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Final Regulatory Determination on Four Large-Volume Wastes From the
Combustion of Coal by Electric Utility Power Plants

Part V

58 FR 42466

DATE: Monday, August 9, 1993

ACTION: Final regulatory determination.

To view the next page, type .np* TRANSMIT.
To view a specific page, transmit p* and the page number, e.g. p*1

SUMMARY: Today's action presents the Agency's final regulatory determination required by Section 3001(b) (3) (C) of the Resource Conservation and Recovery Act (RCRA) on four large-volume fossil-fuel combustion (FFC) waste streams-fly ash, bottom ash, boiler slag, and flue gas emission control waste-studied in the Agency's February 1988, Report to Congress: Wastes from the Combustion of Coal by Electric Utility Power Plants (RTC). EPA has concluded that regulation under Subtitle C of RCRA is inappropriate for the four waste streams that were studied because of the limited risks posed by them and the existence of generally adequate State and Federal regulatory programs. The Agency also believes that the potential for damage from these wastes is most often determined by site- or region-specific factors and that the current State approach to regulation is thus appropriate. Therefore, the Agency will continue to exempt these wastes from regulation as hazardous wastes under RCRA Subtitle C. However, EPA believes that industry and the States should continue to review the appropriate management of these wastes. EPA will consider these wastes during the Agency's ongoing assessment of industrial non-hazardous wastes under RCRA Subtitle D.

EPA plans to make a final regulatory determination on the remaining FFC waste streams (beyond the four listed above) subject to Section 3001(b) (3) of RCRA by April 1, 1998.

EFFECTIVE DATE: September 2, 1993.

FOR FURTHER INFORMATION CONTACT: For further information on the regulatory determination, contact the RCRA/Superfund hotline at (800) 424-9346 or (703) 412-9810, or Patti Whiting at (703) 308-8421.

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I. Background

A. Statutory Authority

Today's notice is issued under the authority of Section 3001(b)(3)(C) of RCRA, which requires that after completion of the Report to Congress mandated by Section 8002(n) of RCRA, the Administrator must determine whether Subtitle C

regulation of fossil fuel combustion wastes is warranted.

B. History of the Combustion Waste Exclusion

In December 1978, EPA proposed the first regulations to implement Subtitle C of RCRA. At that time, the Agency recognized that certain large-volume wastes, including wastes from the combustion of fossil fuels, might warrant special treatment. However, the Agency had very little information regarding the nature of and risks posed by these large-volume wastes. Additionally, the Agency had no data on the costs and effectiveness of technologies for managing these wastes. In light of these uncertainties, EPA proposed a limited set of regulations for the management of these wastes (43 FR 58946, 59015, December 18, 1978).

On May 19, 1980, EPA promulgated the initial regulations implementing Subtitle C. By then, however, Congress was debating RCRA reauthorization and both Houses had passed bills restricting EPA's authority to regulate large-volume wastes under Subtitle C of RCRA. Anticipating the enactment of legislation amending RCRA Section 3001, EPA excluded fossil fuel combustion wastes from these regulations (45 FR 33084, 33089, May 19, 1980).

In October 1980, Congress passed the Solid Waste Disposal Act Amendments. Among other things, the amendments temporarily exempted from regulation as hazardous wastes certain large-volume wastes generated primarily from the combustion of coal or other fossil fuels (RCRA Section 3001(b)(3)(A)(i)). These large-volume wastes include fly ash waste, bottom ash waste, boiler slag waste, and flue gas emission control (or flue gas desulfurization) waste. In RCRA Section 8002(n), Congress directed EPA to conduct a detailed and comprehensive study based on eight study factors (discussed in detail below) and to submit a Report to Congress on "the adverse effects on human health and the environment, if any, of the disposal and utilization of fly ash waste, bottom ash waste, slag waste, flue gas emission control waste, and other byproduct materials generated primarily from the combustion of coal or other fossil fuels."

Finally, in RCRA Section 3001(b)(3)(C), Congress directed that within 6 months of submitting the report, EPA must, after public hearings and opportunity for comment, decide whether regulation of the management of the temporarily exempt FFC wastes as hazardous wastes under Subtitle C is warranted. Once the decision is made, the Administrator must publish the Agency's regulatory determination in the Federal Register.

In 1981, EPA provided an interpretation of the RCRA regulations regarding the exclusion of fossil-fuel combustion wastes from regulation under Subtitle C n1 . EPA stated that, pending the results of the Report to Congress, the Agency would interpret the following to be exempt from RCRA Subtitle C pending further study: (1) Fly ash, bottom ash, boiler slag, and flue gas emission control wastes resulting from: the combustion solely of coal, oil, or natural gas, the combustion of any mixture of these fossil fuels, and the combustion of any mixture of coal and other fuels n2 where coal makes up at least 50 percent of the mixture, and (2) wastes produced in conjunction with the combustion of fossil fuels that are necessarily associated with the production of energy and

that have been and are mixed with and co-disposed or co-treated with fly ash, bottom ash, boiler slag, or flue gas emission control wastes from coal combustion.

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n1 Letter from G. Dietrich, U.S. EPA, to P. Emler, Utility Solid Waste Activities Group, January 13, 1981, Report to Congress: Wastes from the Combustion of Coal by Electric Utility Power Plants, February 1988, Appendix A.

n2See discussion below on page 10.

RCRA was amended again in 1984 by the Hazardous and Solid Waste Amendments (HSWA) (Pub. L. No. 98-616, 98 Stat. 3221). These amendments [*42467] added Section 3004(x), which gave EPA the flexibility to promulgate regulations under Subtitle C that considered the unique characteristics of some large-volume wastes, including FFC wastes. Specifically, if EPA determined that some or all of the wastes from fossil-fuel combustion should be regulated as hazardous waste, it could modify certain HSWA requirements to take into account the special characteristics of the wastes, the practical difficulties of implementing the standards, and site-specific characteristics, as long as the modifications still protected human health and the environment.

In February 1988, EPA submitted its Report to Congress: Wastes from the Combustion of Coal by Electric Utility Power Plants, as required under RCRA Section 8002(n). Because coal-fired electric utilities generate a large majority of all fossil-fuel combustion wastes, the RTC focused on wastes generated by coal-fired electric utilities. The document does not address wastes generated by utilities burning other fossil fuels or wastes from non-utility boilers burning any type of fossil fuel (the Agency deferred study of these waste streams until a later date). The report provided the Agency's analysis of available data considering the eight study factors listed in Section 8002(n) of RCRA and presented the Agency's tentative determination regarding large-volume wastes from coal-fired electric utilities. Following the release of the RTC, the Agency provided a notice and comment period that extended through May 16, 1988, and held a public hearing in Denver, Colorado, on April 26, 1988. Appendix A summarizes the comments received on the RTC.

Because of other priorities, the Agency did not publish the regulatory determination for fossil-fuel combustion wastes within the timeframe established in Section 3001(b)(3)(C). As a result, a suit was filed on behalf of the Bull Run Coalition (an Oregon citizens group), with the Edison Electric Institute intervening as plaintiffs. n3 On June 30, 1992, the Agency entered into a Consent Decree that established a schedule for the Agency to complete the regulatory determinations for all fossil-fuel combustion wastes. The Consent Decree divides FFC wastes into two categories: (1) Fly ash, bottom ash, boiler slag, and flue gas emission control waste from the combustion of coal by electric utilities and, (2) all remaining wastes subject to RCRA Sections 3001(b) and 8002(n). Separate schedules are provided in the Consent Decree for each category of waste.

n3 Frank Gearhart, et al. v. William K. Reilly, et al., No. 91-2435 (D.D.C.)

In accordance with the requirements of the Consent Decree, the Agency notified the parties to the litigation on December 1, 1992, that a regulatory determination for fly ash, bottom ash, slag, and flue gas emission control waste

from the combustion of coal by electric utilities would be made by August 2, 1993. For the remaining FFC wastes, the Agency indicated that further study was required and that a regulatory determination would be completed for these wastes by April 1, 1998.

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In preparing the regulatory determination, EPA collected and reviewed recent information on wastes from coal-fired electric utility power plants. On February 12, 1993, EPA published a Notice of Data Availability in the Federal Register, soliciting comments on these data (58 FR 8273). In the notice, EPA also requested comments on a proposed methodology to be used in making the final regulatory determination. This three-step analytical approach was recently used in making the June 13, 1991, regulatory determination for special wastes from mineral processing (56 FR 27300). Comments on the newly available data and on the proposed methodology are discussed in Appendix B of today's notice.

Today's decision is based on the RTC and the data and analyses that underlie the report, comments on the RTC, supplemental information gathered after the RTC, and comments on that newly available information.

C. Overview of the Report to Congress

1. Scope of the Report

EPA published the RTC in 1988. The RTC documents EPA's study of special wastes from coal-fired utilities temporarily excluded from regulation under RCRA Subtitle C. EPA did not include within the scope of the RTC oil- and gas-fired utility wastes, as well as industrial FFC wastes. The study presents EPA's understanding of the generation, management, disposal, and reuse of wastes from coal combustion for electricity generation.

2. Study Factors

The RTC addressed the following eight study factors required under Section 8002(n) of RCRA:

1. Sources and volumes of such materials generated per year,
2. Present disposal and utilization practices,
3. Potential danger, if any, to human health and the environment from the disposal and reuse of such materials,
4. Documented cases in which danger to human health or the environment from surface runoff or leachate has been proved,
5. Alternatives to current disposal methods,
6. Costs of such alternatives,
7. Impact of those alternatives on the use of coal and other natural resources, and
8. Current and potential utilization of such materials.

In preparing the RTC, EPA addressed these eight study factors as they apply

to coal-fired combustion wastes generated by electric utilities. The RTC is divided into six sections that address these factors. The first section provides an overview of the U.S. electric utility industry, including the structure, economic and environmental regulations, and describes the importance of coal to the electric utility industry. The second section examines the amounts and

types of wastes generated. The third section discusses current waste management and disposal practices used by the electric utility industry and possible alternatives to these practices. The fourth section reviews the potential and documented impacts of these wastes on human health and the environment, and the fifth section evaluates costs associated with current waste disposal practices and additional costs that could be incurred under a variety of alternative waste management practices. The final section summarizes the RTC's tentative findings and provides recommendations for a regulatory determination.

3. Preliminary Findings

Using the RTC findings, EPA developed three preliminary recommendations for such wastes. A summary of these recommendations is provided below.

a. Large-volume wastes. The RTC found that while the majority of the materials present in the four large volume wastes-fly ash, bottom ash, boiler slag, and flue dust-are not of major concern (e.g., more than 95 percent of the ash is composed of oxides of silicon, aluminum, iron, and calcium), trace constituents in the wastes, including arsenic, barium, cadmium, chromium, lead, mercury, and selenium, may present risks to human health and the environment. However, the data also indicates that these wastes generally do not exhibit the RCRA hazardous waste characteristics. In particular, a review of the extraction procedure (EP) test data indicated that metals are generally not found in leachate at levels above the hazardous waste toxicity characteristic. Only three [*42468] metals-cadmium, chromium, and arsenic-were detected in any ash or sludge samples above toxicity characteristic levels and then only infrequently.

In addition, the report tentatively concluded that current waste management practices appear to be adequate for protecting human health and the environment. For example, while groundwater monitoring data showed that waste management units can cause releases of pollutants to underlying groundwater, the frequency and magnitude of exceedences of Primary Drinking Water Standards (PDWSs) were found to be relatively low-about 5 percent of all samples showed exceedences of PDWS, with exceedences less than 20 times the applicable standard in all cases. Additionally, human populations generally are not directly exposed to groundwater in the vicinity of coal-fired utility waste management sites; public drinking water intakes are usually at least several kilometers from the sites.

Furthermore, the RTC indicated that as of 1988, coal-fired electric utilities spent about \$ 800 million per year for the disposal of coal combustion wastes. If all utility large-volume wastes from coal combustion were regulated as hazardous wastes, the cost of disposal practices, excluding corrective action costs or higher recycling costs, could increase to \$ 3.7 billion per year. Costs would approach \$ 5 billion annually if all existing facilities were capped and closed and new facilities were constructed with liners, leachate collection systems, flood protection, and groundwater monitoring. Based on these findings, the RTC tentatively concluded that regulation of these wastes under Subtitle C was not warranted.

b. Low-Volume Wastes. The RTC identified a number of wastes other than the

large-volume wastes that are typically generated in lower volumes by coal-fired electric utilities. These "low-volume wastes" include, but are not limited to, boiler blowdown, coal pile runoff, cooling tower blowdown, demineralizer regenerant and rinses, metal and boiler cleaning wastes, pyrites, and sump effluents. The report indicated that several low-volume wastes may exhibit the

hazardous waste characteristics of corrosivity and EP toxicity.

Data in the RTC showed that waste streams produced during equipment maintenance (e.g., boiler chemical cleaning wastes) occasionally exceeded hazardous waste toxicity characteristics for chromium and lead. Boiler chemical cleaning wastes were also, in limited instances, found to exhibit the characteristic of corrosivity. No exceedences of toxicity characteristics were observed for other low-volume wastes, but available data were limited. In addition, the Agency concluded that data on these low-volume wastes that are co-disposed with the four large-volume waste streams were insufficient to determine the potential contribution of particular wastes to environmental risk and that additional study of low-volume wastes was warranted. Because of these findings, the Agency indicated that it was considering removing the exemption for low-volume wastes.

c. Waste utilization. EPA noted in the RTC that waste utilization practices appeared to be conducted in an environmentally safe manner. The Agency encouraged the utilization of coal combustion wastes as one method for reducing the amount of these wastes requiring disposal and supported voluntary efforts by industry to investigate new possibilities for utilizing coal combustion wastes.

4. Public Comment Process

With the publication of the RTC, EPA established a comment period that ended May 16, 1988 (See 53 FR 9976, March 28, 1988). In addition, the Agency held a public hearing on the RTC in Denver, Colorado, on April 26, 1988 (53 FR 14839). A second hearing was scheduled but subsequently cancelled. EPA received 24 sets of written comments prior to the close of the comment period. All individual comments and a transcript from the public hearing are available for public inspection in the RTC docket (Docket No. F-88-PATA-FFFFF). The docket also contains a summary of all the comments presented at the hearing or submitted in writing. EPA's responses to those comments are provided in the docket, as well as in Appendix A to this regulatory determination.

D. Supplemental Analysis and Notice of Data Availability

Supplemental data were collected and analyzed for the large-volume and some low-volume wastes addressed by the RTC. A Notice of Data Availability (Notice), which announced the availability of this information, was published in the Federal Register on February 12, 1993. In the Notice, EPA also made available for comment the proposed methodology to be used in making a final regulatory determination for fly ash, bottom ash, slag, and flue gas emission control wastes. The Agency provided a 45-day public comment period, which closed on March 29, 1993.

The supplemental data provided in the Notice were obtained by EPA from various EPA offices and other Federal agencies, State agencies, and the electric utility industry. In addition, literature searches were performed to identify recently published materials on fly ash, bottom ash, boiler slag, and flue gas emission control waste generated by coal-fired electric utilities. Information

in the Notice included:

Published and unpublished materials obtained from State and Federal agencies, utilities and trade industry groups, and other knowledgeable parties on the volumes and characteristics of fly and bottom ash, slag, and flue gas emission

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control waste.

Published and unpublished materials on management practices (including co-disposal and reutilization) associated with fly and bottom ash, slag, and flue gas emission control waste.

Published and unpublished materials on the potential environmental impacts associated with fly and bottom ash, slag, and flue gas emission control waste management.

Published and unpublished materials on trends in utility plant operations that may affect waste volumes and characteristics. Specific information was sought on innovations in scrubber use and the potential impacts of the 1990 Clean Air Act Amendments on waste volumes and characteristics.

Energy Information Agency (EIA), Department of Energy, 1990 data on utility operations and waste generation obtained from EIA's Form 767 database. These data are submitted to EIA annually by electric utilities.

Site visit reports and accompanying facility submittals for five power plants visited by EPA during fall of 1992.

Materials obtained from public files maintained by State regulatory agencies in Virginia, North Dakota, Texas, Indiana, Colorado, Wisconsin, Ohio, and Pennsylvania. These materials focus on waste characterization and environmental monitoring data, along with supporting background information.

EPA received 14 written comments addressing the Notice. All of the comments are available for public inspection in Docket No. F-93-FFCA-FFFFF. EPA's response to the comments are provided in the docket and in Appendix B to this regulatory determination.

II. Scope of the Regulatory Determination

This section describes the wastes that are and are not affected by this [*42469] regulatory determination. The discussion addresses the affected generators, the status of wastes generated from those utilities that co-burn fossil fuels with non-coal fossil fuels or other materials, and the effect of co-management of the four large-volume wastes with low-volume coal combustion wastes on the regulatory status of the large-volume wastes.

The Consent Decree divided the universe of fossil-fuel combustion wastes into two categories: large-volume wastes from coal-fired electric utilities referenced in RCRA Section 3001(b)(3) (fly ash, bottom ash, boiler slag, and flue gas emission control wastes) and "remaining wastes" (these wastes must still be studied according to RCRA Section 8002(n)). Each category has separate schedules for making the regulatory determination. Today's action only affects fly ash, bottom ash, boiler slag, and flue gas emission control waste from coal-fired electric utilities. All remaining wastes are outside the scope of this determination. Because a waste stream which is categorized as a

large-volume waste as generated may become a remaining waste as a result of the manner in which it is managed, this section explains the universe of as-generated and as-managed large-volume wastes affected by today's action.

A. As-Generated Large-Volume Wastes

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The universe of wastes affected by this action is limited to the large-volume wastes generated by coal-fired units at steam electric utility power plants in the United States, including independent power producers not engaged in any other industrial activity (this latter group was included because the Agency has no reason to believe that its wastes and practices are any different than those of larger power plants). These wastes are subject to the regulatory determination only when managed separately from other FFC wastes. Further, the population is limited to wastes from those facilities for which coal is almost the sole fossil-fuel feed.

Information on electric utilities collected since publication of the Report to Congress demonstrates that nearly all coal-fired boilers occasionally burn small amounts of natural gas and/or fossil-fuel oil for boiler startup or flame stabilization. While oil ash is a remaining waste outside the scope of today's action, the Agency believes, based on published literature and information collected during site visits, that the burning of oil for startup and flame stabilization results in a de minimis contribution to the total volume of combustion by-products generated by the boiler during normal operations. Similarly, natural gas combustion for boiler startup or flame stabilization results in de minimis ash formation relative to the volume of by-products generated from coal combustion. Accordingly, the total volume of fly ash, bottom ash, slag, and flue gas emission control waste generated by a coal-fired plant that burns oil or natural gas in small quantities for start-up or flame stabilization shall be considered a large-volume waste subject to this determination.

The information collected following publication of the RTC also indicates that some operators occasionally burn materials other than coal in utility boilers, some of which are considered hazardous wastes under RCRA (operators may do so and their residues continue to remain exempt under the Bevill exemption as long as 50 percent of the feed is coal and the residue passes the BIF two-part test if they burn hazardous waste). This practice may be conducted for the purposes of disposal or energy recovery. Wastes from the co-burning of materials were not studied in the RTC, and very limited information regarding their generation, characteristics, and management has been collected to date. The Agency recognizes that the burning of such materials, when practiced in an environmentally sound manner, can be an effective waste management or energy recovery strategy. However, EPA has insufficient data to determine the amount of material burned or the potential influence of burning such materials on the characteristics of the four large-volume wastes. The Agency intends to study the co-burning issue further at a later date, as appropriate. Thus, the large-volume wastes which result from any such burning (with the exception of co-burning with hazardous waste) are outside the scope of this determination. The following paragraph discusses the special case of co-burning hazardous waste and coal.

The residues from those facilities that burn hazardous wastes are subject to the Boiler and Industrial Furnace (BIF) rule under RCRA (40 CFR 266.112). n4 Under the BIF rule, facilities must conduct site-specific sampling and analysis of waste-derived residues to document that hazardous waste burning has not significantly increased concentrations of hazardous constituents in the

residues. Because this testing ensures that such wastes are similar to those studied in the RTC, thus making further study of these wastes unnecessary, residues that pass the test are within the scope of today's regulatory determination.

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n4 The 1981 interpretation at footnote 1 above states that the residues from co-burning enjoy the temporary exemption only when the non-coal material in the feed is burned for its fuel value. This condition, however, was removed for co-burners of hazardous waste in the BIF rule (see preamble discussions at 56 FR 7196-7200, Feb. 21, 1991). For the same reasons cited during that rulemaking, and as a matter of consistency, the Agency no longer imposes such a condition when the non-coal material is not a hazardous waste.

Finally, for the purposes of this action, large-volume wastes from coal-fired electric utilities do not include wastes generated from fluidized bed combustion (FBC) boiler units. FBC is a relatively new combustion technology that allows for the removal of sulfur without an end-of-pipe scrubber. The wastes generated by this technology were not studied in the RTC, and only limited information regarding their characteristics and management has been collected to date. The information that is available has not provided EPA with enough evidence to conclude that waste generated from FBC units is substantially similar to conventional boiler wastes. Some sources maintain that FBC units that burn solely coal as a fossil-fuel source generate fly ash and spent bed material that is substantially different from conventional boiler wastes. n5 This is because in FBC, coal is burned in the presence of limestone. The differences in the FBC wastes are defined by a presence of sulfur compounds and high amounts of residual alkalinity. On the other hand, industry representatives believe that the wastes are very similar to the fly ash waste and flue gas emission control wastes studied in the RTC.

n5 United States Environmental Protection Agency, Office of Research and Development, Fluidized-Bed Combustion Technology Overview, EPA-600/7-81-074, April 1981.

The information does indicate that the use of FBC technology in the electric utility industry may be increasing. Because of the current lack of data, the potential of the co-firing of limestone to have a significant effect on the characteristics of the wastes produced, and the potential for increased utilization of the technology, the Agency has decided to defer a decision on these wastes until further information from the growing number of facilities can be examined. Therefore, the Agency considers these wastes "remaining wastes," which are outside the scope of today's regulatory determination.

B. As-Managed Large-Volume Wastes

As described above, large-volume wastes include fly ash, bottom ash, slag, and flue gas emission control wastes [*42470] from coal-fired electric utility boilers. However, the Consent Decree defines large-volume wastes that are "mixed with, co-disposed, co-treated, or otherwise co-managed with other wastes generated in conjunction with the combustion of coal or other fossil-fuels * * *" as remaining wastes. As a result, a waste that may be categorized as large-volume as generated may become a remaining waste by virtue of the circumstances of its management. Remaining wastes are outside the scope of this regulatory determination. (Although these wastes are not covered by today's regulatory determination, these wastes remain exempt from RCRA Subtitle

C until April 1, 1998, at the latest.)

The RTC found that the level of "co-mixing, co-treatment, co-disposal or co-management" practiced at utility waste disposal sites varies considerably. At one extreme, many or most liquid wastes generated at the plant may be handled

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along with ash in a single impoundment system. At the other extreme, all large-volume wastes may be discharged to units receiving no other materials of any kind. In practice, most utility disposal sites operate somewhere between these extremes, with large-volume wastes discharged into units receiving certain other materials. Depending on the specific materials commingled in a particular management unit, the resulting mixture may be a remaining waste and hence fall outside of the scope of today's action.

The Agency recognizes that many plant operators use process waters (e.g., non-contact cooling water and low-pressure service water) in ash handling or FGD systems. Because of the continuous use of these process waters, the Agency does not consider them to be wastes. In any event, the use of these process waters as feedwater for emission control systems or for ash transport generally will not increase the environmental risks associated with the wastes relative to the risks derived from utilization of fresh water for the same purposes. Discouraging such practices may lead to an increased usage of fresh water for the same purposes, thereby increasing the total volume of water exposed to the large-volume wastes as well as the total volume of waste generated. The Agency feels that this would be an undesirable outcome of today's action. For these reasons, the Agency does not consider the practice of using these non-contact process waters in ash sluicing systems or as makeup water for FGD systems to constitute co-management. The four large-volume wastes, therefore, that are transported/mixed with these process waters do not become "remaining wastes." Instead, they are within the scope of this Regulatory Determination. These waters are limited to ash hopper seal water, ash hopper cooling water, and other non-contact cooling waters.

The Agency emphasizes that co-management of low-volume wastes and large-volume wastes makes the combined waste stream a remaining waste. Given below is a list of management practices that result in combined waste streams that are remaining wastes. This list, which is not exhaustive, includes those activities observed or believed to occur at operating FFC waste disposal facilities that involve the "mixing, co-treatment, co-disposal, or co-management" of large-volume wastes with low-volume wastes. Remaining wastes as managed include:

Discharge of boiler blowdown to a large-volume waste impoundment,

Discharge of demineralizer regenerant to a large-volume waste impoundment,

Discharge of metal cleaning wastes to a large-volume waste impoundment,

Discharge of boiler chemical cleaning wastes to a large-volume waste impoundment,

Discharge of plant wastewater treatment effluent to a large-volume waste impoundment,

Discharge of coal mill rejects to a large-volume waste impoundment,

Disposal of oil ash in a large-volume waste landfill or impoundment,

Disposal of plant wastewater treatment sludge in a large-volume waste landfill,

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Disposal of coal mill rejects in a large-volume waste landfill, and
Reuse of metal cleaning wastewaters in a FGD feedwater system.

EPA recognizes that it may not have provided a clear understanding of what constitutes co-management since offering the 1981 interpretation of the exemption cited above. Therefore, the Agency may propose a definition of co-management in the future. This is important because low-volume wastes are within the Bevill Exemption only if they are co-managed with large volume waste. Low-volume wastes that are independently managed are not and have never been within the scope of the Bevill Exemption. n6

n6 Industry comments on both the RTC and Notice generally agreed with this interpretation.

III. Factors Considered in Making the Regulatory Determination

RCRA, as amended, directs EPA to make a regulatory determination generally based upon the RTC and comments received from interested parties. The statute contains the eight study parameters identified in Section I.C.2., Study Factors. In addition, RCRA Section 8002(n) suggests that EPA review relevant studies and other actions of other Federal and State agencies and invite participation by other concerned parties, including industry and other Federal and State agencies, with a view toward avoiding duplication of effort.

EPA complied with the congressional mandate in developing, in 1988, the required RTC. In conducting this study, EPA relied upon the analysis of the eight study factors noted above. The Agency has expanded the data base through the collection of additional data referenced in the February 12, 1993, Notice. The Notice also made available, in the RCRA docket, the three-step methodology the Agency was considering using in making this regulatory determination. This basic analytical approach was used in making the regulatory determination for mineral processing wastes (56 FR 27300, June 13, 1991). EPA modified the methodology in this case, however, so that it best fit the available information on the nature and management of the coal-fired electric utility wastes at issue in this determination. The method involves answering a series of questions covering the potential hazards of the wastes, the existing management and regulatory controls that affect the hazards that may be presented, and the potential impacts of regulating the wastes as hazardous under RCRA Subtitle C. This approach allows EPA to make a systematic evaluation of the information presented in the RTC and other information collected pursuant to the Notice. EPA has solicited and incorporated comments on the RTC, the data described in the Notice, and the three-step methodology in making today's regulatory determination. EPA believes that this approach is consistent with congressional intent.

EPA received no comments that disagreed with any aspect of the three-step methodology. Therefore, no changes have been made in the approach. The decision process outlined below presents a series of questions and sub-questions that were addressed in the order posed. If the Agency determined the response to Step

1 for a waste to be affirmative (e.g., "Yes, management of this waste does pose human health/environmental problems, or might cause problems in the future"), then the analysis proceeded to Step 2 for the waste and constituent(s) of concern. If, however, the answer to Step 1 was negative, then the analysis [*42471] stopped and the Agency determined that regulation of that waste

under Subtitle C was not warranted. If the analysis proceeded to Step 2 and the response to Step 2 was affirmative (e.g., "Yes, more stringent regulation is necessary and desirable"), analysis then proceeded to Step 3. If the response to Step 2 was negative, however, the analysis stopped and the Agency determined that regulation of that waste under Subtitle C was not warranted. Finally, if the Agency proceeded to Step 3 and found that the consequences of regulating the waste under Subtitle C were substantial and not justified by the risk reduction that could be obtained by Subtitle C regulation, then the Agency would determine that Subtitle C regulation was not warranted. The opposite conclusion to the question posed by Step 3 would result in a determination that regulation of the waste as hazardous under Subtitle C is warranted.

The rationale for the order of questions is that a FFC waste should first be considered to present risk to human health or the environment or a potential risk under plausible mismanagement scenarios before the Agency considers it for regulation under Subtitle C. Second, the Agency should determine that current management practices and existing State and Federal regulatory controls are inadequate to limit the risks posed by a waste, and that Subtitle C regulation would be effective and appropriate, before it considers regulating the waste under Subtitle C. Finally, the special status of the waste requires that the Agency consider the impacts to the industry that regulation under Subtitle C would create in making a decision to regulate the waste as hazardous. The methodology, therefore, allows EPA to systematically narrow its focus to those wastes that do or may present significant risk of harm and for which additional regulatory controls are necessary and desirable.

The discussion below addresses each of the steps and sub-steps in more detail.

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

Critical to the Agency's decision-making process is whether the special waste either has caused or may cause human health or environmental damage. To resolve those issues, EPA has posed the following key questions:

Substep 1. Has the waste, as currently managed, caused documented human health impacts or environmental damage?

Substep 2. Does EPA's analysis indicate that the waste could pose significant risk to human health or the environment at any sites that generate it (or in offsite use), under either current management practices or plausible mismanagement scenarios?

Substep 3. Does the waste exhibit any of the characteristics of hazardous waste?

As described above, the Agency first determined whether each waste may pose human health/environmental problems by examining whether the waste has caused documented human health or environmental damages in the past, whether each

waste, as managed, may pose significant risk to human health or the environment, and whether each waste exhibits any of the characteristics of hazardous waste. If each of the questions in Step 1 resulted in a negative response, no further review would be performed for that waste, and the Agency would determine that regulation under Subtitle C of RCRA is not warranted. However, as with the

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Regulatory Determination for Mineral Processing Special Wastes (56 FR 27305, June 13, 1991), an affirmative response to any one of the three sub-questions above did not necessarily trigger further analysis under Step 2 of the methodology. Rather, the Agency answered each of the three questions separately and then considered the combined responses as a whole in deciding whether further evaluation was necessary. In that consideration, the certainty and weight of evidence supporting an affirmative response to one question was taken into account in the Agency's decision to proceed to Step 2. If the Agency determined that additional review was warranted for a particular waste, additional review under Step 2 was limited to those waste characteristics or waste management practices for which significant potential for risk was identified in Step 1.

The first question the Agency addressed under Step 1 was whether coal combustion waste has caused documented human health impacts or environmental damage. To determine this, the Agency first considered existing damage case information presented in the RTC. EPA examined additional damage case information to determine whether there was further evidence of negative impacts to human health or the environment. The Agency requires that each relevant case satisfy at least one of the following three conditions: scientific investigation concluding that damages occurred, administrative ruling concluding that damages occurred, or court decision or out-of-court settlement concluding that damages occurred. Ideally, damages would clearly be the result of the large-volume coal combustion wastes.

In the Agency's analysis, damage to human health or the environment was considered as follows: Threat to human health included both acute and chronic effects (e.g., exceedences of primary drinking water standards, directly observed health effects, such as elevated blood contaminant levels or loss of life) associated with management of coal-fired electric utility wastes, while danger to the environment included: (1) Impairment of natural resources (e.g., contamination of any source of drinking water reasonably expected to be used), (2) ecological effects resulting in impairment of the structure or function of natural ecosystems and habitats, and (3) effects on wildlife resulting in impairment of terrestrial or aquatic fauna (e.g., reduction in species diversity or density, impairment of reproduction).

To address the second question-"could the waste pose significant risk to human health and the environment under either current management practices or plausible mismanagement scenarios, the Agency performed a two-part assessment of the potential for risk presented by the waste.

First, the Agency conducted a risk screen of intrinsic hazard of the wastes, comparing waste characterization data with conservative screening criteria developed for four exposure pathways: groundwater, surface water, inhalation, and ingestion. The purpose of the risk screen was to identify the waste constituents and exposure pathways that have the potential to present threats to human health and the environment. Exceedences of the screening criteria indicate the need for further study, but do not in themselves demonstrate that the wastes pose a significant hazard.

Second, for each waste constituent found to exceed the screening criteria, the Agency evaluated the potential for release, transport, and exposure of that constituent for specific pathways. The three exposure pathways evaluated for human health risk were groundwater ingestion, particulate inhalation, and soil

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ingestion. The fourth pathway, surface water, was evaluated for ecological risk. The Agency solicited comment in the Notice on excluding from consideration another pathway, radiation exposure, because of insufficient information to perform the required analysis. No comments or supplemental data were received regarding the proposed exclusion. Therefore, EPA did not consider radiation exposure in the analysis. [*42472]

To address the third question of Step 1, the Agency reviewed available waste characterization data to determine whether fly and bottom ash, slag, and FGD sludge exhibit any of the hazardous characteristics. In evaluating toxicity data, the Agency considered both Extraction Procedure (EP) and Toxicity Characteristic Leaching Procedure (TCLP) data, since much of the currently available data on toxicity predates the use of the TCLP.

Several commenters on the RTC claimed that the EP toxicity test is not a valid indication of hazards associated with utility wastes since the test was designed to mimic conditions in acidic municipal landfills rather than homogeneous monofills used by electric utilities. Those commenters concluded that data from the EP test significantly overstate potential risks.

As discussed further in Appendix A to this preamble, EPA has developed the methodology to take into account the eight study factors (Section 8002(n)) set forth in the Beville Exemption to determine whether hazardous waste regulation is warranted for FFC wastes. While waste characterization data, including both the results of EP toxicity testing and those of other leaching procedures (TCLP, ASTM, etc.), are considered in the decision, they are not the sole basis for determining whether to regulate fossil-fuel combustion wastes under RCRA Subtitle C. The methodology focuses on the risks posed by fossil-fuel combustion wastes as managed (and some ash is currently managed in Subtitle D landfills). EPA therefore believes that consideration of EP toxicity data, in conjunction with the results of other leaching studies and data on the actual environmental impacts of waste management practices, is appropriate.

EPA received limited additional data from commenters to the Notice. The few EP and TCLP results provided were consistent with other samples collected for the purposes of the RTC and the Notice. None of the additional data supplied during the comment period exceeded the hazardous waste criteria.

Step 2. Is more stringent regulation necessary or desirable?

If the Agency determined in Step 1 that the management of fly or bottom ash, slag, or FGD sludge from coal-fired utilities has caused or may potentially cause human health or environmental impacts, then the Agency would proceed to Step 2. In evaluating the need for more stringent controls to address the potential risks associated with the management of these wastes, EPA asked the following 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 the wastes?

3. Will Subtitle C effectively address problems associated with the waste without imposing significant unnecessary controls that are inconsistent with

the special status of the waste?

In Step 2, the Agency looked at waste management practices and existing regulations to examine the potential for release and exposure under current practices. If current management practices or existing regulatory controls were found to be adequate or if Subtitle C was found to be an ineffective or inappropriate regulatory alternative, then the Agency would determine that the waste should not be regulated under Subtitle C. If, on the other hand, current practices or existing regulatory controls were found to be inadequate in controlling potential and actual risks and if Subtitle C would be effective, the Agency would proceed to Step 3.

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

If, based upon the previous two steps, the Agency found that a waste presents significant risk despite current management practices and existing regulatory controls and that Subtitle C regulation would be effective and appropriate in reducing those risks without imposing unnecessary controls, the Agency would then evaluate the costs and impacts associated with regulating this waste under Subtitle C and, possibly, other regulatory scenarios. Costs and impacts would be evaluated in terms of the estimated affected population of generators, the ability of generators to pass on costs of compliance to customers or suppliers, the effect of regulation on domestic energy supply and capacity, and the effect of regulation on beneficial use of the affected waste.

With cases in which the Subtitle C scenarios would impose widespread and significant impacts on facilities, reduce domestic capacity or supply, and/or deter safe and beneficial use of the waste, EPA might conclude that regulation under Subtitle C is inappropriate. However, EPA might determine that regulation of the waste under Subtitle C is warranted if, in the Agency's judgement, the reduction in risk that would result from such regulation would justify the operational and economic consequences to the industry and the economy as a whole. The Agency invited commenters to the Notice to submit information regarding cost data.

IV. Regulatory Determination for Four Large-Volume Coal-Fired Utility Wastes

The following discussion presents EPA's conclusions regarding the regulatory status of large-volume coal-fired utility wastes under RCRA. The determination as to whether regulation of such wastes under Subtitle C is warranted is based upon the February 1988 Report to Congress, comments on the Report to Congress including comments received at the public hearing held in Denver on April 26, 1988, the information collected for the February 12, 1988, Notice, and comments received on the Notice.

Based on all of the available information, EPA has concluded that regulation of the four large-volume fossil-fuel combustion wastes as hazardous waste under RCRA Subtitle C is unwarranted. Below are the Agency's responses to each step of the decision methodology.

Step 1. Does the management of this waste pose human health/environmental problems? Might current practices cause problems in the future? The Agency has determined that the answer to this question is yes.

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Substep 1. Has the waste, as currently managed, caused documented human health impacts or environmental damage?

Response: The Agency has determined that the waste has caused documented impacts, but at a very limited number of sites.

In accordance with the methodology described above, EPA first addressed whether the management of this waste currently poses human health/environmental problems and whether current practices could cause problems in the future. In its examination of potential/actual cases in which danger to human health or the environment could be attributed to the management of fossil-fuel combustion wastes, the RTC included information from several studies that documented occasional exceedences of primary and secondary drinking water standards in groundwater underlying fossil-fuel waste management sites. To supplement the RTC data, EPA conducted State file reviews in States selected for their geographical representation and large coal-fired electricity generation capacity. Overall, both efforts indicate that the extent of actual damage cases/environmental harm associated with large volume FFC waste management appears limited. [*42473]

EPA used the "test of proof" developed to support the Report to Congress on Mineral Processing Wastes to evaluate the potential damage cases. As described in Chapter 2 of that report, the test of proof requires that a case satisfy at least one of three conditions: scientific investigation concluding that damages occurred, administrative ruling concluding that damages occurred, or court decision or out-of-court settlement concluding that damages occurred. For the six damage cases described below, scientific investigation was the measure of proof satisfied, since the data most supported application of this measure.

In applying the test, EPA first considered whether actual documentation exists that shows that human health or environmental harm occurred (e.g., contaminated groundwater in a water supply well, observed impacts on wildlife). Only a limited number of large-volume FFC waste management sites actually meet this criterion and can be considered proven damage cases. These cases include the two sites identified in the RTC, as well as four additional sites identified during recent data collection efforts. EPA notes that of these six cases, only one case can clearly be attributed to fly ash management alone. The remaining five cases are associated with the co-management of the large-volume wastes with other wastes. Because co-management of large and low-volume wastes is the predominant waste management practice, limited information exists on independently managed large-volume wastes.

The RTC described a site that involved a dike failure that caused an accidental release from a fly ash disposal lagoon to a river. This case resulted in substantial damage to river organisms. The other case described in the RTC involved co-management. In this case, a release occurred from a fly ash and petroleum coke waste disposal site that resulted in the contamination of drinking water wells with selenium and vanadium. This site is ranked on the CERCLA (Superfund) National Priority List Site.

EPA's more recent data collection efforts resulted in the identification of

four additional sites that are considered proven cases of damage (see the Supplemental Analysis of Potential Risks to Human Health and the Environment from Large-Volume Coal Combustion Waste, found in Docket no. F-93-FFCA-FFFFF). Each case involves co-management of wastes at older, unlined waste management units. These incidents involved groundwater contamination and/or vegetative

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damages due to releases from waste management units.

In summary, there is minimal documentation of impacts on drinking water sources in the vicinity of coal-fired utilities. In addition, it is important to note that the damage case sites were chosen for study because of known releases and cannot necessarily be extrapolated to the general universe. Also, most releases have been from unlined units at older sites that in many States are now subject to more stringent design and operating criteria. n7 Furthermore, actual cases of harm to human health or the environment may be limited to a few sites, often with other contributing factors, including additional pollutant sources attributed to the co-management with other FFC and non-FFC wastes. The review of such cases of co-management will be reserved for the "remaining waste" study.

n7 The percentage of units required to meet more stringent design and operating criteria will increase as older units reach capacity (assuming a typical lifetime fo 15 years) and new units come on-line (and are subject to these more stringent requirements).

The FFC waste damage case/environmental data collected to date indicate, therefore, that although the extent appears limited, damage to the environment has occurred. Although the releases are often confined to the vicinity of the units and have not reached environmental/human receptors, the potential for exposure necessitates further analysis in Substep 2, which examines the potential risks posed by these wastes.

Substep 2. Does EPA's analysis indicate that the waste could pose significant risk to human health or the environment at any sites that generate coal combustion wastes, under either current management practices or plausible mismanagement scenarios?

Responses: Groundwater contamination and surface water contamination through groundwater recharge are possible under some plausible conditions (unlined units). Available information on the environmental conditions of the sites indicates ecological and natural resource damages are of most concern, because potential for human exposure is limited.

The RTC contains considerable information on the four large-volume coal combustion wastes (fly ash, bottom ash, slag, and flue gas desulfurization (FGD) sludge). Information includes waste characteristics and management practices, environmental factors affecting human exposure potential at disposal sites, and evidence of ecological damage at coal combustion sites. In addition, EPA collected supplemental information from various EPA offices and other Federal agencies, State agencies, and the electric utility industry on waste characterization, management, and potential impacts. This supplemental information included groundwater monitoring data for 43 coal combustion waste sites collected from State regulatory agencies and from EPA site visit reports. All data used in this supplemental analysis are available for public inspection in the docket No. F-93-FFCA-FFFFF. A bibliography of the sources used in the risk analysis is found in Appendix A of the Supplemental Analysis of Potential Risks to Human Health and the Environment from Large-Volume Coal Combustion

Waste, also found in Docket no. F-93-FFCA-FFFFF.

The first step of the methodology was to evaluate constituents of concern (identified by waste characterization data) using a risk screen. A risk screen analysis is a process which applies a conservative and simplified methodology

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to the constituents and pathways to determine if they are of concern. The risk screen compared waste characterization data with screening-level criteria. The screening criteria were developed to identify wastes, constituents, and pathways requiring further analysis; that is, wastes captured by the screen may or may not be of concern. Criteria for 23 constituents (primarily metals) were developed for groundwater, surface water, ingestion, and inhalation exposure pathways using a methodology similar to that used in the mineral processing regulatory determination. (In the cases where the Agency regulatory levels had changed since the mineral processing RTC, the screening criteria were also updated.)

Groundwater exposure criteria were developed using the MCLs set by the Agency to protect drinking water. If no primary MCL had been established for a particular parameter, then a health-based level (HBL) was calculated using Agency cancer slope factors or non-cancer reference doses (RfDs) from IRIS. n8 In instances where the calculated HBL was less than corresponding MCL, both values were considered in the screening.

n8 U.S. Environmental Protection Agency. Integrated Risk Information System (IRIS). (IRIS, November 1992 update).

Screening criteria based on primary MCLs were derived by multiplying the MCL by a factor of 10 to simulate scenarios where only limited dilution of waste leachate occurs prior to exposure. HBLs were derived from IRIS n9 drinking [*42474] water or oral cancer slope factors (CSFs) representing a 1×10^{-6} lifetime cancer risk, or RfDs. Calculation of the HBLs relied on the following conservative assumptions: the maximally exposed 70 kg individual drinking 2 liters of water per day, 365 days per year, for a lifetime duration of 70 years. (The 70-year exposure duration was chosen to maintain comparability with the MCLs; this approach is consistent with that taken in the mineral processing regulatory determination.) These assumptions yield the following general equations:

$$\text{HBL}_{\text{sub CSF}} \text{ (mg/l)} = (1 \times 10^{-6}) (70 \text{ y}) (70 \text{ kg}) / \text{open brace (CSF (mg/kg/d) sup }^{-6} \text{) (2 l/d) (70 y) close brace}$$

$$\text{HB}_{\text{sub RfD}} \text{ (mg/l)} = (\text{RfD mg/kg/day}) (70 \text{ kg}) / (2 \text{ l/day})$$

As with the MCL-based criteria, the HBLs were multiplied by a factor of 10 to simulate a scenario where only limited dilution of waste leachate occurs prior to exposure. Groundwater exposure criteria were compared with waste EP Toxicity and TCLP analysis results for each of the four waste streams.

n9 Ibid.

The surface water exposure criteria were selected to represent potential harm to aquatic organisms exposed to surface water releases of wastes or waste leachate. The criteria were derived by multiplying the freshwater chronic Ambient Water Quality Criteria (AWQC) for non-human effects by a factor of 100 to simulate a scenario where only limited dilution occurs. Surface water

exposure criteria were compared with waste EP Toxicity and TCLP analysis results for the four waste streams.

The ingestion screening criteria were derived from IRIS oral RfDs and oral CSFs, assuming incidental ingestion of solid waste materials. Exposure

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assumptions are an ingestion rate of 200 mg/day from ages 1 to 6, and 100 mg/day from ages 7 to 31 (resulting in an average of 0.114 g soil/day), an adult receptor weight of 70 kg and an exposure of 350 days/year for 30 years. For CSF-derived values, a life-time averaging 70 years was assumed. These assumptions were then used to calculate the concentration of a constituent in a waste that would result in an exposure equivalent to the RfD or the concentration corresponding to a lifetime cancer risk of 1×10^{-6} . The equations for RfD- and CSF-based criteria are shown below.

$$\text{Criteria}_{\text{sub RfD}} (\text{mg/g}) = \frac{\text{RfD} (\text{mg/kg/d}) \text{ open brace } (70 \text{ kg}) (365 \text{ d/y}) (30 \text{ y}) \text{ close brace}}{\text{open brace } (350 \text{ d/y}) (30 \text{ y}) (0.114 \text{ g soil/d}) \text{ close brace}}$$

$$\text{Criteria}_{\text{sub CSF}} (\text{mg/g}) = \frac{\text{open brace } 10^{-6} \text{ sup - /CSF} (\text{mg/kg/d}) \text{ sup - close brace}}{\text{open brace } (70 \text{ kg}) (365 \text{ d/y}) (70 \text{ y}) \text{ close brace}} / \text{open brace } (350 \text{ d/y}) (30 \text{ y}) (0.114 \text{ g soil/d}) \text{ close brace}$$

No dilution factor was employed in deriving the criteria for solid samples. The exposure pathway assumes exposure to particulate whole waste material. Ingestion exposure criteria were compared with waste total constituent analysis results for the four waste streams.

The exposure assumptions used in deriving inhalation exposure criteria include: 50 $\mu\text{g}/\text{m}^3$ airborne dust concentration; 10 adult inhalation volume of 20 m^3/d ; 70 kg body weight; exposure frequency of 350 days per year; exposure duration of 30 years; and, for CSF-derived values, 70 year lifespan (or averaging time) and 1×10^{-6} risk of cancer. Note that 50 $\mu\text{g}/\text{m}^3$ $1 \times 20 \text{ m}^3/\text{d}$ results in a soil exposure rate of 1 mg/d. The equations used to derive the criteria from both inhalation RfDs and inhalation CSFs are shown below:

$$\text{Criteria}_{\text{sub RfD}} (\text{mg/g}) = \frac{\text{RfD} (\text{mg/kg/d}) \text{ open brace } (70 \text{ kg}) (365 \text{ d/y}) (30 \text{ y}) \text{ close brace}}{\text{open brace } (350 \text{ d/y}) (30 \text{ y}) (0.001 \text{ g soil/d}) \text{ close brace}}$$

$$\text{Criteria}_{\text{sub CSF}} (\text{mg/g}) = \frac{\text{open brace } 10^{-6} \text{ sup - /CSF} (\text{mg/kg/d}) \text{ sup - close brace}}{\text{open brace } (70 \text{ kg}) (365 \text{ d/y}) (70 \text{ y}) \text{ close brace}} / \text{open brace } (350 \text{ d/y}) (30 \text{ y}) (0.001 \text{ g soil/d}) \text{ close brace}$$

Again; no dilution factor was employed in deriving the criteria for solid samples. The exposure pathway assumes exposure to particulate whole waste material. Inhalation exposure criteria were compared with waste total constituent analysis results for the four waste streams.

10 50 $\mu\text{g}/\text{m}^3$ is the National Ambient Air Quality Standard for annual exposure to particulates.

The screening criteria described above were then compared to EP, TCLP, and total constituent data from the RTC and subsequent data collection efforts. For all waste constituents that exceeded a screening-level criterion at more than 10 percent of the sites sampled, or exceeded the criteria by more than a factor of 10, further analysis was conducted. A summary of screening criteria exceedences, reported by waste type and by exposure pathway, can be found in Appendix C of

the Supplemental Analysis of Potential Risks to Human Health and the Environment from Large-Volume Coal Combustion Waste.

The results of the risk screening suggest that of the large-volume wastes, fly ash and FGD sludge are of most concern. The risk screen also identified

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groundwater, surface water, and inhalation as exposure pathways needing further analysis. The constituents needing further analysis included arsenic, cadmium, chromium, lead, mercury, nickel, Ph, selenium, and silver.

The Agency then evaluated the release, transport, and exposure potential of those constituents, wastes, and pathways for which the risk screen indicated that further analysis was necessary. When available, monitoring data were used to determine the potential for human and environmental exposure. In other cases, information on the physical setting of coal combustion waste sites and on the waste management practices was used to evaluate exposure potential. In the case of the inhalation pathway, the potential for human health risk was evaluated using an atmospheric fate and transport model. For the inhalation pathway, the potential for human health risk, when evaluated using an atmospheric fate and transport model, was found to be negligible. For more information on the air pathway analysis, please consult the Supplemental Analysis of Potential Risks to Human Health and the Environment from Large-Volume Coal Combustion Waste. Further analyses of the groundwater and surface water pathway are summarized below.

Groundwater monitoring data were used in both the groundwater and surface water exposure pathway analyses. A summary table of the groundwater monitoring sites is in Appendix D of the Supplemental Analysis of Potential Risks to Human Health and the Environment from Large-Volume Coal Combustion Waste found in the docket. When interpreting the groundwater monitoring data, the Agency took several factors into account.

First, many of the sites may have co-managed their coal combustion wastes with other wastes, such as boiler cleaning solution or pyrites. The extent to which these other wastes may have contributed to groundwater contamination could not be conclusively determined, because it was difficult to assess in many cases whether co-management had occurred and without this information, it was not possible to separate the effects of the large-volume wastes from the other wastes. However, at least two site operators asserted that they believed that co-managed wastes, and not the large-volume wastes, were the cause of groundwater contamination. The Agency took the presence of co-managed wastes into account when evaluating the risk from the large-volume coal combustion wastes.

Second, some of the sites have other possible sources of contamination nearby. To the extent that they can be determined, these sources are noted in the summary table referenced above. Finally, in the case of some contaminants (e.g., iron), naturally occurring levels may be quite high. Again, to the extent that naturally occurring constituents can be [*42475] determined to be adding to downgradient concentrations, this is noted in the summary table.

With these considerations in mind, the Agency determined that available data from coal combustion waste landfills and surface impoundments demonstrated the existence of potential for human exposure to groundwater contamination, because coal combustion waste constituents identified in the risk screen as needing further study were found to be leaching onsite in excess of the primary MCLs.

Subsequent analyses of coal combustion waste sites suggest, however, that potential for actual human exposure is very limited.

For example, nine sites of the forty-nine sites with groundwater monitoring data had contaminants above the MCL that appeared to stem from coal combustion

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units. (Another ten sites had upgradient concentrations equal to downgradient concentrations, other possible sources of groundwater contamination, or (in two cases) a lack of upgradient information, preventing any conclusions about the effects of the coal combustion units on groundwater contamination.) Constituents with exceedences include arsenic, barium, cadmium, chromium, fluoride, lead, mercury, nickel, and selenium. Of the nine sites, none were completely lined, although one site had a clay-lined disposal unit with an under-drain emptying into a series of unlined ponds. All nine sites have older (pre-1975) units, four consisting of surface impoundments, four consisting of landfills, and one with both types of units. Fly ash was the principal waste disposed of in all units. Four sites of the nine also are known to have accepted co-managed wastes (pyrites, boiler cleaning wastes, demineralizer regenerant, oil ash, etc.), and the others may have as well.

Potential for human exposure to groundwater contaminants from coal combustion wastes is limited because of the location of most coal combustion sites. Based on a random study (found in the RTC) of one hundred sites, only 29 percent of the sites have any population within 1 kilometer, and only 34 percent of the sites have public drinking water systems within 5 kilometers. Although infiltration and transportation of contaminants in groundwater varies with site- or regional-specific factors (such as depth to groundwater, hydraulic conductivity, soil type, and net recharge), exposure to coal combustion waste groundwater contaminants 5 kilometers from the source of contamination is not expected to occur. Of the public drinking water systems within 5 kilometers of coal combustion waste sites, just under half (47 percent) are expected to treat the groundwater for hardness (i.e., these systems have groundwater with over 240 ppm CaCO₃), which would tend to remove co-contaminant metals as well.

Coal combustion units also tend to be near surface water bodies. The same RTC study revealed that 58 percent of the sites are within 500 meters of a surface water body. The volume and flow rate of surface water would tend to dilute and divert the contaminant plume.

In addition, groundwater contamination appears to be attributable to past management practices. As the Agency's groundwater monitoring data outlines above, all of the nine sites with a clear indication of groundwater contamination are older (pre-1975), unlined units. (In contrast, of the 13 lined sites, only one had exceedences of an MCL, and that site had equal concentrations upgradient and downgradient.)

Finally, some of the groundwater contamination may be attributable to co-management with other wastes, such as pyrites, boiler cleaning waste, and demineralizer regenerant. Because of the prevalence of co-management (several public comments on the RTC reported that the predominant industry practice is to co-dispose of low-volume wastes in ash or flue gas emission control waste ponds), the large-volume waste may not be the sole contributor to the groundwater contamination. Two of the nine sites report that co-management is the cause of the contamination.

In conclusion, hazardous constituents in coal combustion waste (particularly

in fly ash and flue gas emission control waste) have the potential to leach into groundwater under certain conditions. Contaminants of concern include arsenic, cadmium, chromium, lead, mercury, and selenium. Available data suggest, however, that contamination stems from older, unlined units representing past practices, and that the units are not typically located near populations and drinking

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water systems. In addition, the sites within 5 kilometers of public drinking water systems, about half have groundwater with over 240 ppm CaCosub 3 and are therefore expected to treat the water for hardness, thus removing co-contaminant metals as well. Furthermore, at least some of the groundwater contamination is attributable to other wastes managed with the large-volume coal combustion wastes. Thus, potential for human exposure solely from the large-volume coal combustion waste from current management practices is limited.

An examination of the surface water pathway reveals that, although direct discharge of untreated coal combustion waste to surface water is not likely because of Clean Water Act controls, a few of the coal combustion waste constituents have the potential in some instances, to affect nearby vegetation and aquatic organisms by migration through shallow groundwater to nearby surface waters. This was observed at one site where migration of boron to a nearby wetland was determined by the State to be the cause of vegetative damage. In many cases, natural attenuation processes are expected to dilute the contaminants below levels of concern. For example, if contaminants reach surface waters, the volume of surface water and its high flow rate could dilute the contaminants. For those sites whose nearby water bodies may have a low flow rate (e.g., lakes, swamps, or marshes), however, coal combustion waste may cause local environmental damages, as was observed at the above site.

Even when contaminated groundwater does not affect human health and the environment, it may be considered to have caused impacts that limit future use of that groundwater. In particular, available data suggest that the groundwater at a number of coal combustion waste sites is contaminated above secondary MCLs (SMCLs) by such secondary parameters as iron, manganese, sulfate, and total dissolved solids, although these effects may be localized through dilution and attenuation. The SMCLs are guidelines generally set to be protective of such aesthetic considerations as taste, odor, potential to stain laundry, and human cosmetic effects such as tooth and skin staining.

In addition to being disposed of in landfills and surface impoundments, coal combustion ash is often beneficially used both onsite and offsite. EPA continues to encourage the beneficial use of coal combustion wastes. Because most offsite applications tend to immobilize the coal combustion waste (e.g., fly ash used to make concrete), adverse impacts appear to be unlikely. However, if fly ash is applied directly to agricultural soil, there is some concern with metals uptake by food crops and cattle feed. In addition, boron in the coal ash is readily mobilized and has a phytotoxic effect on plants. Although coal ash is not frequently used in agriculture, any [*42476] agricultural use of coal combustion waste should be carefully evaluated. n11

n11 Characterization of Coal Creek Station Fly Ash for Utilization Potential, Energy and Environmental Research Center, February 1993 (see Docket No. F-93-FFCA-FFFFF).

Substep 3: Does the waste exhibit any of the characteristics of hazardous waste?

Response: The Agency has determined that these wastes exhibit the characteristics of hazardous waste infrequently, from 0 to 7 percent of the samples depending on waste type.

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The RTC concludes that although coal combustion waste may leach contaminants (arsenic, cadmium, chromium, lead, and mercury) above toxicity characteristic regulatory levels, such exceedences are infrequent and the average concentrations of constituents are below characteristically toxic levels. A full bibliography of the sources of EP and TCLP data and a summary of the results are given in Appendices A and B of the Supplemental Analysis of Potential Risks to Human Health and the Environment from Large-Volume Coal Combustion Waste.

The results of Step 1 of the analysis indicate that the wastes rarely exhibit any characteristics of hazardous waste and the waste pose very limited risk to human health or the environment under certain scenarios, such as unlined units sited over shallow groundwater with nearby drinking water wells. Furthermore, since most releases have occurred at unlined older sites, EPA recognized that a review of current waste management practices and regulatory control governing these practices was appropriate as outlined in Step 2 of the methodology, which assesses the need for more stringent regulation.

Step 2: Is more stringent regulation necessary or desirable? The Agency has determined that the answer is no. EPA regulation is not necessary or desirable.

In evaluating the need for more stringent controls to address the potential risks associated with the management of these wastes, EPA first evaluated the adequacy of current industry waste management practices in limiting contaminant release and associated risk. The Agency then viewed the adequacy of current State and Federal regulatory controls addressing these wastes. For the purposes of this analysis, EPA supplemented the data supplied in the RTC with site visits, a 1992 EPA study under which the Agency obtained and reviewed State regulations applicable to FFC waste management, the Department of Energy's 1991 report entitled Coal Combustion Waste Disposal: Update of State Regulations and Cost Data, dialogue with industry and State representatives, the Electric Power Research Institute's Facility Design and Installation Manual (1991), State file searches, and literature reviews.

Substep 1. Are current practices adequate to limit contaminant release and associated risk?

Response: The Agency has determined that industry practices are moving toward increased use of control measures (liners, covers, etc.) and groundwater monitoring.

The Agency's data on current practices indicate that industry is moving toward an increased use of control measures (e.g., liners, covers) and groundwater monitoring. For example, the RTC noted that before 1975, less than 20 percent of units (surface impoundments and landfills) in the United States for which data were available had installed some form of liner. More recent data (EEI's Power Statistics Database, 1989) suggest that 13 to 29 percent of surface impoundments for which data are available, have some form of liner and that 41 to 43 percent of landfills have some form of liner. As the damage case and groundwater monitoring information suggests, most of the releases have occurred at older, unlined units. EPA has observed during site visits that newer units

are generally lined. Furthermore, most newer utility waste management facilities have groundwater monitoring systems, and many also have leachate collection systems. Despite the positive trends in management of FFC wastes, some of these units may be sited with inadequate controls. Therefore, in addition to viewing industry management practices, EPA collected and evaluated information on the

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extent of current State and Federal regulation of coal-fired utility waste management.

Substep 2. Are current Federal and State regulatory controls adequate to address the management of the waste?

Response: Effluent limitations in the Clean Water Act regulations for steam electric power plants under 40 CFR part 423 require no discharge from new fly ash ponds. State programs are generally adequate and are improving, with most States now requiring permits and minimum design and operating criteria that would address likely risks. Additionally, Federal authorities exist to address site-specific problems posing threats to human health and the environment under RCRA Section 7003 and CERCLA Sections 104 and 106.

The RTC included information on coal-fired electric utility waste regulation in all 50 States. In updating this information, EPA conducted a review of States that were selected according to the high levels of ash generated in those States. This approach resulted in a study universe of 17 States that generate approximately 70 percent of all coal ash in the United States.

The data show that States have generally implemented more stringent regulations for FFC waste since 1983 (when the State regulation review was conducted for the RTC). Under developing State industrial solid waste management programs, coal-fired utilities are more frequently being required to meet waste testing standards, and waste management units often must comply with design and operating requirements (e.g., liners and groundwater monitoring standards).

Of the 17 States for which EPA updated the RTC data, 14 regulate coal-fired utility wastes as solid wastes, explicitly exempting them from hazardous waste regulation; 16 States require offsite FFC waste management units to have some type of operating permit, with design and operating criteria varying by State; 12 have mandatory liner requirements, while three States provide for discretionary authority to impose liner requirements on a site-specific basis; 12 impose mandatory groundwater monitoring requirements on FFC waste disposal sites; and 16 impose final cover requirements. In addition, some States have been working to reduce the threat of groundwater and surface water contamination, by discouraging the use of wet management in ponds as a disposal practice (through permitting requirements and location restrictions). On the Federal level, National Pollutant Discharge Elimination System permits under the Clean Water Act regulate all direct discharges to surface water. Effluent limitations under 40 CFR part 423 govern steam electric power generating point sources and require no (zero) discharge to surface waters from new source fly ash transport waters (40 CFR 423.15(g)).

Of the remaining three States, two States establish requirements based on waste characteristics and one exempts these wastes from their solid and hazardous waste management program.

Considering industry's trend toward more protective waste management practices, the fact that State regulatory programs are generally adequate, and

because Federal authorities exist that can address these wastes, EPA has concluded that current management practices and regulatory controls are adequate for managing the four large-volume FFC wastes. [*42477]

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Substep 3. Would Subtitle C effectively address the problems associated with the waste without imposing significant unnecessary controls?

Response: The Agency has determined that it is unlikely that Subtitle C would effectively address the problems associated with the four large-volume fossil-fuel combustion wastes without imposing unnecessary controls.

After reviewing industry practices and current State and Federal regulation, EPA reviewed the alternative scenario of regulating the four large-volume FFC wastes under Subtitle C. First, it was recognized that coal combustion wastes rarely exceed the RCRA characteristics for hazardous waste, and therefore, that most coal combustion wastes would not be subject to Subtitle C controls unless they were listed as hazardous wastes. Furthermore, it was noted that even if these wastes were listed as hazardous, and therefore, regulated under Subtitle C, such an approach would be inappropriate for these wastes. A Subtitle C system would require coal combustion units to obtain a Subtitle C permit (which would unnecessarily duplicate existing State requirements) and would establish a series of waste unit design and operating requirements for these wastes, which would generally be in excess of requirements to protect human health and the environment. For example, if such wastes were placed in the Subtitle C universe, all ash disposal units would be required to meet specific liner and monitoring requirements. Since FFC sites vary widely in terms of topographical, geological, climatological, and hydrological characteristics (e.g., depth to groundwater, annual rainfall, distance to drinking water sources, soil type) and the wastes' potential to leach into the groundwater and travel to exposure points is linked to such factors, it is more appropriate for individual States to have the flexibility necessary to tailor specific controls to the site or region specific risks posed by these wastes.

EPA also reviewed the comments received in response to the 1988 RTC and the Notice. Comments received on the RTC showed unanimous support for EPA's initial recommendation that large-volume combustion wastes do not warrant regulation under RCRA Subtitle C. Specifically, the commenters felt that current Subtitle D criteria, together with existing State regulations, have proved adequate to protect human health and the environment. Furthermore, of the respondents to the Notice who addressed the recommendation that large-volume combustion wastes do not warrant regulation under Subtitle C, all agreed that the supplemental data support this recommendation.

For these reasons, EPA concludes that Subtitle C is inappropriate to address the problems associated with these wastes and that the site or region specific State approach is appropriate for addressing the limited human health and environmental risks involved with the disposal of FFC wastes. The Agency encourages States to continue to develop and implement site-specific approaches to these wastes. EPA believes that industry and the States should continue to review the appropriate management of these wastes. EPA will also consider these wastes during the Agency's ongoing assessment of industrial non-hazardous wastes under RCRA Subtitle D. Should the characteristics of the waste streams change as a result of implementation of any provisions of the Clean Air Act as amended in 1990, the Agency may choose to reexamine the exemption.

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

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Although the analysis never reached this point, EPA's preliminary examination of potential costs under Subtitle C indicates that annual costs of full Subtitle C controls would range between \$ 100 and \$ 500 million per year. This assumes that these wastes would be listed as hazardous in RCRA part 261, subpart D. However, if these wastes were not listed, the wastes would often not be subject to Subtitle C, since they rarely test characteristically hazardous pursuant to part 261, subpart C. Subtitle C controls include groundwater monitoring, liners, leachate collection, closure/covers, dust control, financial assurance, location restrictions, and corrective action.

V. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) of 1980 (Pub.L. 96-354), requires Federal regulatory agencies to consider the impact of rulemaking on "small entities." If a rulemaking will have a significant impact on small entities, agencies must consider regulatory alternatives that minimize economic impact.

Today's decision does not affect any small entity. Rather, it continues to exempt the four large-volume wastes from coal-fired electric utilities from regulation as hazardous wastes. Accordingly, this action will not add any economic burdens to any affected entities, small or large. Therefore, a regulatory flexibility analysis is not required. Pursuant to Section 605(b) of the RFA, 5 U.S.C. 605(b), the Administrator certifies that this rule will not have a significant impact on small entities.

VI. Regulatory Determination Docket

Documents related to this regulatory determination are available for inspection at the docket.

The EPA RCRA docket is located at the following address: United States Environmental Protection Agency, EPA RCRA Docket, room M2427, 401 M Street SW., Washington, DC 20460.

The docket is open from 9 a.m. to 4 p.m., Monday through Friday, except for Federal holidays. The public must make an appointment to review docket materials. Call the docket clerk at (202) 260-9327 to make an appointment.

Dated: August 2, 1993.

Carol M. Browner,

Administrator.

Appendix A-Analysis of and Responses to Public Comments on the Report to Congress

The 1988 Report to Congress: Wastes from the Combustion of Coal by Electric Utility Power Plants concluded with three recommendations. Comments on the RTC were largely organized in response to those recommendations. The summarized

comments and EPA's response to those comments follow each recommendation, printed in bold below.

(1) EPA has concluded that coal combustion waste streams generally do not exhibit hazardous characteristics under current RCRA regulations. EPA does not

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intend to regulate under Subtitle C fly ash, bottom ash, boiler slag, and flue gas emission control wastes.

All respondents agreed with and supported the RTC's first recommendation that high-volume combustion wastes do not warrant regulation under Subtitle C. They concluded that current Subtitle D criteria, together with existing State regulations, have proved adequate to protect human health and the environment.

Several commenters claimed that the EP toxicity test is not a valid indication of the hazards associated with utility wastes since the test was designed to mimic conditions in acidic municipal landfills rather than homogeneous monofills used by electric utilities. They claim, therefore, that data from the EP test significantly overstate potential risks.

As noted in the RTC and by several commenters, the Bevill Exemption requires EPA to consider eight factors (Section 8002(n)) in determining [*42478] whether hazardous waste regulation is warranted for fossil-fuel combustion wastes. To that end, EPA has developed the methodology identified in the Notice that takes into account all of these factors. While waste characterization data, including the results of EP toxicity testing as well as other leaching procedures (TCLP, ASTM, and batch/column) are considered in the decision, they are not the sole basis for determining whether to regulate FFC wastes as hazardous. The methodology specifically focuses on the risks posed by FFC wastes as they are actually managed.

EPA acknowledges that EP toxicity test results may not always represent the leaching potential of hazardous constituents from FFC wastes. However, some ash is (or could be) managed in offsite Subtitle D landfills. Furthermore, EPA has found significant variability in the leaching characteristics of FFC wastes, depending on the fossil-fuel source and boiler operating conditions. Therefore, EPA believes that consideration of EP toxicity data, in conjunction with the results of other leaching studies and data on the actual environmental impacts of waste management practices, is appropriate. Finally, EPA's data show that EP toxicity test results for the four large-volume wastes are not inconsistent with leach tests conducted using ASTM, batch/column, and TCLP methods (see February, 1988 RTC).

(2) EPA is concerned that several other wastes from coal-fired utilities may exhibit the hazardous characteristics of corrosivity or EP toxicity and merit regulation under Subtitle C. EPA intends to consider whether these waste streams should be regulated under Subtitle C of RCRA based on further study and information obtained during the public comment period.

Nineteen of the twenty-two respondents commented on the RTC's second recommendation to study low-volume wastes further and consider regulating these wastes under RCRA Subtitle C. All 19 respondents disagreed with the recommendation to regulate any low-volume wastes under Subtitle C.

Several commenters claimed that insufficient data existed to support a Regulatory Determination for low-volume wastes. EPA concurs with these comments.

The Agency intends to study co-managed low-volume wastes further to obtain sufficient data to make a Regulatory Determination. Low-volume wastes managed independently are outside the scope of the Bevill Exemption.

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Many comments maintained that Subtitle C regulation is not warranted for low-volume wastes co-managed with large-volume coal combustion wastes. Some commenters claimed that the predominant industry practice is to co-dispose of low-volume wastes in ash or FGD sludge ponds (several commenters referenced the 1985 Radian study and the 1982 Envirosphere report). Such co-management was claimed to be practical, effective, and environmentally sound. The report acknowledges that this practice may reduce the potential hazard of low-volume wastes, by neutralization or dilution. Commenters emphasized that no adverse environmental impacts from the co-disposal of high-volume and low-volume wastes have been shown in studies by the electric utility industry and EPA and that none were cited in the RTC.

EPA acknowledges that the RTC contained very limited information on the extent and potential environmental impacts of co-management of low-volume wastes with ash, slag, and FGD wastes. In fact, although the Agency has information verifying that co-management does occur, there is limited information clarifying the amounts and types of co-management. Indeed, this was the reason EPA reached no tentative conclusions regarding these practices. Comprehensive studies were available for fewer than five of the hundreds of existing co-management sites. EPA's efforts to compile more recent data continue to show limited information on the effects of co-management. However, some information suggests that at several large-volume waste management sites where groundwater impacts have been detected (see data in the RCRA Docket), the operators have suggested that the cause of the contamination is co-management with low-volume wastes. Of specific concern are pyrites and chemical boiler cleaning wastes. Further, the Agency has observed that the general trend in the industry is to segregate certain low-volume wastes (i.e., pyrites, boiler cleaning wastes, and demineralizer regenerant) from ash, slag, and FGD sludge.

The Agency believes that additional data collection for the low-volume wastes co-managed with the large-volume wastes described in the report is required and is deferring a final Regulatory Determination for co-managed wastes, pending completion of further studies. Co-managed low-volume wastes remain exempt from hazardous waste regulation, however, until such a determination is made. As required under the Bevill Exemption, the Agency emphasizes that the decision on remaining wastes will be based on all Section 8002(n) study factors, not on waste characterization data alone.

As discussed in the scope section of this determination, the Agency does not consider process waters (e.g., non-contact cooling water and low-pressure service water) used in ash handling or FGD systems to be wastes. Also, the continuous use of these process waters as feedwater for emission control systems or for ash transport generally will not increase the environmental risks associated with the wastes relative to the risks derived from utilization of fresh water for the same purposes. Discouraging such practices may lead to an increased usage of fresh water for the same purposes, thereby increasing the total volume of water exposed to the large-volume wastes as well as the total volume of waste generated. The Agency believes that this would be an undesirable outcome of today's action. For these reasons, the Agency does not consider the practice of using these non-contact process waters in ash sluicing systems or as

makeup water for FGD systems to constitute co-management.

One commenter thought that the limitations applied to discharges of pollutants from ash disposal facilities under the National Pollutant Discharge Elimination System adequately protect the environment and that additional

regulations would be redundant.

The Agency does not concur with the commenter that meeting NPDES permit limits at surface water discharge points alone is necessarily adequate to ensure groundwater protection. For example, FFC waste management units may not have surface water discharges, and, therefore, might not be required to have NPDES permits. Even if NPDES-permitted, these units may generate leachate that could affect underlying groundwater. Although some States may use Federal NPDES permit requirements to protect groundwater resources, the Clean Water Act and the NPDES program generally focus on protecting surface water quality.

One commenter referred to a 1976 study conducted by an electric utility company in which both bench (laboratory) and field tests were conducted. The purpose of the study was to demonstrate to EPA, for purposes of meeting the effluent limitations of a NPDES permit, that co-disposal of two boiler cleaning wastes with ash in ash ponds provided treatment equivalent to that available from a dedicated waste treatment facility. The bench tests showed 99 percent treatment for metals. The commenter maintained that the [*42479] low-volume wastes were effectively treated without any increase in risk from the high-volume wastes (and the waste management unit) into which they were added.

EPA acknowledges that the referenced study does demonstrate that a level of Ph adjustment can be achieved over a period of time so that NPDES permit limits can be met. However, the study does not address protection of the groundwater underlying the impoundment. Further, the study provides data for only two types of boiler cleaning solution mixed with ash from a single plant. Because of the variability in types of boiler cleaning solutions and ash characteristics and the relative paucity of data on low-volume wastes and co-management in general (and the consequent uncertainty related to the environmental impacts of co-management), the Agency believes that further study is required.

Several commenters claimed that EPA appeared to have selectively included data from EP test results for boiler cleaning wastes and other low-volume waste streams in the RTC (Exhibits 5-5 and 5-6). Exhibit 5-5 (taken from the 1985 Radian study) presents test results for two treated and three untreated boiler cleaning waste streams. The commenters noted that the Radian study sets forth data for four untreated and four treated waste streams. None of the results for the streams omitted in the report exceeds the EP toxicity limits. To the extent that only the untreated waste streams for which an exceedence was shown are included in the report, the commenters maintained that observations on those results are overstated.

In addition, the commenters felt that the report was similarly selective in reporting "EP Toxicity Test Results for Liquid Low-Volume Wastes" (taken from the 1987 Radian study) shown in Exhibit 5-6. Where the original data included 17 boiler cleaning wastes and 7 waterside rinse tests, the report included only 10 boiler cleaning wastes and 3 waterside wastes in Exhibit 5-6. Additionally, by omitting the "less than" sign next to many of the values, there was concern that the report gives a false impression that a reading is a positive value, when actually the value was below the detection limit. It was also pointed out that

this omission factors into the calculation of the geometric mean for the samples.

EPA acknowledges the comments. The intent was not to overstate or overemphasize the frequency or magnitude of observed concentrations of

constituents in leachate. Rather, EPA was attempting simply to present data that illustrated the concentrations that could be observed. In its Regulatory Determination on the wastes, EPA considered all data (including non-detects), rather than only selected observations.

One commenter noted that the boiler cleaning wastewaters from the initial acid wash stage and subsequent rinses should not be considered separately because they are typically combined and managed together as a single waste stream. The commenter noted that the report shows these fluids as separate waste streams and includes data for each stream in Exhibit 5-6. If the data were collected on these fluids as a unified stream, the commenter claimed that the resulting boiler cleaning waste would likely not, exceed any of the current limits for EP toxicity.

The commenter went on to say that even if certain boiler cleaning wastes may, in certain circumstances, test hazardous as generated, this fact should not trigger Subtitle C regulation. The commenter emphasized that co-disposed boiler cleaning waste does not present a hazard and that this critical fact is acknowledged in the RTC.

The Agency has found that some utilities do manage the wastes generated during different stages of the waterside boiler tube cleaning operations separately, at least for some period of time. Therefore, the Agency believes that it is appropriate to consider waste characterization data for the distinct streams (as well as for combined streams). As noted previously, the Agency does not believe that the RTC and other currently available information provide sufficient data to complete a Regulatory Determination for boiler chemical cleaning wastes co-managed with large-volume wastes at this time.

One commenter cited data on 17 untreated waterside boiler cleaning wastes (which include ethylene-diamine-triacetic acid (EDTA), hydroxyacetic-formic acid, and ammoniated bromate and hydrochloric acid). Only one sample (or 5.8 per cent) showed an exceedence of the EP limits, for total lead with a concentration of 6.67 mg/l. The average lead concentration for all 17 samples was 1.43 mg/l with a median value of 0.5 mg/l. None of the 17 waterside boiler cleaning waste samples was corrosive.

Another commenter cited company data for 69 samples of waterside boiler cleaning wastes (which include EDTA, hydroxyacetic-formic acid, and citric acid). Among these samples, only 15 (or 22 percent) showed exceedences of the EP limits. Thirteen of these exceedences were for total chromium and two were for total lead. The average total chromium concentration for all 69 samples was 3.41 mg/l with a median value of 2.08 mg/l. The average total lead concentration was 1.23 mg/l with a median value of 0.56 mg/l. The commenter emphasized that these values were all considerably less than those cited in the RTC.

In addition, the company tested several of the same waterside boiler cleaning wastes for hexavalent chromium under the EP toxicity test procedure. Of the 16 samples so tested, only 1 showed a concentration of hexavalent chromium above the detection limit of 0.02 mg/l. Two of the 16 tested samples, exceeded 5.0

mg/l for total chromium concentrations. All 17 of the other samples showed concentrations of hexavalent chromium below the detection limit.

EPA acknowledges these comments and would welcome the opportunity to review any additional data. The averages for lead and chromium cited by the

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commenters are indeed lower than those cited in the RTC. However, because some boiler cleaning chemicals appear to exhibit hazardous waste characteristics and the data on the impacts of their management with large-volume wastes are limited, the Agency believes further study is necessary before a final regulatory determination is made.

Several commenters claimed that the costs of managing low-volume wastes under Subtitle C would be very high. Some commenters felt that such management would necessitate transporting these wastes offsite, thereby posing risks of environmental releases without significant environmental benefit. Other commenters observed that continuing to manage these wastes onsite would require that the disposal facilities become treatment, storage, or disposal facilities.

As noted previously, EPA is deferring a final determination on low-volume wastes co-managed with the four large-volume wastes, pending additional data collection. As necessary and in accordance with the Section 8002(n) study factors, EPA will consider the potential cost impacts in making a determination for these wastes. Low-volume wastes managed independently are not and never have been within the scope of the Bevill Exemption.

The Agency also recognizes that transporting hazardous wastes may pose risks of environmental releases. However, regulations have been developed to ensure that hazardous wastes are transported in a manner [*42480] sufficient to protect human health and the environment (see 40 CFR @ 263).

Many commenters stated that when low-volume wastes are co-managed with high-volume wastes, the Bevill Amendment forbids EPA from regulating them until the Agency addresses each of the Section 8002(n) factors in its study and bases its determination on all of those factors. These commenters maintained that EPA may not rely solely on the outcome of a waste characteristic test as the basis of its Regulatory Determination regarding these wastes and this management process. They went on to say that the record assembled in the Report to Congress presents no evidence of environmental risk associated either with this co-management practice or with the co-disposed wastes and contains no information or findings as to many of the remaining Section 8002(n) factors.

For the reasons cited above, the data are insufficient to assess fully the potential risks associated with present co-disposal practices. As discussed, EPA does not intend to rely solely on waste characterization data as the basis of its Regulatory Determination for remaining wastes. The Agency acknowledges that many of the 8002(n) study factors have not been considered for low-volume wastes co-managed with high-volume wastes. EPA plans to address these study factors before we make a final regulatory determination on these wastes.

(3) EPA encourages the utilization of coal combustion wastes as one method for reducing the amount of these wastes that need to be disposed to the extent that such utilization can be done in an environmentally safe manner.

While all respondents agreed with the RTC's third recommendation encouraging coal combustion waste utilization, several qualifying comments were received.

One commenter noted that, while the RTC is correct in requiring that utilization to be done in an environmentally safe manner, Congress needs to be equally concerned that waste utilization is done in a structurally safe manner. This commenter claimed that the RTC's assertion, "all types of coal ash are

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appropriate for use as construction materials, as cement additives, and for several other uses," is entirely erroneous. The commenter stated that the RTC contradicts this statement further on by delineating some of the reasons why some fly ashes are not appropriate for use in construction. All materials used in engineering construction work are required to comply with appropriate ASTM standards. Regarding utilization in concrete, the commenter felt that the RTC must cite the appropriate ASTM Standard C618.

EPA acknowledges and agrees with the comment. However, it is not within EPA's authority to mandate structural requirements, except where they may affect the potential for environmental impacts.

In a recommendation on utilization, one commenter pointed out that the RTC encourages this practice "to the extent that it can be done in an environmentally safe manner." The commenter cited the report's statement that "current waste utilization practices appear to be done in an environmentally safe manner." The commenter claims that there is no delineation between practices that are environmentally safe and ones that are not environmentally safe.

To date, and using the limited data available, the Agency has not found any environmental damages associated with the utilization of large-volume coal-fired utility wastes. However, the Agency agrees with the commenter that utilization of coal combustion wastes should be done in a manner fully protective of the environment and consistent with existing Federal and State regulations.

Several commenters disagreed with the RTC where it stated that the potential for significantly increasing the amount of waste utilization may be limited. Given current utilization techniques, the report predicts that the major portion of coal combustion wastes will continue to be land disposed. Some commenters felt that reluctance toward waste utilization is largely due to the stigma of classifying the by-products as "waste" and that EPA should remove "beneficially used coal ash" from the definition of "solid waste".

Some commenters also noted that in enacting RCRA, Congress intended that EPA take a more active role in resource conservation and recovery. They thought EPA should give stronger support for additional use and market development with the emphasis placed on large-volume utilization. It was noted that some States have exempted ash for reuse from their solid waste programs and recommended that the Agency support State efforts to authorize the use of coal combustion by-products.

These commenters claimed that considerable attention was directed to limited cases of adverse impact in the RTC. They maintained that EPA should acknowledge in its Regulatory Determination that a selective ash characterization program coupled with good engineering practice would ensure environmental acceptability of large-volume ash applications. The Agency should take a leadership role by issuing procurement guidelines related to the use of coal ash in high-volume applications within the transportation and construction industries. Such high-volume applications would include the use of coal ash as structural fills,

road embankments, and backfills.

The Agency notes that Congress specifically mandates in RCRA Section 8002(n) that the Agency consider the cases of adverse impact. The Agency encourages utilization of coal combustion byproducts and supports State efforts to

promote utilization in an environmentally beneficial manner. EPA notes that the Agency has issued a procurement guideline to encourage the use of fly ash in cement and concrete in Federal projects (see 48 FR 4230, January 28, 1984). The Agency prefers to allow States the flexibility to develop their own approaches to fostering utilization. The individual states are in the best position to determine what types of utilization are appropriate for their environmental settings.

Appendix B-Analysis of and Responses to Public Comments on the Notice of Data Availability

On February 12, 1993, the Agency issued a Notice of Data Availability (Notice) requesting comment on additional data on fossil-fuel combustion (FFC) wastes. These data are intended to update and supplement the materials presented in the 1988 Report to Congress on Wastes from the Combustion of Coal by Electric Utility Power Plants (RTC). In addition, the Notice solicited comment on the proposed methodology to be used in completing the August 1993 regulatory determination.

Comments were received from 14 parties. Several commenters also submitted additional published materials on FFC waste characteristics and management/treatment techniques. The Agency considered these materials in completing the regulatory determination, as appropriate.

The following discussion briefly summarizes the comments received on the additional data and the proposed methodology. The Agency's responses are also provided. The comments and responses have been grouped according to general topic areas.

Methodology: Several commenters supported the use of EPA's proposed three-step methodology for completing the FFC waste regulatory determination. No commenters disagreed with any aspect of the methodology. [*42481]

Fly Ash, Bottom Ash, Boiler Slag, and FGD Waste: Nearly all respondents indicated that the Notice documents supported the 1988 RTC's recommendation that large-volume combustion wastes do not warrant regulation under Subtitle C. No commenters disagreed with this recommendation.

The Agency concurs with the commenters that the information contained in the docket does not contradict the data presented in the RTC. The Notice documents update and supplement the RTC by providing additional data on waste characteristics, environmental monitoring, and environmental impacts.

Several commenters noted that State regulation of FFC waste management has become more stringent since the 1988 RTC. More stringent solid waste regulations, including waste testing requirements and design- and performance-based standards, were specifically cited.

The Department of Energy and the EPA have recently completed separate studies of the current level of State regulation of FFC wastes. Proceeding from the

findings of these studies, the Agency concurs with the commenters that State requirements have generally become more stringent since 1983 (when the data cited in the 1988 RTC were collected). EPA supplemented the 1983 data for all 50 States with an updated analysis of 17 States representing all geographic regions of the United States and generating approximately 70 percent of the Nation's

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coal ash. As noted in the preamble to the regulatory determination, this study showed that States are imposing additional controls to ensure the proper management of these wastes.

One commenter felt that there is the potential for groundwater degradation from these coal combustion residues as a result of their leaching potential, although regulation of these wastes under Subtitle C is not appropriate. The inherent high permeability of materials landfilled without the benefit of stabilization or liners could allow a large volume of percolation to occur, resulting in potential groundwater contamination. The commenter urged the Agency to eliminate questionable coal combustion waste impoundments and suggested that regulations similar to 40 CFR part 258 (requirements for municipal solid waste landfills) would be appropriate for FFC waste management units.

While the Agency believes that design and operating requirements similar to part 258 may be appropriate for some FFC waste management units, the risks posed by FFC waste management are site-specific. Although groundwater contamination has occurred at certain coal combustion waste sites, contamination has been due to a limited number of constituents, which are likely to attenuate and dilute to safe levels before reaching an exposure point. This is in contrast to municipal solid waste landfills that are subject to 40 CFR part 258. The leachate at these sites often contains elevated levels of a wide range of toxic pollutants, and numerous damages have been observed. Therefore, the Agency believes that the level of protection provided by the part 258 criteria may not need to be universally applied to all FFC waste management units. It is therefore appropriate to allow the States to retain the flexibility to tailor requirements to site-specific or regional factors rather than establish broad Federal minimum requirements. It should be noted that many States have adopted regulatory requirements for FFC waste management units comparable to the part 258 criteria. EPA will consider these wastes as part of the Agency's ongoing assessment of industrial non-hazardous wastes under RCRA Subtitle D.

Low-Volume Wastes and Co-Management: Five of the fourteen respondents supported permanently retaining the exemption for low-volume coal-fired utility wastes co-managed with large-volume wastes. These commenters indicated that the 1988 RTC and Notice data show that co-management is an environmentally sound management practice. One commenter specifically cited two Electric Power Research Institute (EPRI) studies completed since 1988 as demonstrating that co-managed wastes should be excluded.

EPA's efforts to compile more recent data continue to show limited information on the effects of co-management. However, some information included in the Notice docket suggests that at several large-volume waste management sites where groundwater impacts have been detected, the operators have suggested that the cause of the contamination is co-management with low-volume wastes. Of specific concern to the Agency is co-management of ash, slag, and FGD waste with pyrites and/or chemical boiler cleaning wastes.

The Agency does not believe that the two recent co-management studies cited by the commenter are conclusive or sufficiently representative of the entire

universe of co-management sites. For example, at one site, EPRI findings indicate that a release is occurring because of pyrite co-disposal. The release is localized by site-specific conditions (i.e., alkaline soils) that may not be found at every facility. Similarly, a release is also occurring at the second site. While migration of constituents with primary drinking water standards is

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limited, boron and sulfate have been detected in downgradient wells.

Low-volume wastes co-managed with large-volume wastes remain exempt pending additional study. Separately managed low-volume wastes are outside the scope of the exemption, as noted by one commenter representing a large part of the industry. The same commenter in responding to the RTC cited RCRA Section 3001(b)(3)(i) and a January 13, 1981, letter from G. Dietrich, U.S. EPA, to P. Emler, Utility Solid Waste Activities Group, as indicating that the Bevill Exemption applies only to low-volume wastes when they are co-managed with the four large-volume. n13

n13 Comments dated May 16, 1988, received from USWAG on the RTC and comments dated March 29, 1993, received from USWAG on the Notice (see Docket numbers F-88-PATA-FFFFF and F-93-FFCA-FFFFF).

However, the Agency cautions that the limited data available to date indicate that co-management of some large-volume wastes with pyrites and chemical boiler cleaning wastes can cause adverse environmental impacts. Pending the study of low-volume wastes co-managed with large-volume wastes, the Agency will continue to rely on its authorities pursuant to RCRA Section 7003 as well as its Superfund authorities under CERCLA Sections 104 and 106, to address any human health and environmental threats associated with the co-management of these wastes.

Several commenters emphasized that low-volume wastes are typically co-managed with ash, slag, and FGD wastes.

The Agency has observed that the general trend in the industry is to segregate certain low-volume wastes (e.g., boiler chemical cleaning wastes) from ash, slag, and FGD wastes. At some plants, low-volume wastes, such as pyrites and chemical boiler cleaning wastes, are now being disposed of separately. As indicated above, the Agency believes that additional study is required to evaluate the risks posed by co-management of the low-volume wastes with the large-volume wastes.

Reutilization: One commenter noted that in enacting RCRA, Congress intended that EPA take an active role in resource conservation and recovery. The commenter indicated that some States have developed overly stringent regulatory requirements that have [*42482] discouraged reuse of FFC wastes. Several commenters recommended that, in the Regulatory Determination, EPA should recognize coal combustion byproducts as beneficial resources rather than as waste materials.

Because, according to the RTC, the majority of coal combustion byproducts are currently managed as wastes rather than re-used (because, in part, of market conditions as well as regulatory status), the Agency believes it is appropriate to consider them waste materials. However, the Agency continues to encourage reutilization of coal combustion byproducts and supports State efforts to promote reutilization in an environmentally beneficial manner. In terms of exempting coal combustion wastes from the definition of solid waste, because

this determination is confined to the issue of whether to regulate those wastes as hazardous, this request is outside the scope of today's action. The Agency, however, is currently engaging in an effort to revise the definition of solid waste. In April 1993, EPA's Definition of Solid Waste Task Force held a public meeting in Washington, DC. The task force plans to hold a series of monthly

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open meetings from July through November 1993, which will provide a forum for the public to provide input on the definition of solid waste.

Comments Related to Specific Documents:

Two commenters suggested that three documents in the docket addressing the Gavin Power Plant were added in error and should not be considered in the regulatory determination because they deal with the investigation of groundwater constituents (volatile organic compounds (VOCs)) that are unrelated to the management of coal combustion byproducts.

The Agency recognizes that the source of the VOC contamination at the Gavin site is unlikely to have been coal combustion wastes. These documents were included in the docket only to provide a complete understanding of groundwater conditions, including background levels, at the site.

Site Visit Reports: One commenter provided comments on EPA's site visit report for the Cayuga Power Station, PSI Energy, Incorporated. The commenter's specific remarks and the Agency's responses are summarized below:

One commenter noted that the Cayuga site visit report incorrectly assumes that all data in Table 5 are from downgradient wells. The commenter suggests that the maximum arsenic and vanadium values above background were actually detected in an ash well (PZ-14), rather than with a soil core system. Because of this, the commenter concludes that no adverse impact on groundwater has occurred.

In response, CPZ-14 is specifically identified in EPRI's Report on the Cayuga site (see Comanagement of Coal Combustion By-product and Low-Volume Wastes: Midwestern Sites, EPRI Report EN-7545) as a downgradient well, and arsenic and vanadium were found above background levels in the sediments immediately underlying the ash pond. The Agency acknowledges that any release of these constituents is limited because they were not found in other wells. It should further be noted that other constituents, including sulfate and boron, have consistently been found above background levels in several downgradient wells.

One commenter stated that the Cayuga site visit report overemphasizes the lack of background groundwater monitoring data, because the actual downgradient groundwater data show no adverse impacts.

The report only indicates which parameters appear to be above background levels and notes that the limited background data make any data analysis difficult. The site visit report does not comment on whether the data show any adverse impacts associated with the ash management unit.

One commenter noted that total constituent and hydroxylamine extraction coal ash data presented in the EPRI study and the Cayuga site visit report should not be used to consider the actual leaching potential.

These data were included in the site visit report because they were the only

waste characterization data available for the Cayuga site (no other leaching studies were performed). The Agency recognizes that the hydroxylamine extraction test provides a "worst case" estimate of the potential for constituent mobilization and would likely overestimate actual leachability. The Agency emphasizes that the proposed three-step methodology not only considers waste

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characterization information, but also the actual risks posed by a waste in its "as managed" state.

One commenter noted that the new groundwater monitoring data included in the Notice docket show few exceedences of primary drinking water standards. Most exceedences of primary drinking water standards occurred at older sites that are atypical of current sites. Exceedences of Secondary Drinking Water Standards occur more frequently, but the percentage of sites involved is still low. The commenter noted that exceedences of SDWSs are not violations of a Federal standard requiring enforcement or of most State standards, since SDWSs are guidelines. Further, exceedences would likely not occur if the relevant point of compliance were set further from the site (e.g., 150 meters downgradient as in the municipal solid waste landfill rules). Finally, the commenter indicated that many elevated constituent levels could be attributable to natural or other non-coal ash related sources (data were cited from several sites). Another commenter suggested that the data show that the potential exists for groundwater degradation through migration of constituents with SDWSs (e.g., iron, sulfates, chlorides, and other soluble salts).

The Agency disagrees that the new docket materials show a low percentage of exceedences of both PDWSs and SDWSs. Of the 49 individual sites with groundwater monitoring information (summarized in Appendix D of the Supplemental Analysis of Potential Risks to Human Health and the Environment from Large-Volume Coal Combustion Waste, found in the docket), 19 had at least one exceedence of a PDWS, and 42 had at least one exceedence of a SDWS.

The Agency concurs that some of these exceedences of PDWSs could be due to contamination from other sources and that dilution and attenuation would tend to reduce contaminant concentration below levels of concern at receptors. While the Agency recognizes that SDWS exceedences are not always considered violations, elevated levels of secondary parameters can cause adverse impacts. Therefore, the Agency has considered the mobility of these parameters in determining the risks posed by FFC waste management. Acknowledging the results of this analysis, the Agency concurs that many newer units have been designed to prevent releases (i.e., with liners), releases are frequently localized by site-specific conditions such that contaminants do not reach receptors, and exceedences are sometimes caused by natural or non-coal ash related sources (often for chlorides, iron, and manganese). Finally, although much of the data is from older sites, many of these sites are currently active; therefore, they cannot be regarded as categorically atypical.

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