

MASTER

SHALLOW-LAND-BURIAL HANDBOOK

W. J. Boegly, Jr. and E. C. Davis

Environmental Sciences Division
Oak Ridge National Laboratory*
Oak Ridge, Tennessee 37830

INTRODUCTION

Milestone C is one of the major technical milestones for the DOE Low-Level Waste Management Program; and is defined as providing the documentation required to support the locating of a Shallow Land Burial Site in the United States. One of the sub-milestones included is the development of a Handbook or manual which provides a review and evaluation of current defense and commercial waste practices and a description of the state-of-the-art technology for shallow land burial of low-level radioactive wastes. Current plans envision completion of an initial draft of the Handbook by the end of FY 1981, followed by a detailed review and issuance of a final draft version by the end of FY 1982. Additional research results produced in future fiscal years may be incorporated into further revisions of the Handbook.

One of the major concerns in the preparation of such a document is a determination of the intent of the Handbook, its potential users, and the depth or degree of coverage to be achieved. For purposes of the initial draft it was assumed that the Handbook would attempt to inform the reader of the current way in which low-level wastes are being handled, to outline the legal and institutional problems that would be involved in developing and licensing such a facility, and to describe in some detail the considerations and data needs for siting, designing, operating, and closing such a facility. As a result, the initial draft is not a Handbook that provides answers to all questions, nor insures that following the steps detailed in the Handbook guarantees that the facility will be licensed; it does, however, illustrate the types of actions that must be considered and the types of information required to achieve successful operations.

It must be pointed out that the initial draft is more suited to utilization by decision makers concerned with how one goes about siting and operating the shallow land burial ground than as a source book for scientists and engineers concerned with technical details necessary to insure compliance with licensing regulations. At this time it is not clear if one handbook can adequately meet the goals

*Operated by Union Carbide Corporation under contract W-7405-eng-26 with the U.S. Department of Energy.

DISCLAIMER

This work was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy or completeness of any information published hereof. Reference herein to any specific commercial product or process or to any trade name or trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

For information contact the Office of Public Affairs, Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830. Telephone (615) 576-8400. This document is available for copying without charge to any copyright owner's library.

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

OP

suggested in Milestone C and still provide the necessary guidance for the diverse audience that might use the Handbook in the future.

SHALLOW LAND BURIAL HANDBOOK

Once the purpose of the handbook was developed, it was then possible to develop an outline of the material and subjects to be included. The suggested outline for the first draft is given in Table 1, and shows that the draft is composed of seven Chapters and two Appendices. A brief description of each of the Chapters follows.

1. Introduction

The major function of this Chapter is to briefly define the term low-level wastes, indicate where they are generated, provide some indication of the magnitude of the disposal problem and the current and future need for such facilities, and outline current practices and alternatives. The material presented in this Chapter is directed mainly at the reader who has heard about low-level wastes, but is essentially uninformed about the technical aspects of low-level wastes.

2. Case Histories

Chapter 2 summarizes pertinent information on existing shallow land burial grounds in both the defense and commercial sector. These summaries indicate the location of the disposal site, its ownership, who operates it, how it is operated, and any problems resulting from operations. In the initial draft most of this information is extracted from published sources; it is anticipated that visits will be made and discussions held at all of the sites during the review and revision period in an attempt to obtain the latest information on the sites, and obtain consistent information for each of the burial grounds. This Chapter would then represent a summary of the state-of-the-art in technology for shallow land burial of low-level wastes.

3. Legislation and Regulation

Location of a shallow land burial ground requires compliance with Federal, State, and local laws and regulations. Chapter 3 briefly outlines the Federal laws and associated regulations that impact development and siting of low-level waste facilities. Federal agencies other than those involved in developing standards or regulating and licensing facilities are also identified. In the case of State involvement, the agencies are less clearly defined than on the Federal level, however an attempt has been made to describe the types of agencies that should be consulted. The importance of local involvement is also discussed in general terms. Finally, licensing procedures (as described in the proposed 10 CFR 61) are described. Table 2 presents a detailed outline for Chapter 3.

4. Site Selection

Chapter IV describes the type of information required and suggested methodology for selecting a site for a shallow land burial ground as currently practiced. Included are such topics as meteorology and climatology, geology, hydrology, topography, distance from population centers and waste sources, etc. This Chapter presents this material in a generic sense since criteria for site selection have yet to be finalized by either DOE or NRC. When criteria become available they will be incorporated into the Handbook. Both DOE and NRC currently appear to be developing "performance" type criteria which means that the site selection process will be directed at meeting certain performance objectives and not numerical values. If this type of criteria is selected for final rulemaking, revisions to Chapter 4 may be minimized.

5. Suggested Design Practices

This Chapter is structured to present information on the design considerations that should be utilized in designing a shallow land burial facility. Since each facility presents specific design problems, the approach utilized attempts to discuss what is needed and what factors should be considered by the designer. Numerical design information is not included, however examples of trench dimensions, cover thickness, and equipment are supplied for guidance. Discussion is presented regarding methods utilized to minimize the entrance of surface and ground water into the trenches. A detailed outline for Chapter 5 is shown in Table 3.

6. Operating Procedures

Operating procedures are described which are necessary to meet licensing requirements and insure that proper waste placement, covering, and monitoring are carried out. The new waste classification criteria proposed by NRC is described in this Chapter. Monitoring programs required to insure compliance with Federal regulations are discussed. Finally, requirements for keeping records both during and after operations cease are described.

7. Closure and Post-Closure

The final Chapter describes the requirements for closing the burial ground and outlines the steps proposed by NRC for post-closure care. Also included is a section on monetary requirements for closure and post-closure and methods acceptable to NRC for guaranteeing availability of funds. Monitoring and maintenance activities required during these time periods are also discussed.

Appendices

Two appendices are currently included in the initial draft of the Handbook; these are a Glossary and a copy of 10 CFR 61 as published in the Federal Register on July 24, 1981.

SUMMARY

The initial draft of the Shallow Land Burial Handbook has been prepared and submitted to the DOE Low-level Waste Management Program for review and comment. Current planning envisions a peer review of this draft, followed by a workshop to discuss in greater detail the content of the next draft. Reviewers of the draft are being asked not only to comment on the usefulness of the material included, but also to comment on the depth of coverage required. This material and new research results available during the review and revision period will be considered for incorporation into the next version of the Handbook. Reviews will be requested from Federal and State Agencies, burial ground operators, consultants, and environmental groups. This review procedure has been developed in an attempt to produce a Handbook that will be of maximum utility to all individuals and groups concerned with disposal of low-level wastes.

Table 1. Outline of the Shallow Land Burial Handbook

1. INTRODUCTION
 - A. What are Low-Level Wastes?
 - B. Sources and Amounts of Low-Level Wastes
 - C. Need for Low-Level Burial Grounds
 - D. Current Practices and Alternatives
2. CASE HISTORIES
 - A. Commercial Burial Grounds
 - B. DOE Burial Grounds
3. LEGISLATION AND REGULATION
 - A. Major Federal Laws
 - B. Major Federal Regulations
 - C. Regulatory Responsibilities for Low-Level Radioactive Waste
 - D. Other Federal Involvement
 - E. State Involvement
 - F. Local Involvement
 - G. Licensing Activities
4. SITE SELECTION
 - A. Meteorology and Climatology
 - B. Geology
 - C. Hydrology - Surface and Ground Water
 - D. Topography
 - E. Proximity to Population Centers
 - F. Geographic Distance to Waste Sources
 - G. Summary of Site Selection Process
5. SUGGESTED DESIGN PRACTICES
 - A. Site Layout
 - B. Trench Design
 - C. Environmental Control Features
 - D. Monitoring Systems
6. OPERATING PROCEDURES
 - A. Receiving and Initial Handling of Waste shipments
 - B. Waste Placement
 - C. Covering and Revegetation
 - D. Monitoring Program
 - E. Record Keeping
7. CLOSURE AND POST-CLOSURE
 - A. Stages of Closure and Post-Closure
 - B. Post-Closure Land Use Planning
 - C. Post-Closure Land Use Controls
 - D. Monetary Considerations
 - E. Closure and Post-Closure Monitoring
 - F. Closure and Post-Closure Maintenance

APPENDICES

- A. Glossary
- B. 10 CFR 61

Table 2. Detailed Outline of Chapter 3 of
the Shallow and Burial Handbook

-
- 3. LEGISLATION AND REGULATIONS
 - 3.1 Major Federal Laws
 - 3.2 Major Federal Regulations
 - 3.3 Regulatory Responsibilities for Low-Level Radioactive Waste
 - 3.3.1 U.S. Environmental Protection Agency
 - 3.3.2 U.S. Nuclear Regulatory Commission
 - 3.3.3 U.S. Department of Energy
 - 3.3.4 U.S. Department of Transportation
 - 3.4 Other Federal Agency Involvement
 - 3.4.1 U.S. Geological Survey
 - 3.4.2 Council on Environmental Quality
 - 3.4.3 State Planning Council on Radioactive Waste Management
 - 3.4.4 National Governors' Association
 - 3.4.5 National Conference of State Legislatures
 - 3.5 State Involvement
 - 3.5.1 Executive Office
 - 3.5.2 State Agencies
 - 3.5.3 Legislature/General Assembly
 - 3.6 Local Involvement
 - 3.7 Licensing Activities
 - 3.7.1 Preoperational Phase
 - 3.7.2 Operational Phase
 - 3.7.3 Disposal Site Closure Phase
 - 3.7.4 Post-Closure Observation and Maintenance Phase
 - 3.7.5 Institutional Control Phase
 - 3.8 References
-

Table 3. Detailed Outline of Chapter 5 of
the Shallow Land Burial Handbook

- 5. SUGGESTED DESIGN PRACTICES
 - 5.1 Site Layout
 - 5.1.1 Buildings
 - 5.1.2 Equipment
 - 5.1.2.1 Scales
 - 5.1.2.2 Excavation Equipment
 - 5.1.2.3 Monitoring Equipment
 - 5.1.2.4 Fire and Safety Equipment
 - 5.1.2.5 Volume Reduction Equipment
 - 5.1.2.6 Waste Handling Equipment
 - 5.1.3 Access Roads
 - 5.1.4 Trench Space
 - 5.1.5 Buffer Zone
 - 5.1.6 Security Provisions
 - 5.2 Trench Design
 - 5.2.1 Trench Depth
 - 5.2.2 Trench Width
 - 5.2.3 Trench Length
 - 5.2.4 Relationship to Water Table
 - 5.2.5 Permanent Trench Markers
 - 5.3 Environmental Control Technology
 - 5.3.1 Surface Water Diversion
 - 5.3.2 Covers
 - 5.3.3 Ground Water Diversion
 - 5.3.4 Liners
 - 5.3.5 Leachate and Gas Production
 - 5.4 Environmental Monitoring
 - 5.5 References
-