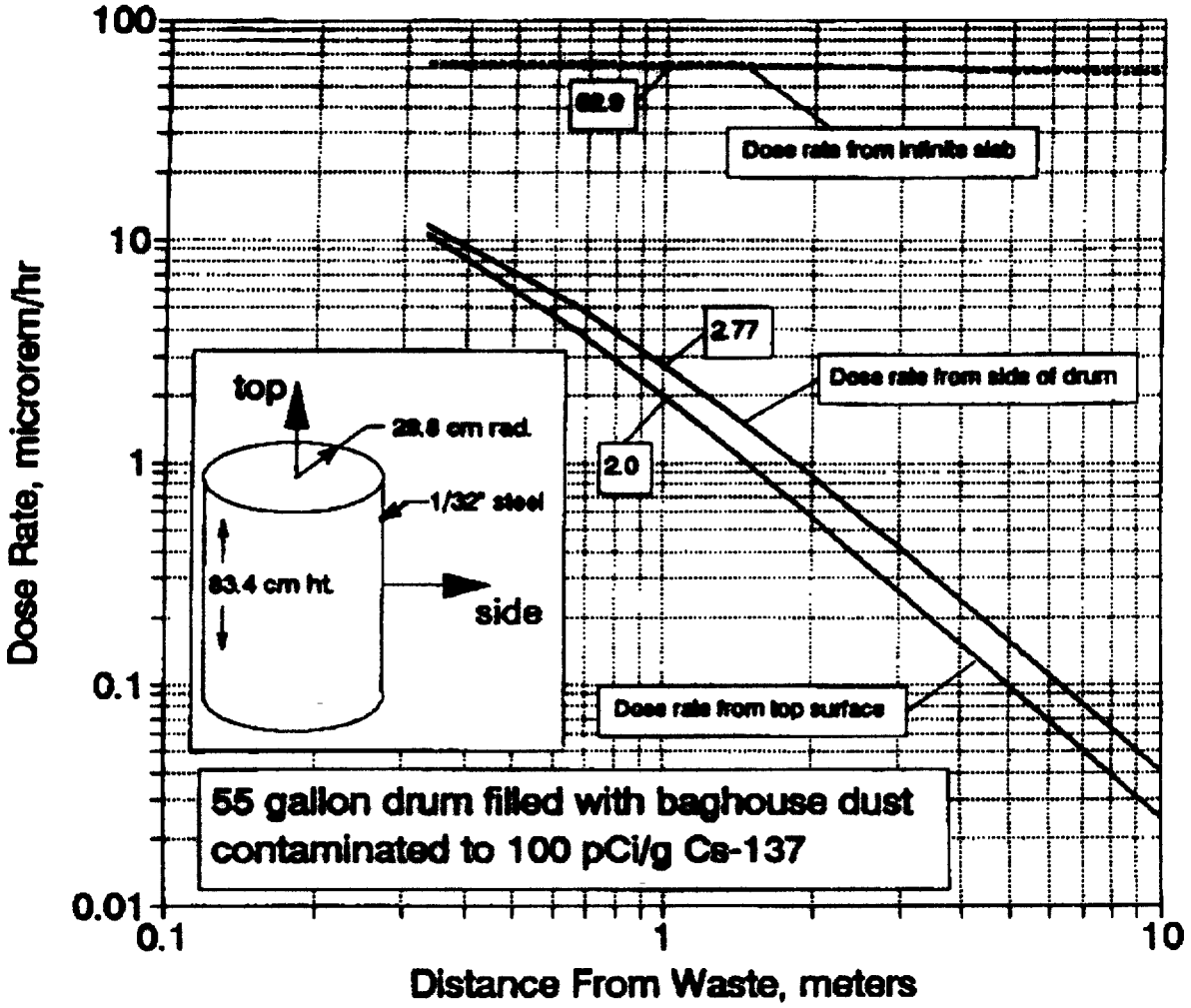

Figure 5. Shape Factor Plot for Standard 55 Gal. Drum

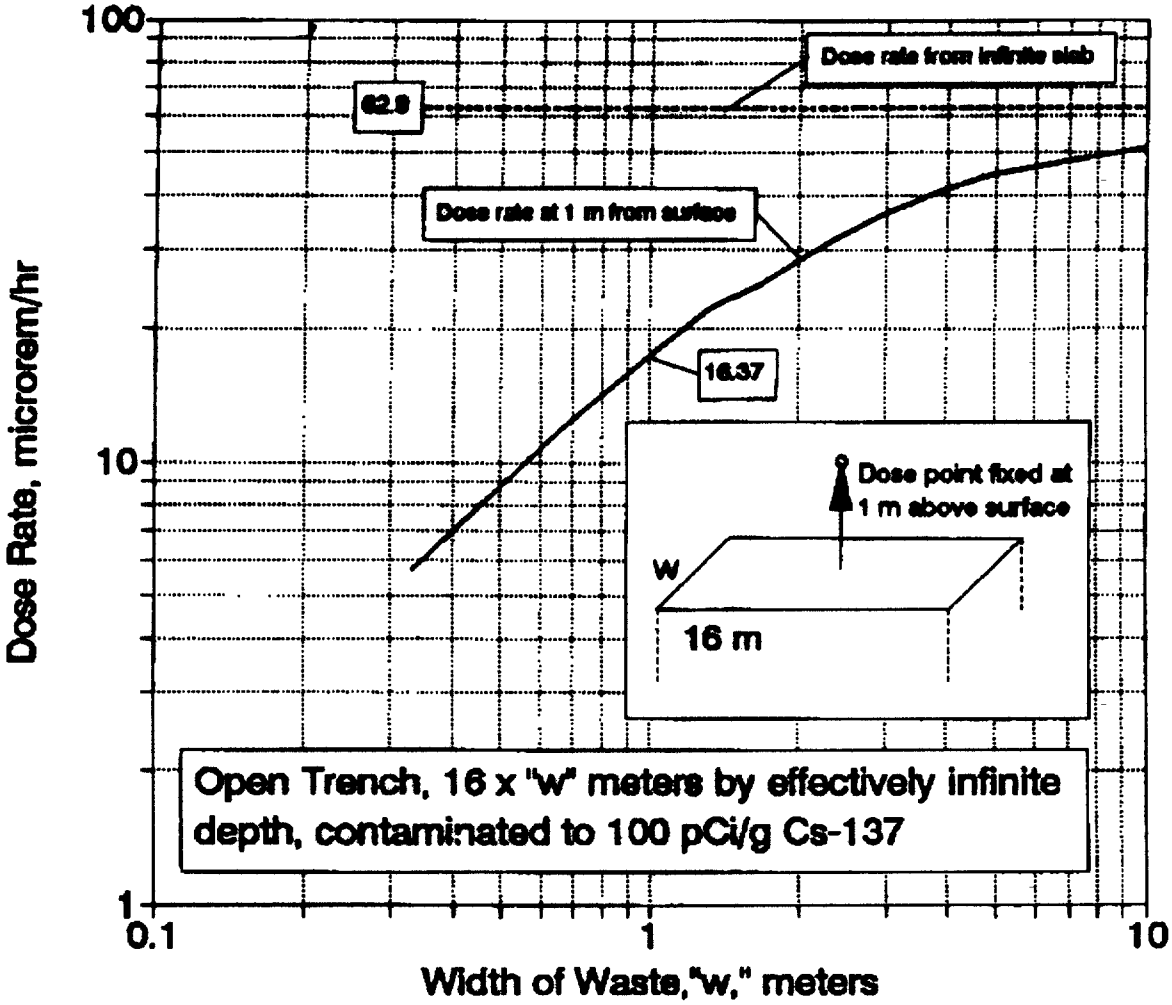

Figure 6. Dose Rate as a Function of Trench Width

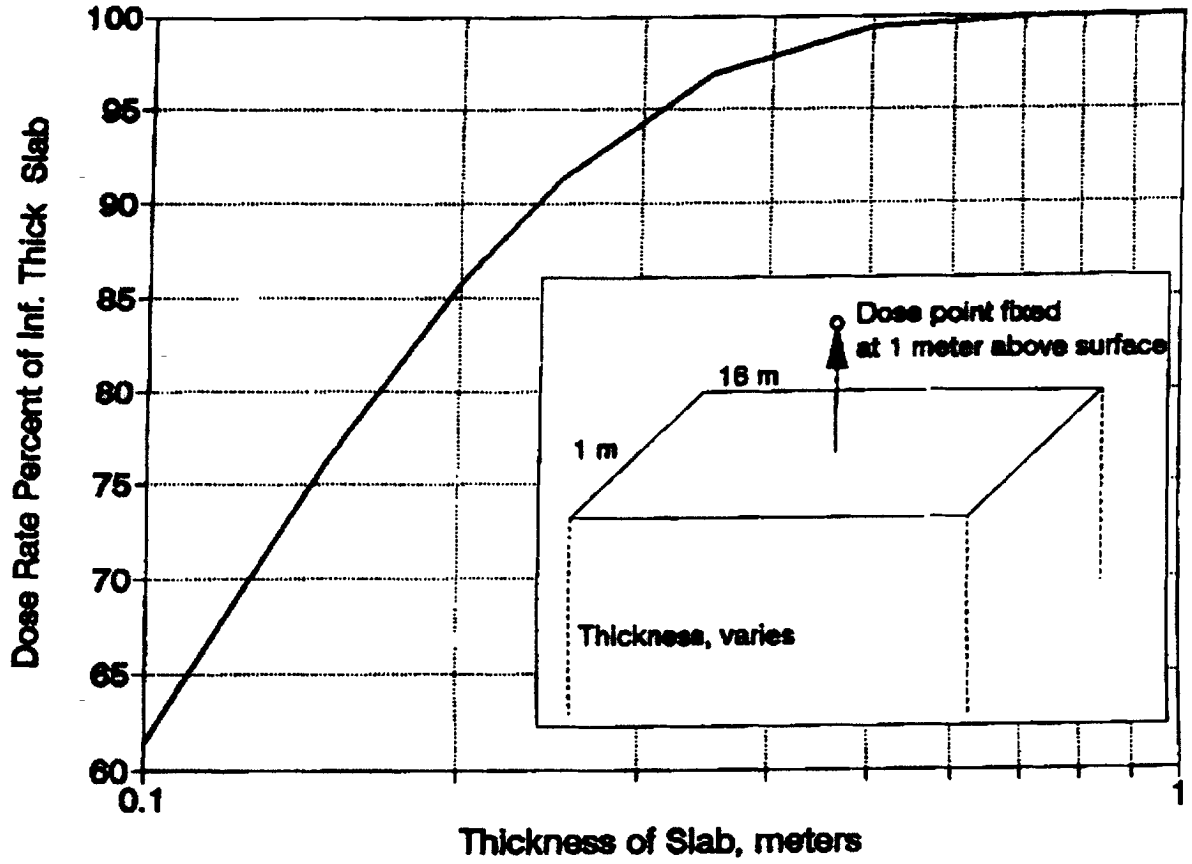

Figure 7. Dose Rate (Expressed as a Percentage of an Infinite Slab Dose Rate) as a Function of Trench Thickness

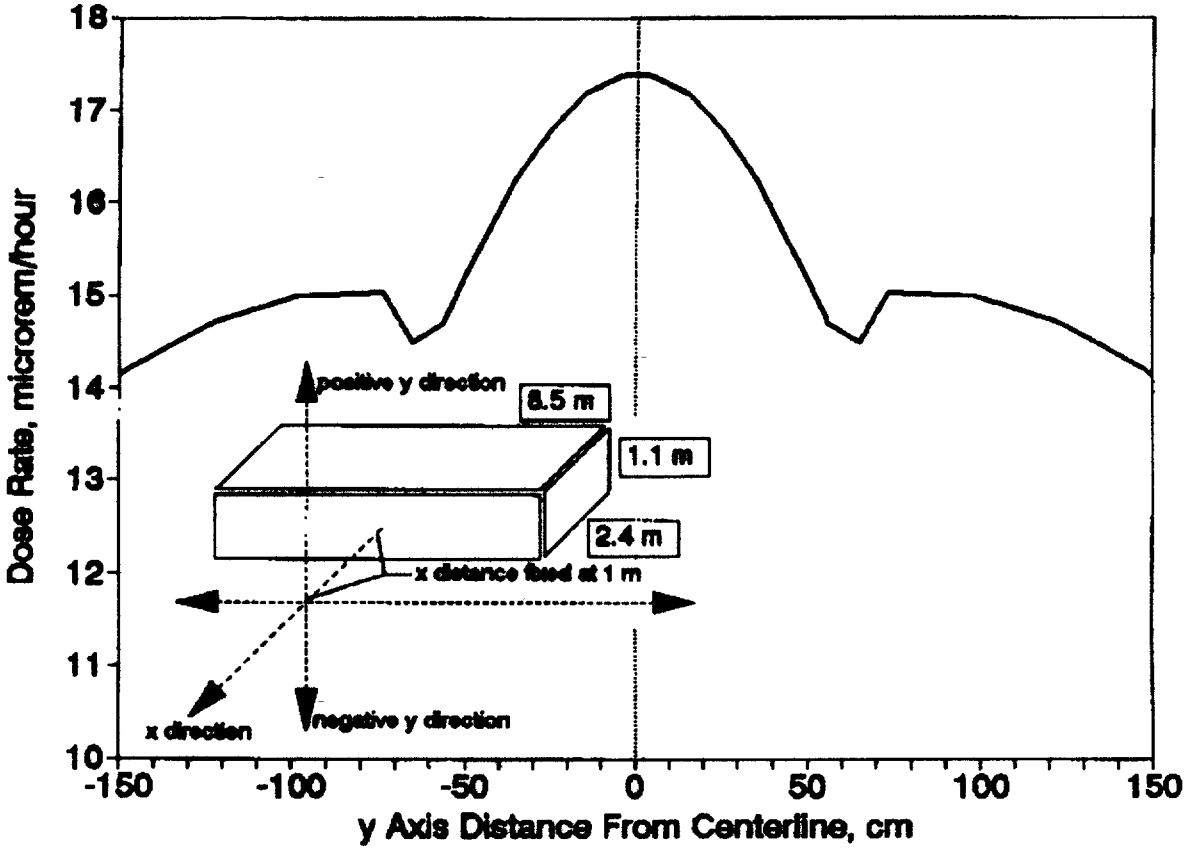

Figure 8. Dose Rates as a Function of Vertical Distance Offset from Center Point of Trailer-Type Container

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Dated at Rockville, Maryland, this 11th day of January, 1996.

For the Nuclear Regulatory Commission.

Michael F. Weber,

Chief, Low-Level Waste and Decommissioning Projects Branch, Division of Waste Management, Office of Nuclear Material Safety and Safeguards.

[FR Doc. 96–703 Filed 1–19–96; 8:45 am]

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