

US EPA ARCHIVE DOCUMENT

## CHAPTER ONE

### INTRODUCTION

Section 3001(b)(3)(A)(iii) of the Resource Conservation and Recovery Act (RCRA) excludes cement kiln dust waste from regulation under Subtitle C of RCRA, pending completion of a Report to Congress required by §8002(o) and a determination by the EPA Administrator either to promulgate regulations under Subtitle C or that such regulations are unwarranted (as required by §3001(b)(3)(C)). This report has been prepared by EPA to meet the requirements of §3001(b)(3) and §8002(o) that the Agency study cement kiln dust (CKD) waste generated in the production of cement clinker and prepare a Report to Congress on the findings of the study.

This introductory chapter is organized into four sections. The first section discusses the purpose and scope of this report, while section two presents EPA's general study methods and the major sources of information used in preparing this document. Section three describes the Agency's decision making rationale that will be used in making the final regulatory determination. Finally, section four provides an overview of the content and organization of this report.

#### 1.0 PURPOSE AND SCOPE

On October 21, 1976, Congress enacted RCRA (Pub. L. 94-580). Section 3001 of RCRA mandated that the EPA Administrator "promulgate regulations identifying characteristics of hazardous waste, and listing particular hazardous wastes which shall be subject to the provisions of this subtitle." Section 3004 required the Administrator to promulgate standards applicable to owners and operators of hazardous waste treatment, storage, and disposal facilities.

In response to these requirements, EPA proposed regulations for managing hazardous wastes under Subtitle C of RCRA on December 18, 1978 (43 FR 58946). In this regulatory proposal, EPA proposed to defer most of the RCRA Subtitle C requirements for six categories of wastes, which it termed "special wastes," until information could be gathered and assessed and the most appropriate regulatory approach determined. Special wastes are typically generated in large volumes, are thought to pose less risk to human health and the environment than wastes (to be) regulated as hazardous wastes, and may be inappropriately regulated under the proposed technical requirements implementing Subtitle C. EPA identified CKD waste as one of these "special wastes".<sup>1</sup>

In 1979, Congress began work on reauthorization of RCRA. During the reauthorization process, Rep. Thomas Bevill (Alabama) offered an amendment (now frequently referred to as the Bevill Amendment) which, among other things, modified §3001 to temporarily exempt "cement kiln dust waste" (along with two other categories of waste) from Subtitle C regulation, pending completion of certain studies. On October 12, 1980, Congress enacted the Solid Waste Disposal Act Amendments of 1980 (Pub. L. 96-482), which added §3001(b)(3)(A)(i-iii) (the Bevill Amendment) to RCRA. These amendments also added §8002(o), which required the Administrator to study the adverse effects on human health and the environment, if any, from the disposal of "cement kiln dust waste," and submit a Report to Congress on its findings. The 1980 amendments also added §3001(b)(3)(C), which requires the Administrator to make a regulatory determination, within six months of the completion of the §8002(o) study, whether or not to regulate CKD waste under Subtitle C of RCRA.

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<sup>1</sup> The other five proposed "special wastes" specifically identified in the 1978 proposed rule were mining waste; utility waste; phosphate rock mining, beneficiation, and processing waste; uranium mining waste; and oil and gas drilling muds and oil production brines.

In response to the 1980 RCRA amendments, on November 19, 1980, EPA published an interim final amendment to its hazardous waste regulations to reflect the provisions of the Bevill Amendment (45 FR 76618), which is codified at 40 CFR 261.4(b)(8). Consequently, since that time, CKD has been exempt from Subtitle C of RCRA -- that is, this material has never been regulated as a hazardous waste under federal law.<sup>2</sup>

The purpose of this report is to comply with the Congressional edict and to establish the factual basis for EPA decision making regarding the appropriate regulatory status, under RCRA, of CKD waste. In keeping with the statutory requirements, this report addresses the following eight study factors, as articulated at §8002(o) of RCRA:

- (1) The source and volumes of [CKD] generated per year;
- (2) Present disposal practices;
- (3) Potential danger, if any, to human health and the environment from the disposal of [CKD];
- (4) Documented cases in which danger to human health or the environment has been proved;
- (5) Alternatives to current disposal methods;
- (6) The costs of such alternatives;
- (7) The impact of those alternatives on the use of natural resources; and
- (8) The current and potential utilization of [CKD].

In addition, the report includes a review of applicable state and federal regulations, so regulatory decisions that derive from the report will avoid duplication of existing requirements.

## **1.1 GENERAL METHODS AND INFORMATION SOURCES**

In preparing this report, EPA has developed industry-wide, and in some cases, facility-specific data and analytical methods that reflect the complexity of the issues that are addressed in this report. The facilities that generate CKD waste vary considerably in size, location, operational aspects, and waste management techniques. Moreover, to examine in detail the broad array of study factors mandated by RCRA §8002(o), EPA had to develop approaches and methods that were sufficiently sophisticated to take into account the special nature of CKD. This section outlines the general methods and the data sources that the Agency employed to respond to the statutory study factors, beginning with a discussion of the major data collection initiatives that EPA's Office of Solid Waste (OSW) has conducted during the past three years.

### **1.1.1 General Analytical Methods**

To address the RCRA §8002(o) study factors in a thorough and systematic fashion, EPA has organized this report and conducted its supporting analyses along functional lines. The Agency has combined its examination of certain study factors into groups and has presented its analysis of the others in a logical sequence. For that reason, certain key concepts are addressed in several chapters of the Report, albeit with different emphases. Examples of such

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<sup>2</sup> It should be noted here that under the RCRA Subtitle C Boilers and Industrial Furnaces (BIF) Rule, CKD generated by kilns that burn hazardous waste as fuel may be ineligible for Bevill Exclusion under certain conditions (see 40 CFR 266.112).

cross-cutting issues include CKD composition, cement kiln design and operation, and kiln fuel type.

The specific methods that EPA used to address each of the study factors are described in detail in Chapters 3 through 9. Additional information on the methods used and supporting data are contained in the Background Documents to this Report.

### 1.1.2 EPA Data Collection Activities

To develop an adequate information base to address the eight study factors, OSW conducted a number of data collection activities. The focus of most of these efforts was site-specific. As a result, EPA was able to compile reasonably detailed industry-wide information, which was used extensively to prepare this report. The major information-gathering initiatives are identified and discussed in the following paragraphs.

#### A. 1991 Portland Cement Association (PCA) Survey of Cement Kiln Facilities

In December 1991, the Portland Cement Association (PCA) prepared and distributed a written questionnaire to the operators of the 115 cement kiln facilities in the U.S. that EPA believed generated CKD waste. These facilities were identified from information in existing Agency files, information provided by PCA, and from data supplied by the U.S. Bureau of Mines (BOM). The questionnaire was designed to elicit information both on CKD waste generation and management at clinker-producing facilities, and on the operational characteristics of the facilities. The majority of the questions addressed waste management and were ordered so as to "track" CKD from the point of generation through ultimate disposition.

Approximately 80 percent of the facilities that currently generate CKD responded to the questionnaire. PCA has made these survey responses available to the Agency, and hence, to the public record. Responses were entered into a computerized data base, which EPA used in conducting the analyses described below. A description of the survey is contained in the Background Documents to this Report. Copies of the survey instrument, as well as all available non-confidential company responses, may be found in the supporting docket for this report.

#### B. 1992 and 1993 CKD Sampling and Analysis

Because CKD has not been studied by OSW previously, and because existing facility-specific data on this waste were sparse, EPA conducted a CKD and cement clinker sampling and analysis program in early 1992. The Agency's field sampling teams visited 15 cement facilities, recorded observations of operational practices, photographed waste management activities, and collected samples. In most cases, EPA sampled both "as generated" and "as managed" CKD.

To clarify certain analytical issues raised by the results of the 1992 sampling and analysis effort (referred to throughout this Report as "Phase I"), EPA conducted a second, more focused CKD sampling and analysis program in May 1993 (referred to as Phase II). The Agency visited and took CKD (and in some cases, clinker) samples from six cement plants (one of which had been visited during Phase I), and performed various chemical analyses. One important distinction between the two sampling and analysis programs is that the analytical methods employed for measuring dioxin and dibenzofuran concentrations in Phase II analysis were far more sensitive than those used in Phase I.

The data developed in EPA's two-phase CKD sampling program is summarized in the supporting docket for this report. A description of EPA's waste sampling study is presented in a Technical Background Document, which may also be found in the docket.

#### C. Damage Case Collection

To respond to the need to describe "documented cases in which danger to human health or the environment has been proved," (referred to in this report as "damage cases") as directed by RCRA, EPA conducted an exhaustive examination of the extent to which CKD has been implicated in human health or environmental contamination incidents. This effort began by contacting appropriate staff in all EPA regions and states in which one or more cement kiln facilities is located. When available, the information was obtained through the mail or through visits to state/local officials having regulatory jurisdiction over CKD management.

The Agency's damage case analysis is based primarily on documented evidence, rather than on visits to the sites being evaluated. However, the 15 Phase I waste sampling visits included an effort to collect information on the existence of potential environmental pathways through which CKD and its constituents might migrate and cause adverse impacts. The result of this effort is a compilation of information regarding the past and present management practices that have been applied to CKD, and the environmental or human health consequences of these practices.

Damage case findings are presented in Chapter 5 of this report; the individual sites that have been evaluated are listed in a supporting Technical Background Document, which also provides more extensive discussions and supporting evidence.

#### D. EPA Site Visits

In addition to the waste sampling and damage case collection efforts described above, EPA visited two cement facilities during the summer of 1991 to enhance the Agency's general understanding of CKD generation and management practices. The knowledge and insights gained during these and subsequent sampling visits have enabled the Agency to understand and evaluate current waste management practices, and to draw conclusions and make recommendations regarding the appropriate regulatory status of CKD.

#### E. RCRA §3007 Waste and Site Characteristics Data Request

To augment existing EPA waste and site characterization data and to allow affected facilities to have meaningful input into the Agency's evaluation of the physical and chemical characteristics of CKD, EPA issued a formal written request, under authority of RCRA §3007, to cement plant operators. The purpose of the request was to obtain any available information on the characteristics of the dust that they generate. In particular, the Agency sought new information on the presence and concentrations of organic constituents in CKD, and patterns of off-site CKD use in productive applications, as well as site-specific environmental characteristics of those plants for which PCA surveys had not been received. The request did not specify the quantity of data required by EPA or a data format, so as to make compliance by the facility operators as simple as possible.

EPA reviewed all data submittals and collected and used the data that are most relevant to the analyses presented in this study.

### 1.2 EPA'S DECISION MAKING RATIONALE

Based on the analysis of the study factors found at §8002(o), EPA has arrived at preliminary findings that are relevant to the appropriate regulatory status of CKD under RCRA. These findings suggest two general EPA options that were developed through the systematic evaluation process described below. In this process, the Agency considered the study factors in a step-wise fashion. This methodology is consistent with previous Bevill Amendment decisions, such as those made for mineral processing. In applying this framework, EPA used a number of assumptions, which are described in the following paragraph.

The first assumption that the Agency made is that decision criteria were needed so that reasonable decisions regarding the need for additional regulatory controls can be achieved. The

second major assumption guiding EPA's decision-making process was that the study factors that are most important in establishing the regulatory status of CKD are 1) the risks posed and documented damages caused by the dust, and 2) the costs and impacts that would be associated with more stringent regulatory controls, if such additional controls were warranted. The reason for this is that in the absence of potential risk and/or documented damages, there is no need for hazardous waste regulation under RCRA Subtitle C (the key issue in question); if greater regulatory controls are needed because of significant potential or documented danger, the costs and impacts of regulatory controls are the critical factor in determining whether a given alternative would lead to the desired outcome (adequate protection of human health and the environment, and continued operation of the affected facilities). EPA also believes that it has developed and analyzed regulatory compliance scenarios that are realistic from an operational and engineering standpoint, and that are likely to be adequately protective of human health and the environment (i.e., could be implemented by facility operators and would result in societal benefits).

## Evaluation Criteria

Step 1. Does management of CKD pose human health/environmental problems? Might current practices cause problems in the future?

Critical to the Agency's decision-making process is whether CKD either has caused or could cause human health or environmental damage. To resolve this issue, EPA posed the following key questions:

- (1) Has CKD, as currently managed, caused documented human health impacts or environmental damage?
- (2) Does EPA's analysis indicate that CKD could pose significant risk to human health or the environment at any of the sites that generate it (or in off-site use), under either current management practices or plausible mismanagement scenarios?
- (3) Does CKD exhibit any of the characteristics of hazardous waste?

If the answer to any of these three questions was yes, then EPA would conclude that further evaluation was necessary. If the answer to all of these questions was no, then the Agency would conclude that regulation of CKD under RCRA Subtitle C is unwarranted.

Step 2. Is more stringent regulation necessary and desirable?

If CKD has caused or may cause human health or environmental impacts, then EPA would conclude that an examination of alternative regulatory controls was appropriate. Given the context and purpose of the present study, the Agency focused on an evaluation of the likelihood that such impacts might continue or arise in the absence of Subtitle C regulation, by posing the following two questions:

- (1) Are current practices adequate to limit contaminant release and associated risk?
- (2) Are current federal and state regulatory controls adequate to address the management of CKD?

If current practices and existing regulatory controls are adequate, and if the potential for actual future impacts is low (e.g., facilities in remote locations), then the Agency would tentatively conclude that regulation of CKD under Subtitle C is unwarranted. Otherwise, further examination of regulatory alternatives was necessary.

Step 3. What would the operational and economic consequences be of a decision to regulate CKD under Subtitle C?

If, based upon the previous two steps, EPA believed that regulation of CKD under Subtitle C might be appropriate, then the Agency would evaluate the costs and impacts of two potential regulatory options. The focus of this inquiry was whether the magnitude and distribution of regulatory compliance costs might jeopardize the continued economic viability of one or more generators if the waste were to be regulated under the Subtitle C scenario. The key questions in the Agency's decision-making process were as follows:

- (1) Are predicted economic impacts associated with the Subtitle C scenario significant for any of the affected facilities?
- (2) To what extent could these compliance costs be avoided through the implementation of alternative CKD management practices?

- (3) In the event that significant impacts are predicted, might a substantial proportion of domestic capacity or product consumption be affected?
- (4) What effects would hazardous waste regulation have upon the viability of the beneficial use or recycling of CKD?

In EPA's judgment, absence of significant impacts would suggest that Subtitle C regulation might be appropriate for CKD if findings indicate that it poses significant risk. If even less stringent Subtitle C standards impose widespread and significant impacts on facilities, and/or deter the safe and beneficial use of the dust, EPA would conclude that regulation under some form of Subtitle D program might be more appropriate.

### 1.3 CONTENTS AND ORGANIZATION OF REPORT

This Report to Congress consists of two volumes, as follows:

#### Volume I: Executive Summary

- This volume provides an overview of the methods and data sources used to conduct the study, the technical findings of the study, a description of the regulatory options considered, EPA's conclusions and preliminary recommendations, and a discussion of the next steps the Agency plans to undertake.

#### Volume II: Methods and Findings

- Chapter 1, Introduction, summarizes the purpose and scope of the report, general methods and information sources used, and EPA's decision-making rationale.
- Chapter 2, Cement Industry Overview, provides a description of CKD waste, cement industry structure and characteristics, the cement manufacturing process, the types of production processes used, and significant process inputs.
- Chapter 3, CKD Generation and Characteristics, describes the generation of CKD, dust collection devices and recycling of dust back to the kiln, and the physical and chemical characteristics of CKD.
- Chapter 4, Current CKD Management Practices, outlines the range of CKD management practices currently employed at domestic cement plants.
- Chapter 5, Documented Damages from Management of CKD, provides a discussion of case studies in which it has been shown that currently used CKD management practices have led to documented environmental impairment.
- Chapter 6, Potential Danger to Human Health and the Environment, presents a discussion of EPA's risk assessment in which the Agency examined inherent hazards posed by CKD, evaluated site-specific risk factors, and performed quantitative transport, fate, and exposure modeling.
- Chapter 7, Existing Regulatory Controls on CKD Management, reviews applicable federal and state laws and regulations controlling CKD management with respect to the various environmental media.

- Chapter 8, Alternative Management Practices and CKD Utilization, investigates a variety of alternative management practices for CKD and beneficial uses of CKD removed from the production system, and examines the technical feasibility, human health/environmental considerations, and economic feasibility of each option.
- Chapter 9, Cost and Economic Impacts of Alternatives to Current CKD Disposal Practices, discusses methods and data sources used, cost modeling results, and analysis of the economic impacts under each of several regulatory and operational scenarios.
- Chapter 10, Study Findings and Regulatory Options.

Additional documentation regarding the methods, data sources, and assumptions used in preparing this report and the analyses contained herein may be found in the RCRA docket (docket number F-93-RCKA-FFFFF).

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