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Part II

Environmental Protection Agency

40 CFR Parts 257, 261, 264 et al.
Hazardous and Solid Waste Management System; Identification and Listing of Special Wastes; Disposal of Coal Combustion Residuals From Electric Utilities; Proposed Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 257, 261, 264, 265, 268, 271 and 302

[EPA–HQ–RCRA–2009–0640; FRL–9149–4]

RIN–2050–AE81

Hazardous and Solid Waste Management System; Identification and Listing of Special Wastes; Disposal of Coal Combustion Residuals From Electric Utilities

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: The Environmental Protection Agency (EPA or Agency) is proposing to regulate for the first time, coal combustion residuals (CCRs) under the Resource Conservation and Recovery Act (RCRA) to address the risks from the disposal of CCRs generated from the combustion of coal at electric utilities and independent power producers. However, the Agency is considering two options in this proposal and, thus, is proposing two alternative regulations. Under the first proposal, EPA would reverse its August 1993 and May 2000 Bevill Regulatory Determinations regarding coal combustion residuals (CCRs) and list these residuals as special wastes subject to regulation under subtitle C of RCRA, when they are destined for disposal in landfills or surface impoundments. Under the second proposal, EPA would leave the Bevill determination in place and regulate disposal of such materials under subtitle D of RCRA by issuing national minimum criteria. Under both alternatives EPA is proposing to establish dam safety requirements to address the structural integrity of surface impoundments to prevent catastrophic releases.

EPA is not proposing to change the May 2000 Regulatory Determination for beneficially used CCRs, which are currently exempt from the hazardous waste regulations under Section 3001(b)(3)(A) of RCRA. However, EPA is clarifying this determination and seeking comment on potential refinements for certain beneficial uses. EPA is also not proposing to address the placement of CCRs in mines, or non-minefill uses of CCRs at coal mine sites in this action.

DATES: Comments must be received on or before September 20, 2010. EPA will provide an opportunity for a public hearing on the rule upon request. Requests for a public meeting should be submitted to EPA's Office of Resource Conservation and Recovery by July 21, 2010. *See* the **FOR FURTHER INFORMATION CONTACT** section for contact information. Should EPA receive requests for public meetings within this timeframe, EPA will publish a document in the **Federal Register** providing the details of such meetings.

ADDRESSES: Submit your comments, identified by Docket ID No. EPA–HQ–RCRA–2009–0640, by one of the following methods:

- *http://www.regulations.gov:* Follow the on-line instructions for submitting comments.
- *E-mail:* Comments may be sent by electronic mail (e-mail) to *rcra-docket@epa.gov,* Attention Docket ID No. EPA–HQ–RCRA–2009–0640. In contrast to EPA's electronic public docket, EPA's e-mail system is not an "anonymous access" system. If you send an e-mail comment directly to the Docket without going through EPA's electronic public docket, EPA's e-mail system automatically captures your e-mail address. E-mail addresses that are automatically captured by EPA's e-mail system are included as part of the comment that is placed in the official public docket, and made available in EPA's electronic public docket.
- *Fax:* Comments may be faxed to 202–566–0272; Attention Docket ID No. EPA–HQ–RCRA–2009–0640.
- *Mail:* Send your comments to the Hazardous Waste Management System; Identification and Listing of Special Wastes; Disposal of Coal Combustion Residuals From Electric Utilities Docket, Attention Docket ID No., EPA–HQ–RCRA–2009–0640, Environmental Protection Agency, *Mailcode:* 5305T, 1200 Pennsylvania Ave., NW., Washington, DC 20460. Please include a total of two copies.
- *Hand Delivery:* Deliver two copies of your comments to the Hazardous Waste Management System; Identification and Listing of Special Wastes; Disposal of Coal Combustion Residuals From Electric Utilities Docket, Attention Docket ID No., EPA–HQ–RCRA–2009–0640, EPA/DC, EPA West, Room 3334, 1301 Constitution Ave., NW., Washington, DC 20460. Such deliveries are only accepted during the Docket's normal hours of operation, and special arrangements should be made for deliveries of boxed information.

Instructions: Direct your comments to Docket ID No. EPA–HQ–RCRA–2009–0640. EPA's policy is that all comments received will be included in the public docket without change and may be made available online at *http://www.regulations.gov,* including any personal information provided, unless the comment includes information claimed to be Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Do not submit information that you consider to be CBI or otherwise protected through *http://www.regulations.gov* or e-mail. The *http://www.regulations.gov* Web site is an "anonymous access" system, which means EPA will not know your identity or contact information unless you provide it in the body of your comment. If you send an e-mail comment directly to EPA without going through *http://www.regulations.gov,* your e-mail address will be automatically captured and included as part of the comment that is placed in the public docket and made available on the Internet. If you submit an electronic comment, EPA recommends that you include your name and other contact information in the body of your comment and with any disk or CD–ROM you submit. If EPA cannot read your comment due to technical difficulties and cannot contact you for clarification, EPA may not be able to consider your comment. Electronic files should avoid the use of special characters, any form of encryption, and be free of any defects or viruses. For additional information about EPA's public docket, visit the EPA Docket Center homepage at *http://www.epa.gov/epahome/dockets.htm.* For additional instructions on submitting comments, go to the **SUPPLEMENTARY INFORMATION** section of this document.

Docket: All documents in the docket are listed in the *http://www.regulations.gov* index. Although listed in the index, some information is not publicly available, *e.g.,* CBI or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, will be publicly available only in hard copy. Publicly available docket materials are available either electronically in *http://www.regulations.gov* or in hard copy at the Hazardous Waste Management System; Identification and Listing of Special Wastes; Disposal of Coal Combustion Residuals From Electric Utilities Docket, EPA/DC, EPA West, Room 3334, 1301 Constitution Ave., NW., Washington, DC 20460. This Docket Facility is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The Docket telephone number is (202) 566–0270. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The

telephone number for the Public Reading Room is (202) 566–1744.

FOR FURTHER INFORMATION CONTACT: Alexander Livnat, Office of Resource Conservation and Recovery, Environmental Protection Agency, 5304P; *telephone number:* (703) 308–7251; *fax number:* (703) 605–0595; *e-mail address: livnat.alexander@epa.gov,* or Steve Souders, Office of Resource Conservation and Recovery, Environmental Protection Agency, 5304P; *telephone number:* (703) 308–8431; *fax number:* (703) 605–0595; *e-mail address: souders.steve@epa.gov.* For technical information on the CERCLA aspects of this rule, contact Lynn Beasley, Office of Emergency Management, Regulation and Policy Development Division (5104A), U.S. Environmental Protection Agency, 1200 Pennsylvania Avenue, NW., Washington, DC 20460, [*E-mail address and telephone number: Beasley.lynn@epa.gov* (202–564–1965).]

For more information on this rulemaking please visit *http://www.epa.gov/epawaste/nonhaz/industrial/special/fossil/index.htm.*

SUPPLEMENTARY INFORMATION:

A. Does this action apply to me?

The proposed rule would apply to all coal combustion residuals (CCRs) generated by electric utilities and independent power producers. However, this proposed rule does not address the placement of CCRs in minefills. The U. S. Department of Interior (DOI) and EPA will address the management of CCRs in minefills in a separate regulatory action(s), consistent with the approach recommended by the National Academy of Sciences, recognizing the expertise of DOI's Office of Surface Mining Reclamation and Enforcement in this area.[1] In addition, under either alternative proposal, EPA is not proposing to affect the current status of coal combustion residuals that are beneficially used.[2] (*See* section IV. D for further details on proposed clarifications of beneficial use.) CCRs from non-utility boilers burning coal are not included within today's proposed rule. EPA will decide on an appropriate action for these wastes after completing this rulemaking effort.

The proposed rule may affect the following entities: electric utility facilities and independent power producers that fall under the North American Industry Classification System (NAICS) code 221112, and hazardous waste treatment and disposal facilities that fall under NAICS code 562211. The industry sector(s) identified above may not be exhaustive; other types of entities not listed could also be affected. The Agency's aim is to provide a guide for readers regarding those entities that potentially could be affected by this action. To determine whether your facility, company, business, organization, etc., is affected by this action, you should refer to the applicability criteria contained in section IV of this preamble. If you have any questions regarding the applicability of this action to a particular entity, consult the person listed in the preceding **FOR FURTHER INFORMATION CONTACT** section.

B. What should I consider as I prepare my comments for EPA?

1. *Submitting confidential business information (CBI).* Do not submit information that you consider to be CBI through *http://www.regulations.gov* or by e-mail. Send or deliver information identified as CBI only to the following address: RCRA CBI Document Control Officer, Office of Resource Conservation and Recovery (5305P), U.S. EPA, 1200 Pennsylvania Avenue, NW., Washington DC 20460, Attention Docket No, EPA–HQ–RCRA–2009–0640. You may claim information that you submit to EPA as CBI by marking any part or all of the information as CBI (if you submit CBI on a disk or CD ROM, mark the outside of the disk or CD ROM as CBI and then identify electronically within the disk or CD ROM the specific information that is claimed as CBI). Information so marked will not be disclosed, except in accordance with the procedures set forth in 40 CFR part 2. In addition to one complete version of the comment that includes information claimed as CBI, a copy of the comment that does not contain the information claimed as CBI must be submitted for inclusion in the public docket. If you submit the copy that does not contain CBI on disk or CD ROM, mark the outside of the disk or CD ROM clearly that it does not contain CBI. Information not marked as CBI will be included in the public docket and EPA's electronic public docket without prior notice. If you have questions about CBI or the procedures for claiming CBI, please contact: LaShan Haynes, Office of Resource Conservation and Recovery (5305P), U.S. Environmental Protection Agency, 1200 Pennsylvania Avenue, NW., Washington DC 20460–0002, telephone (703) 605–0516, e-mail address *haynes.lashan@epa.gov.*

2. *Tips for Preparing Your Comments.* When submitting comments, remember to:

- Identify the rulemaking by docket number and other identifying information (subject heading, **Federal Register** date and page number).
- Follow directions—The Agency may ask you to respond to specific questions or organize comments by referencing a Code of Federal Regulations (CFR) part or section number.
- Explain why you agree or disagree, suggest alternatives, and substitute language for your requested changes, and explain your interest in the issue you are attempting to address.
- Describe any assumptions and provide any technical information and/or data that you used.
- If you estimate potential costs or burdens, explain how you arrived at your estimate in sufficient detail to allow for it to be reproduced.
- Provide specific examples to illustrate your concerns, and suggest alternatives.
- Explain your views as clearly as possible.
- Make sure to submit your comments by the comment period deadline identified.

3. *Docket Copying Costs.* The first 100-copied pages are free. Thereafter, the charge for making copies of Docket materials is 15 cents per page.

C. Definitions, Abbreviations and Acronyms Used in This Preamble (Note: Any term used in this proposed rulemaking that is not defined in this section will either have its normal dictionary meaning, or is defined in 40 CFR 260.10.)

Acre-foot means the volume of one acre of surface area to a depth of one foot.

Beneficial Use of Coal Combustion Products (CCPs) means the use of CCPs that provides a functional benefit; replaces the use of an alternative material, conserving natural resources that would otherwise need to be obtained through practices such as extraction; and meets relevant product specifications and regulatory standards (where these are available). CCPs that are used in excess quantities (*e.g.,* the field-applications of FGD gypsum in amounts that exceed scientifically-supported quantities required for enhancing soil properties and/or crop

[1] The National Research Council (NRC) Committee on Mine Placement of Coal Combustion Wastes stated: "The committee believes that OSM and its SMCRA state partners should take the lead in developing new national standards for CCR use in mines because the framework is in place to deal with mine-related issues." National Academy of Sciences. Managing Coal Combustion Residues in Mines; The National Academies Press, Washington, DC, 2006.

[2] The NRC committee recommended "that secondary uses of CCRs that pose minimal risks to human health and the environment be strongly encouraged." *Ibid.*

yields), placed as fill in sand and gravel pits, or used in large scale fill projects, such as for restructuring the landscape, are excluded from this definition.

Boiler slag means the molten bottom ash collected at the base of slag tap and cyclone type furnaces that is quenched with water. It is made up of hard, black, angular particles that have a smooth, glassy appearance.

Bottom ash means the agglomerated, angular ash particles, formed in pulverized coal furnaces that are too large to be carried in the flue gases and collect on the furnace walls or fall through open grates to an ash hopper at the bottom of the furnace.

CCR Landfill means a disposal facility or part of a facility where CCRs are placed in or on land and which is not a land treatment facility, a surface impoundment, an underground injection well, a salt dome formation, a salt bed formation, an underground mine, a cave, or a corrective action management unit. For purposes of this proposed rule, landfills also include piles, sand and gravel pits, quarries, and/or large scale fill operations. Sites that are excavated so that more coal ash can be used as fill are also considered CCR landfills.

CCR Surface Impoundment or *impoundment* means a facility or part of a facility which is a natural topographic depression, man-made excavation, or diked area formed primarily of earthen materials (although it may be lined with man-made materials), which is designed to hold an accumulation of CCRs containing free liquids, and which is not an injection well. Examples of CCR surface impoundments are holding, storage, settling, and aeration pits, ponds, and lagoons. CCR surface impoundments are used to receive CCRs that have been sluiced (flushed or mixed with water to facilitate movement), or wastes from wet air pollution control devices, often in addition to other solid wastes.

Cenospheres are lightweight, inert, hollow spheres comprised largely of silica and alumina glass.

Coal Combustion Products (CCPs) means fly ash, bottom ash, boiler slag, or flue gas desulfurization materials, that are beneficially used.

Coal Combustion Residuals (CCRs) means fly ash, bottom ash, boiler slag, and flue gas desulfurization materials destined for disposal. CCRs are also known as coal combustion wastes (CCWs) and fossil fuel combustion (FFC) wastes, when destined for disposal.

Electric Power Sector (Electric Utilities and Independent Power Producers) means that sector of the power generating industry that comprises electricity-only and combined-heat-and-power (CHP) plants whose primary business is to sell electricity, or electricity and heat, to the public.

Existing CCR Landfill means a landfill which was in operation or for which construction commenced prior to the effective date of the final rule. A CCR landfill has commenced construction if the owner or operator has obtained the Federal, State and local approvals or permits necessary to begin physical construction; and either

(1) A continuous on-site, physical construction program has begun; or

(2) The owner or operator has entered into contractual obligations—which cannot be cancelled or modified without substantial loss—for physical construction of the CCR landfill to be completed within a reasonable time.

Existing CCR Surface Impoundment means a surface impoundment which was in operation or for which construction commenced prior to the effective date of the final rule. A CCR surface impoundment has commenced construction if the owner or operator has obtained the Federal, State and local approvals or permits necessary to begin physical construction; and either

(1) A continuous on-site, physical construction program has begun; or

(2) The owner or operator has entered into contractual obligations—which can not be cancelled or modified without substantial loss—for physical construction of the CCR surface impoundment to be completed within a reasonable time.

Flue Gas Desulfurization (FGD) material means the material produced through a process used to reduce sulfur dioxide (SO_2) emissions from the exhaust gas system of a coal-fired boiler. The physical nature of these materials varies from a wet sludge to a dry powdered material, depending on the process, and their composition comprises either sulfites, sulfates or a mixture thereof.

Fly ash means the very fine globular particles of silica glass which is a product of burning finely ground coal in a boiler to produce electricity, and is removed from the plant exhaust gases by air emission control devices.

Hazard potential means the possible adverse incremental consequences that result from the release of water or stored contents due to failure of a dam (or impoundment) or mis-operation of the dam or appurtenances.[3]

High hazard potential surface impoundment means a surface impoundment where failure or mis-operation will probably cause loss of human life.

Significant hazard potential surface impoundment means a surface impoundment where failure or mis-operation results in no probable loss of human life, but can cause economic loss, environment damage, disruption of lifeline facilities, or impact other concerns.

Low hazard potential surface impoundment means a surface impoundment where failure or mis-operation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the surface impoundment owner's property.

Less than low hazard potential surface impoundment means a surface impoundment not meeting the definitions for High, Significant, or Low Hazard Potential.

Independent registered professional engineer or hydrologist means a scientist or engineer who is not an employee of the owner or operator of a CCR landfill or surface impoundment who has received a baccalaureate or post-graduate degree in the natural sciences or engineering and has sufficient training and experience in groundwater hydrology and related fields as may be demonstrated by state registration, professional certifications, or completion of accredited university programs that enable that individual to make sound professional judgments regarding groundwater monitoring, contaminant fate and transport, and corrective action.

Lateral expansion means a horizontal expansion of the waste boundaries of an existing CCR landfill, or existing CCR surface impoundment made after the effective date of the final rule.

Maximum Contaminant Level (MCL) means the highest level of a contaminant that is allowed in drinking water under the Safe Drinking Water Act (SDWA). MCLs are set as close to the MCL goals as feasible using the best available treatment technology and taking cost into consideration. MCLs are enforceable standards for drinking water.

Minefill means a project involving the placement of CCRs in coal mine voids for use as fill, grouting, subsidence control, capping, mine sealing, and

[3] The Hazard Potential Classification System for Dams was developed by the U.S. Army Corps of Engineers for the National Inventory of Dams (*see https://rsgis.crrel.usace.army.mil/apex/f?p=397:1:913698079375545*). Hazard potential ratings do not provide an estimate of the probability of failure or mis-operation, but rather what the consequences of such a failure or mis-operation would be.

treating acid mine drainage, whether for purposes of disposal or for beneficial use, such as mine reclamation.

Natural water table means the natural level at which water stands in a shallow well open along its length and penetrating the surficial deposits just deeply enough to encounter standing water at the bottom. This level is uninfluenced by groundwater pumping or other engineered activities.

Organosilanes are organic compounds containing at least one carbon to silicon bond, and are typically used to promote adhesion.

Potential damage case means those cases with documented MCL exceedances that were measured in ground water beneath or close to the waste source. In these cases, while the association with CCRs has been established, the documented exceedances had not been demonstrated at a sufficient distance from the waste management unit to indicate that waste constituents had migrated to the extent that they could cause human health concerns.

Pozzolanic material means primarily vitreous siliceous materials, such as many types of CCRs that, when combined with calcium hydroxide and in the presence of water, exhibit cementitious properties.

Proven damage case means those cases with (i) Documented exceedances of primary maximum contaminant levels (MCLs) or other health-based standards measured in ground water at sufficient distance from the waste management unit to indicate that hazardous constituents have migrated to the extent that they could cause human health concerns, and/or (ii) where a scientific study provides documented evidence of another type of damage to human health or the environment (*e.g.,* ecological damage), and/or (iii) where there has been an administrative ruling or court decision with an explicit finding of specific damage to human health or the environment. In cases of co-management of CCRs with other industrial waste types, CCRs must be clearly implicated in the reported damage.

Sand and gravel pit, and/or quarry means an excavation for the commercial extraction of aggregate for use in construction projects. CCRs have historically been used to fill sand and gravel pits and quarries. CCRs are not known to be used to fill metal mines.

Secondary Drinking Water Standards are non-enforceable federal guidelines regarding cosmetic effects (such as tooth or skin discoloration) or aesthetic effects (such as taste, odor, or color) of drinking water.

Special Wastes means any of the following wastes that are managed under the modified subtitle C requirements: CCRs destined for disposal.

Surface Water means all water naturally open to the atmosphere (rivers, lakes, reservoirs, ponds, streams, impoundments, seas, estuaries, etc.).

Uniquely associated wastes means low-volume wastes other than those defined as CCRs that are related to the coal combustion process. Examples of uniquely associated wastes are precipitation runoff from coal storage piles at the electric utility, waste coal or coal mill rejects that are not of sufficient quality to burn as a fuel, and wastes from cleaning boilers used to generate steam.

CCPs Coal Combustion Products
CCRs Coal Combustion Residuals
CFR Code of Federal Regulations
CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
EPA U.S. Environmental Protection Agency
EPCRA Emergency Planning and Community Right-to-Know Act
MCL Maximum Contaminant Level
m/L milligrams per liter
NPDES National Pollutant Discharge Elimination System
NRC National Response Center
PDWS Primary Drinking Water Standard
OSM Office of Surface Mining Reclamation and Enforcement, U.S. Department of the Interior
RCRA Resource Conservation and Recovery Act (42 USCA 6901)
RQ Reportable Quantity
SDWS Secondary Drinking Water Standard
SMCRA Surface Mining Control and Reclamation Act
µg/L micrograms per liter
WQC Federal water quality criteria

D. The Contents of This Preamble Are Listed in the Following Outline

I. Background

A. Why is EPA proposing two options?

1. Basis of Why EPA Is Proceeding With Today's Co-Proposals

EPA is revisiting its regulatory determination for CCRs under the Bevill amendment. This decision is driven in part by the failure of a surface impoundment retaining wall in Kingston, TN in December 2009. Deciding upon the appropriate course of action to address over 100 million tons per year of CCRs is an extremely important step. In developing this proposal, EPA conducted considerable data gathering and analysis. While the public was able to comment on significant portions of our analyses in August 2007, as part of a Notice of Data Availability, there are differing views regarding the meaning of EPA's information and what course of action EPA should take. In part, the differing views are fueled by the complex data, analyses, legislation, implications of available options, possible unintended consequences, and a decision process, all of which pose considerations that could justify EPA selecting a RCRA subtitle C approach or selecting a RCRA subtitle D approach.

Deciding whether or not to maintain the Bevill exemption for CCRs, entails an evaluation of the eight RCRA Section 8002(n) study factors:

- Source and volumes of CCRs generated per year
- Present disposal and utilization practices
- Potential danger, if any, to human health and the environment from the disposal and reuse of CCRs
- Documented cases in which danger to human health or the environment from surface runoff or leachate has been proved
- Alternatives to current disposal methods
- The cost of such alternatives
- The impact of the alternatives on the use of coal and other natural resources
- The current and potential utilization of CCRs

Ultimately, the approach selected will need to ensure that catastrophic releases such as occurred at the Tennessee Valley Authority's (TVA's) Kingston, Tennessee facility do not occur and that other types of damage cases associated with CCR surface impoundments and landfills are prevented. Thus, this process requires EPA to balance the eight factors, which ultimately rests on a policy judgment. This is further complicated in this case because the facts identified under each of the individual factors are even subject to widely varying perspectives. For example, in considering the alternatives to current disposal methods, some claim that RCRA subtitle C would significantly lessen beneficial use while others *see* beneficial use expanding as disposal becomes more costly; some *see* damage cases as substantial, while others note very few incidences of significant off-site contamination.

Given the inherently discretionary nature of the decision, the complexities of the scientific analyses, and the controversy of the issue, EPA wants to ensure that the ultimate decision is based on the best available data, and is taken with the fullest possible extent of public input. As discussed in section IV in greater detail, there are a number of issues on which additional or more recent information would be useful in

allowing the Agency to reach a final decision. In the absence of this information, EPA has not yet reached a conclusion as to how to strike the appropriate balance among these eight factors and so is presenting two proposals for federal regulation of CCRs.

As EPA weighs the eight Bevill study factors to reach our ultimate decision, EPA will be guided by the following principles, which are reflected in the discussions throughout this preamble. The first is that EPA's actions must ultimately be protective of human health and the environment. Second, any decision must be based on sound science. Finally, in conducting this rulemaking, EPA wants to ensure that our decision processes are transparent and encourage the greatest degree of public participation. Consequently, to further the public's understanding and ability to comment on all the issues facing the Agency, within this proposal, EPA identifies a series of scientific, economic, and materials management issues on which we are seeking comment from the public to strengthen our knowledge of the impact of EPA's decision.

There are three key areas of analyses where EPA is seeking comment: The extent of existing damage cases, the extent of the risks posed by the mismanagement of CCRs, and the adequacy of State programs to ensure proper management of CCRs (*e.g.,* is groundwater monitoring required of CCR landfills and surface impoundments). Since the 2007 NODA, EPA received new reports from industry and environmental and citizen groups regarding damage cases. Industry provided information indicating that many of EPA's listed proven damage cases do not meet EPA's criteria for a damage case to be proven. Environmental and citizen groups, on the other hand, reported that there are additional damage cases of which EPA is unaware. EPA's analysis, as well as the additional information from industry and environmental and citizen groups, which is in the docket for this proposal, needs to undergo public review, with the end result being a better understanding of the nature and number of damage cases. In addition, as discussed at length in sections II and IV, a number of technical questions have been raised regarding EPA's quantitative groundwater risk assessment. The Agency would implement similar technical controls under RCRA subtitle C or D. Therefore, a central issue is the adequacy of State programs. Under either regulatory approach, State programs will have key implementation roles. This is a very complex area to evaluate. For example, as EPA reports that 36% of the States do not have minimum liner requirements for CCR landfills, and 67% do not have liner requirements for CCR surface impoundments, we also observe that nearly all new CCR landfills and surface impoundments are constructed with liners. It should also be recognized that while states currently have considerable expertise in their State dam safety programs, those programs do not tend to be part of State solid waste or clean water act programs, and so, oversight may not be adequately captured in EPA's existing data. In several areas, there are these types of analytical tensions that warrant careful consideration by the public and EPA. This proposal requests states and others to provide further information on state programs, including the prevalence of groundwater monitoring at existing facilities (an area where our information is nearly 15 years old) and why state programs may address groundwater monitoring and risks differently for surface impoundments located proximate to rivers.

The results of the risk analysis demonstrate significant risks from surface impoundments. A common industry practice, however, is to place surface impoundments right next to water bodies. While the Agency's population risk assessment analysis accounted for adjacent water bodies, the draft risk assessment that presents individual risk estimates does not account for the presence of adjacent water bodies in the same manner that the population risk assessment did. EPA is requesting public comment on the exact locations of CCR waste management units so that the Agency can more fully account for water bodies that may exist between a waste management unit and a drinking water well (and thus, could potentially intercept a contaminated groundwater plume). EPA is also requesting comments on how the risk assessment should inform the final decision.

While the Agency believes the analyses conducted are sound, today's co-proposal of two options reflects our commitment to use the public process fully to ensure the best available scientific and regulatory impact analyses are considered in our decision. The final course of action will fully consider these legitimate and complex issues, and will result in the selection of a regulatory structure that best addresses the eight study factors identified in section 8002(n) of RCRA, and ensures protection of human health and the environment.

2. Brief Description of Today's Co-Proposals

a. Summary of Subtitle C Proposal

In combination with its proposal to reverse the Bevill determination for CCRs destined for disposal, EPA is proposing to list as a special waste, to be regulated under the RCRA subtitle C regulations, CCRs from electric utilities and independent power producers when destined for disposal in a landfill or surface impoundment. These CCRs would be regulated from the point of their generation to the point of their final disposition, including during and after closure of any disposal unit. This would include the generator and transporter requirements and the requirements for facilities managing CCRs, such as siting, liners (with modification), run-on and run-off controls, groundwater monitoring, fugitive dust controls, financial assurance, corrective action, including facility-wide corrective action, closure of units, and post-closure care (with certain modifications). In addition, facilities that dispose of, treat, or, in many cases, store, CCRs also would be required to obtain permits for the units in which such materials are disposed, treated, and stored. The rule would also regulate the disposal of CCRs in sand and gravel pits, quarries, and other large fill operations as a landfill.

To address the potential for catastrophic releases from surface impoundments, we also are proposing requirements for dam safety and stability for impoundments that, by the effective date of the final rule, have not closed consistent with the requirements. We are also proposing land disposal restrictions and treatment standards for CCRs, as well as a prohibition on the disposal of treated CCRs below the natural water table.

b. Summary of Subtitle D Proposal

In combination with today's proposal to leave the Bevill determination in place, EPA is proposing to regulate CCRs disposed of in surface impoundments or landfills under RCRA subtitle D requirements which would establish national criteria to ensure the safe disposal of CCRs in these units. The units would be subject to, among other things, location standards, composite liner requirements (new landfills and surface impoundments would require composite liners; existing surface impoundments without liners would have to retrofit within five years, or cease receiving CCRs and close); groundwater monitoring and corrective action standards for releases from the unit; closure and post-closure care

requirements; and requirements to address the stability of surface impoundments. We are also soliciting comments on requiring financial assurance. The rule would also regulate the disposal of CCRs in sand and gravel pits, quarries, and other large fill operations as a landfill. The rule would not regulate the generation, storage or treatment of CCRs prior to disposal. Because of the scope of subtitle D authority, the rule would not require permits, nor could EPA enforce the requirements. Instead, states or citizens could enforce the requirements under RCRA citizen suit authority; the states could also enforce any state regulation under their independent state enforcement authority.

EPA is also considering a potential modification to the subtitle D option, called "D prime" in the following table. Under this option, existing surface impoundments would not have to close or install composite liners but could continue to operate for their useful life. In the "D prime" option, the other elements of the subtitle D option would remain the same.

3. Summary of Estimated Regulatory Costs and Benefits

For the purposes of comparing the estimated regulatory compliance costs to the monetized benefits for each regulatory option, the Regulatory Impact Analysis (RIA) computed two comparison indicators: Net benefits (*i.e.,* benefits minus costs), and benefit/cost ratio (*i.e.,* benefits divided by costs). Table 1 below provides a summary of estimated regulatory costs and benefits for three regulatory options, based on the 7% discount rate base case and the 50-year period-of-analysis applied in the RIA. Furthermore, this benefit and cost summary table displays ranges of net benefit and benefit/cost results across three different scenarios concerning the potential impacts of each option on the future annual beneficial use of CCRs under each option. The first scenario presents the potential impact scenario that assumes that the increased future annual cost of RCRA-regulated CCR disposal will induce coal-fired electric utility plants to increase beneficial use of CCRs. The second scenario presents a potential market stigma effect under the subtitle C option which will induce a decrease in future annual CCR beneficial use. The third scenario assumed that beneficial use of CCRs continues according to its recent trend line without any future change as a result of any of the regulatory options. The RIA estimates both the first and second scenario incrementally in relation to the third scenario no change trend line. Table 1 shows the range of impacts and associated ranges of net benefits and benefit-cost ratios across these three beneficial use scenarios for each regulatory option. While each of these three scenario outcomes may be possible, EPA's experience with the RCRA program indicates that industrial generators of RCRA-regulated wastes are often able to increase recycling and materials recovery rates after a subtitle C regulation. Section XII in this preamble provides additional discussion of these estimates.

TABLE 1—SUMMARY TABLE COMPARISON OF REGULATORY BENEFITS TO COSTS—RANGING OVER ALL THREE BENEFICIAL USE SCENARIOS

[$Millions @ 2009$ prices and @ 7% discount rate over 50-year future period-of-analysis 2012 to 2061]

	Subtitle C "Special waste"	Subtitle D	Subtitle "D prime"
A. Present Values:			
1. Regulatory Costs:	$20,349	$8,095	$3,259.
2. Regulatory Benefits:	$87,221 to $102,191	$34,964 to $41,761	$14,111 to $17,501.
3. Net Benefits (2–1)	($251,166) to $81,842	($6,927) to $33,666	($2,666) to $14,242.
4. Benefit/Cost Ratio (2/1)	(11.343) to 5.022	0.144 to 5.159	0.182 to 5.370.
B. Average Annualized Equivalent Values:*			
1. Regulatory Costs	$1,474	$587	$236.
2. Regulatory Benefits:	$6,320 to $7,405	$2,533 to $3,026	$1,023 to $1,268.
3. Net Benefits (2–1)	($18,199) to $5,930	($502) to $2,439	($193) to $1,032.
4. Benefit/Cost Ratio (2/1)	(11.347) to 5.022	0.145 to 5.159	0.182 to 5.370.

* **Note:** Average annualized equivalent values calculated by multiplying 50-year present values by a 50-year 7% discount rate "capital recovery factor" of 0.07246.

B. What is the statutory authority for this action?

These regulations are being proposed under the authority of sections 1008(a), 2002(a), 3001, 3004, 3005, and 4004 of the Solid Waste Disposal Act of 1970, as amended by the Resource Conservation and Recovery Act of 1976 (RCRA), as amended by the Hazardous and Solid Waste Amendments of 1984 (HSWA), 42 U.S.C. 6907(a), 6912(a), 6921,6924, 6925 and 6944. These statutes, combined, are commonly referred to as "RCRA."

RCRA section 1008(a) authorizes EPA to publish "suggested guidelines for solid waste management." 42 U.S.C. 6907(a). Such guidelines must provide a technical and economic description of the level of performance that can be achieved by available solid waste management practices that provide for protection of human health and the environment.

RCRA section 2002 grants EPA broad authority to prescribe, in consultation with federal, State, and regional authorities, such regulations as are necessary to carry out the functions under federal solid waste disposal laws. (42 U.S.C. 6912(a)).

RCRA section 3001(b) requires EPA to list particular wastes that will be subject to the requirements established under subtitle C. (42 U.S.C. 6921(b)). The regulation listing such wastes must be based on the listing criteria established pursuant to section 3001(a), and codified at 40 CFR 261.11.

Section 3001(b)(3)(A) of RCRA established a temporary exemption for fly ash waste, bottom ash waste, slag waste, and flue gas emission control waste generated primarily from the combustion of coal or other fossil fuels, among others, and required the Agency to conduct a study of those wastes and, after public hearings and an opportunity for comment, determine whether these wastes should be regulated pursuant to subtitle C requirements (42 U.S.C. 6921 (b)(3)(A)).

Section 3004 of RCRA generally requires EPA to establish standards applicable to the treatment, storage, and disposal of hazardous waste to ensure that human health and the environment are protected. 42 U.S.C. 6924. Sections

3004(c) and (d) prohibit free liquids in hazardous waste landfills. Sections 3004(g) and (m) prohibit land disposal of hazardous wastes, unless, before disposal, those wastes meet treatment standards established by EPA that will "substantially diminish the toxicity of the waste or substantially reduce the likelihood of migration of hazardous constituents from the waste so that short-term and long-term threats are minimized." (42 U.S.C. 6924(c), (d), (g), and (m)).

RCRA section 3004(x) allows the Administrator to tailor certain specified requirements for particular categories of wastes, including those that are the subject of today's proposal, namely "fly ash waste, bottom ash waste, and flue gas emission control wastes generated primarily from the combustion of coal or other fossil fuels" (42 U.S.C. 6924(x)). EPA is authorized to modify the requirements of sections 3004 (c), (d), (e), (f), (g), (o), and (u), and section 3005(j), to take into account the special characteristics of the wastes, the practical difficulties associated with implementation of such requirements, and site-specific characteristics, including but not limited to the climate, geology, hydrology and soil chemistry at the site. EPA may only make such modifications, provided the modified requirements assure protection of human health and the environment. (42 U.S.C. 6924(x)).

RCRA section 3005 generally requires any facility that treats, stores, or disposes of wastes identified or listed under subtitle C, to have a permit. 42 U.S.C. 6925(a). This section also generally imposes requirements on facilities that become newly subject to the permitting requirements as a result of regulatory changes, and so can continue to operate for a period until they obtain a permit—*i.e.,* "interim status facilities." 42 U.S.C. 6925(e), (i), (j). Congress imposed special requirements on interim status surface impoundments in section 3005(j). In order to continue receiving wastes, interim status surface impoundments are generally required to retrofit the impoundment within 4 years, to install a double liner, with a leachate collection system, and groundwater monitoring. 42 U.S.C. 6925(j)(6). In addition, wastes disposed into interim status surface impoundments must meet the land disposal restrictions in EPA's regulations, or the unit must be annually dredged. 42 U.S.C. 6925(j)(11).

RCRA Section 4004 generally requires EPA to promulgate regulations containing criteria for determining which facilities shall be classified as sanitary landfills (and not open dumps) so that there is no reasonable probability of adverse effects on health or the environment from disposal of solid wastes at such facilities.

C. Regulation of Wastes Under RCRA Subtitle C

Solid wastes may become subject to regulation under subtitle C of RCRA in one of two ways. A waste may be subject to regulation if it exhibits certain hazardous properties, called "characteristics," or if EPA has specifically listed the waste as hazardous. *See* 42 U.S.C. 6921(a). EPA's regulations in the Code of Federal Regulations (40 CFR) define four hazardous waste characteristic properties: Ignitability, corrosivity, reactivity, or toxicity (*See* 40 CFR 261.21–261.24). All generators must determine whether or not a waste exhibits any of these characteristics by testing the waste, or by using knowledge of the process that generated the waste (*see* § 262.11(c)). While not required to sample the waste, generators will be subject to enforcement actions if found to be improperly managing wastes that exhibit one or more of the characteristics.

EPA may also conduct a more specific assessment of a waste or category of wastes and "list" them if they meet the criteria set out in 40 CFR 261.11. Under the third criterion, at 40 CFR 261.11(a)(3), a waste will be listed if it contains hazardous constituents identified in 40 CFR part 261, Appendix VIII, and if, after considering the factors noted in this section of the regulations, we "conclude that the waste is capable of posing a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed." We place a chemical on the list of hazardous constituents on Appendix VIII only if scientific studies have shown a chemical has toxic effects on humans or other life forms. When listing a waste, we also add the hazardous constituents that serve as the basis for listing the waste to 40 CFR part 261, Appendix VII.

The regulations at 40 CFR 261.31 through 261.33 contain the various hazardous wastes that EPA has listed to date. Section 261.31 lists wastes generated from non-specific sources, known as "F-wastes," that are usually generated by various industries or types of facilities, such as "wastewater treatment sludges from electroplating operations" (*see* EPA Hazardous Waste No. F006). Section 261.32 lists wastes generated from specific industry sources, known as "K-wastes," such as "Spent potliners from primary aluminum production" (*see* EPA Hazardous Waste No. K088). Section 261.33 contains lists of commercial chemical products and other materials, known as "P-wastes" or "U-wastes," that become hazardous wastes when they are discarded or intended to be discarded.

As discussed in greater detail later in this proposal, EPA is considering whether to codify a listing of CCRs that are disposed of in landfills or surface impoundments, in a new section of the regulations, as "Special Wastes." EPA is considering creating this new category of wastes, in part, to reflect the fact that these wastes would be subject to modified regulatory requirements using the authority provided under section 3004(x) of RCRA (*e.g.,* the modified CCR landfill and surface impoundment liner and leak detection system requirements, the effective dates for the land disposal restrictions, and the surface impoundment retrofit requirements).

If a waste exhibits a hazardous characteristic or is listed under subtitle C, then it is subject to the requirements of RCRA subtitle C, and the implementing regulations found in 40 CFR parts 260 through 268, parts 270 to 279, and part 124. These requirements apply to persons who generate, transport, treat, store or dispose of such waste and establish rules governing every phase of the waste's management from its generation to its final disposition and beyond. Facilities that treat, store or dispose of hazardous wastes require a permit which incorporates all of the design and operating standards established by EPA rules, including standards for piles, landfills, and surface impoundments. Under RCRA subtitle C requirements, land disposal of hazardous waste is prohibited unless the waste is first treated to meet the treatment standards (or meets the treatment standards as generated) established by EPA that minimize threats to human health and the environment posed by the land disposal of the waste, or unless the waste is disposed in a unit from which there will be no migration of hazardous constituents for as long as the waste remains hazardous. In addition, RCRA subtitle C facilities are required to clean up any releases of hazardous waste or constituents from solid waste management units at the facility, as well as beyond the facility boundary, as necessary to protect human health and the environment. RCRA subtitle C also requires that permitted facilities demonstrate that they have adequate financial resources (*i.e.,* financial assurance) for obligations, such as closure, post-closure care, necessary

clean up, and any liability from facility operations.

The RCRA subtitle C requirements are generally implemented under state programs that EPA has authorized to operate in lieu of the federal program, based upon a determination that the state program is no less stringent than the federal program. In a state that operates under an authorized program, any revisions made to EPA requirements are generally effective as part of the federal RCRA program in that state only after the state adopts the revised requirement, and EPA authorizes the state requirement. The exception applies with respect to requirements implementing statutory provisions added to subtitle C by the 1984 Hazardous and Solid Waste Amendments to RCRA; such requirements are immediately effective in all states, and are enforced by EPA.

All RCRA hazardous wastes are also hazardous substances under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as defined in section 101(14)(C) of the CERCLA statute. This applies to wastes listed in §§ 261.31 through 261.33, as well as any wastes that exhibits a RCRA hazardous characteristic. Table 302.4 at 40 CFR 302.4 lists the CERCLA hazardous substances along with their reportable quantities (RQs). Anyone spilling or releasing a hazardous substance at or above its RQ must report the release to the National Response Center, as required in CERCLA Section 103. In addition, Section 304 of the Emergency Planning and Community Right-to-Know Act (EPCRA) requires facilities to report the release of a CERCLA hazardous substance at or above its RQ to State and local authorities. Today's rule proposes an approach for estimating whether released CCRs exceed an RQ. Wastes listed as special wastes will generally be subject to the same requirements under RCRA subtitle C and CERCLA as are hazardous wastes, although as discussed elsewhere in this preamble, EPA is proposing to revise certain requirements under the authority of section 3004(x) of RCRA to account for the large volumes and unique characteristics of these wastes.

D. Regulation of Solid Wastes Under RCRA Subtitle D

Solid wastes that are neither a listed and/or characteristic hazardous waste are subject to the requirements of RCRA subtitle D. Subtitle D of RCRA establishes a framework for Federal, State, and local government cooperation in controlling the management of nonhazardous solid waste. The federal role in this arrangement is to establish the overall regulatory direction, by providing minimum nationwide standards for protecting human health and the environment, and to providing technical assistance to states for planning and developing their own environmentally sound waste management practices. The actual planning and direct implementation of solid waste programs under RCRA subtitle D, however, remains a state and local function, and the act authorizes States to devise programs to deal with State-specific conditions and needs. That is, EPA has no role in the planning and direct implementation of solid waste programs under RCRA subtitle D.

Under the authority of sections 1008(a)(3) and 4004(a) of subtitle D of RCRA, EPA first promulgated the Criteria for Classification of Solid Waste Disposal Facilities and Practices (40 CFR part 257) on September 13, 1979. These subtitle D Criteria establish minimum national performance standards necessary to ensure that "no reasonable probability of adverse effects on health or the environment" will result from solid waste disposal facilities or practices. Practices not complying with the criteria constitute "open dumping" for purposes of the Federal prohibition on open dumping in section 4005(a). EPA does not have the authority to enforce the prohibition directly (except in situations involving the disposal or handling of sludge from publicly-owned treatment works, where Federal enforcement of POTW sludge-handling facilities is authorized under the CWA). States and citizens may enforce the prohibition on open dumping using the authority under RCRA section 7002. EPA, however, may act only if the handling, storage, treatment, transportation, or disposal of such wastes may present an imminent and substantial endangerment to health or the environment (RCRA 7003). In addition, the prohibition may be enforced by States and other persons under section 7002 of RCRA.

In contrast to subtitle C, RCRA subtitle D requirements relate only to the disposal of the solid waste, and EPA does not have the authority to establish requirements governing the generation, transportation, storage, or treatment of such wastes prior to disposal. Moreover, EPA would not have administrative enforcement authority to enforce any RCRA subtitle D criteria for CCR facilities, authority to require states to issue permits for them or oversee those permits, nor authority for EPA to determine whether any state permitting program for CCR facilities is adequate. Subtitle D of RCRA also provides less extensive authority to establish requirements relating to the cleanup (or corrective action) and financial assurance at solid waste facilities.

EPA regulations affecting RCRA subtitle D facilities are found at 40 CFR parts 240 through 247, and 255 through 258. The existing part 257 criteria include general environmental performance standards addressing eight major topics: Floodplains (§ 257.3–1), endangered species (§ 257.3–2), surface water (§ 257.3–3), ground water (§ 257.3–4), land application (§ 257.35), disease (§ 257.3–6), air (§ 257.3–7), and safety (§ 257.3–8). EPA has also established regulations for RCRA subtitle D landfills that accept conditionally exempt small quantity generator hazardous wastes, and household hazardous wastes (*i.e.,* "municipal solid waste") at 40 CFR Part 258, but these are of limited relevance to CCRs, which fall into neither category of wastes.

E. Summary of the 1993 and 2000 Regulatory Determinations

Section 3001(b)(3)(A)(i) of RCRA (known as the Bevill exclusion or exemption) excluded certain large-volume wastes generated primarily from the combustion of coal or other fossil fuels from being regulated as hazardous waste under subtitle C of RCRA, pending completion of a Report to Congress required by Section 8002(n) of RCRA and a determination by the EPA Administrator either to promulgate regulations under RCRA subtitle C or to determine that such regulations are unwarranted.

In 1988, EPA published a Report to Congress on Wastes from the Combustion of Coal by Electric Utility Power Plants (EPA, 1988). The report, however, did not address co-managed utility CCRs, other fossil fuel wastes that are generated by utilities, and wastes from non-utility boilers burning any type of fossil fuel. Further, because of other priorities, EPA did not complete its Regulatory Determination on fossil fuel combustion (FFC) wastes at that time.

In 1991, a suit was filed against EPA for failure to complete a Regulatory Determination on FFC wastes (*Gearhart* v. *Reilly* Civil No. 91–2345 (D.D.C.), and on June 30, 1992, the Agency entered into a Consent Decree that established a schedule for EPA to complete the Regulatory Determinations for all FFC wastes. Specifically, FFC wastes were divided 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 independent commercial power

producers, and (2) all remaining wastes subject to RCRA Sections 3001(b)(3)(A)(i) and 8002(n)—that is, large volume coal combustion wastes generated at electric utility and independent power producing facilities that are co-managed together with certain other coal combustion wastes; coal combustion wastes generated at non-utilities; coal combustion wastes generated at facilities with fluidized bed combustion technology; petroleum coke combustion wastes; wastes from the combustion of mixtures of coal and other fuels (*i.e.,* co-burning of coal with other fuels where coal is at least 50% of the total fuel); wastes from the combustion of oil; and wastes from the combustion of natural gas.

On August 9, 1993, EPA published its Regulatory Determination for the first category of wastes (58 FR 42466, *http://www.epa.gov/epawaste/nonhaz/industrial/special/mineral/080993.pdf*), concluding that regulation under subtitle C of RCRA for these wastes was not warranted. To make an appropriate determination for the second category, or "remaining wastes," EPA concluded that additional study was necessary. Under the court-ordered deadlines, the Agency was required to complete a Report to Congress by March 31, 1999, and issue a Regulatory Determination by October 1, 1999.

In keeping with its court-ordered schedule, and pursuant to the requirements of Section 3001(b)(3)(A)(i) and Section 8002(n) of RCRA, EPA prepared a Report to Congress on the remaining FFC wastes in March 1999 (*http://www.epa.gov/epaoswer/other/fossil/volume_2.pdf*). The report addresses the eight study factors required by Section 8002(n) of RCRA for FFC wastes (*see* discussion in section IV. B).

On May 22, 2000, EPA published its Regulatory Determination on wastes from the combustion of fossil fuels for the remaining wastes (65 FR 32214, *http://www.epa.gov/fedrgstr/EPA-WASTE/2000/May/Day-22/f11138.htm*). In its Regulatory Determination, EPA concluded that the remaining wastes were largely identical to the high-volume monofilled wastes, which remained exempt based on the 1993 Regulatory Determination. The high volume wastes simply dominate the waste characteristics even when co-managed with other wastes, and thus the May 2000 Regulatory Determination addressed not only the remaining wastes, but effectively reopened the decision on CCRs that went to monofills.

EPA concluded that these wastes could pose significant risks if not properly managed, although the risk information was limited. EPA identified and discussed a number of documented proven damage cases, as well as cases indicating at least a potential for damage to human health and the environment, but did not rely on its quantitative groundwater risk assessment, as EPA concluded that it was not sufficiently reliable. However, EPA concluded that significant improvements were being made in waste management practices due to increasing state oversight, although gaps remained in the current regulatory regime. On this basis, the Agency concluded to retain the Bevill exemption, and stated we would issue a regulation under subtitle D of RCRA, establishing minimum national standards. Those subtitle D standards have not yet been issued. (Today's proposal could result in the development of the subtitle D standards consistent with the May 2000 Regulatory Determination, or with a revision of the determination, or the issuance of subtitle C standards under RCRA.)

EPA also explicitly stated in the May 2000 Regulatory Determination that the Agency would continue to review the issues, and would reconsider its decision that subtitle C regulations were unwarranted based on a number of factors. EPA noted that its ongoing review would include (1) "the extent to which [the wastes] have caused damage to human health or the environment;" (2) the adequacy of existing regulation of the wastes; (3) the results of an NAS report regarding the adverse human health effects of mercury;[4] and (4) "risk posed by managing coal combustion solid wastes if levels of mercury or other hazardous constituents change due to any future Clean Air Act air pollution control requirements for coal burning utilities" and that these efforts could result in a subsequent revision to the Regulatory Determination. For a further discussion of the basis for the Agency's determination, *see* section IV below.

F. What are CCRs?

CCRs are residuals from the combustion of coal. For purposes of this proposal, CCRs are fly ash, bottom ash, boiler slag (all composed predominantly of silica and aluminosilicates), and flue gas desulfurization materials (predominantly Ca-SO_X compounds) that were generated from processes intended to generate power.

Fly ash is a product of burning finely ground coal in a boiler to produce electricity. Fly ash is removed from the plant exhaust gases primarily by electrostatic precipitators or baghouses and secondarily by wet scrubber systems. Physically, fly ash is a very fine, powdery material, composed mostly of silica. Nearly all particles are spherical in shape.

Bottom ash is comprised of agglomerated coal ash particles that are too large to be carried in the flue gas. Bottom ash is formed in pulverized coal furnaces and is collected by impinging on the furnace walls or falling through open grates to an ash hopper at the bottom of the furnace. Physically, bottom ash is coarse, with grain sizes spanning from fine sand to fine gravel, typically grey to black in color, and is quite angular with a porous surface structure.

Boiler slag is the molten bottom ash collected at the base of slag tap and cyclone type furnaces that is quenched with water. When the molten slag comes in contact with the quenching water, it fractures, crystallizes, and forms pellets. This boiler slag material is made up of hard, black, angular particles that have a smooth, glassy appearance.

Flue Gas Desulfurization (FGD) material is produced through a process used to reduce sulfur dioxide (SO_2) emissions from the exhaust gas system of a coal-fired boiler. The physical nature of these materials varies from a wet sludge to a dry powdered material, depending on the process. The wet sludge generated from the wet scrubbing process using a lime-based reagent is predominantly calcium sulfite, while the wet sludge generated from the wet scrubbing process using a limestone-based reagent is predominantly calcium sulfate. The dry powdered material from dry scrubbers that is captured in a baghouse consists of a mixture of sulfites and sulfates.

CCRs are managed in either wet or dry disposal systems. In wet systems, materials are generally sluiced via pipe to a surface impoundment. The material can be generated wet, such as FGD, or generated dry and water added to facilitate transport (*i.e.* sluiced) through pipes. In dry systems, CCRs are transported in its dry form to landfills for disposal.

1. Chemical Constituents in CCRs

The chemical characteristics of CCRs depend on the type and source of coal, the combustion technology, and the pollution control technology employed. For the 1999 Report to Congress and the May 2000 Regulatory Determination, EPA developed an extensive database

[4] Toxicological Effects of Methylmercury, National Academy of Sciences, July 2000 (*http://books.nap.edu/catalog.php?record_id=9899#toc*). EPA has not taken any actions regarding the May 2000 Regulatory Determination as a result of the NAS report.

on the leaching potential of CCR constituents using the toxicity characteristic leaching procedure (TCLP) from a number of sources. More recent data on the composition of CCRs, including their leaching potential, have been collected and are discussed in the next sub-section. The CCR constituent database (available in the docket to this proposal) contains data on more than 40 constituents. Table 2 presents the median compositions of trace element TCLP leachates of each of the main four types of large volume CCRs (fly ash, bottom ash, boiler slag, and FGD gypsum). (Additional information, including the range of TCLP values, is available in the docket or on-line in the documents identified in the footnotes to the following table.)

TABLE 2—TCLP MEDIAN COMPOSITIONS OF COAL-FIRED UTILITY LARGE-VOLUME CCRS [5] (MG/L)

Constituent	Fly ash	Bottom ash	Boiler slag	FGD
As	0.066	0.002	0.002	0.290
Ba	0.289	0.290	0.260	0.532
B	0.933	0.163	n/a	—
Cd	0.012	0.005	0.0018	0.010
Cr^{VI}	0.203	0.010	0.003	0.120
Cu	n/a	n/a	0.050	n/a
Pb	0.025	0.005	0.0025	0.120
Hg	0.0001	0.0001	0.0002	0.0001
Se	0.020	0.0013	0.0025	0.280
Ag	0.005	0.0050	0.0001	0.060
V	0.111	0.0050	0.010	—
Zn	0.285	0.015	0.075	—

n/a = data not available.
-- = too few data points to calculate statistics.
Source: Data from supporting documentation to the 1993 Regulatory Determination; values below the detection limit were treated as one-half the detection limit.

The composition of FGD gypsum depends on the position within the air emissions control system where the SO_2 component is subject to scrubbing: If scrubbing takes place up stream of the removal of fly ash particulates, the FGD would actually comprise a mix of both components. Table 3 presents mean TCLP trace element compositions of FGD gypsum generated by a scrubbing operation that is located down stream from the particulate collection elements of the air emissions control system; it therefore represents an 'end member' FGD gypsum.

TABLE 3—FGD GYPSUM TCLP COMPOSITIONS (MG/L) FROM: (1) TWO OHIO POWER PLANTS *[6] (MEAN DATA); (2) 12 SAMPLES OF COMMERCIAL WALLBOARD PRODUCED FROM SYNTHETIC GYPSUM **[7] (MEDIAN DATA)

Constituent	Cardinal Plant *	Bruce Mansfield Plant *	Synthetic Gypsum **
As	<0.006	0.0075	0.00235
Ba	0.373	0.270	0.043
B	0.137	0.0255	n/a
Cd	0.00167	0.00055	0.00145
Cr	0.00587	0.00575	0.0047
Cu	<0.001	<0.001	n/a
Pb	<0.003	<0.003	0.0006
Hg	1.8×10^{-5}	2.6×10^{-6}	<0.0003
Se	0.0123	<0.011	0.044
V	<0.001	0.002	n/a
Zn	0.170	0.0560	n/a
Ag	n/a	n/a	<0.00005

n/a = data not available.

The contaminants of most environmental concern in CCRs are antimony, arsenic, barium, beryllium, cadmium, chromium, lead, mercury, nickel, selenium, silver and thallium. Although these metals rarely exceed the RCRA hazardous waste toxicity characteristic (TC), because of the mobility of metals and the large size of typical disposal units, metals (especially arsenic) have leached at levels of concern from unlined landfills and surface impoundments. In addition, it should also be noted that since the Agency announced its May 2000 Regulatory Determination, EPA has revised the maximum contaminant level (MCL) for arsenic,[8] without a corresponding revision of the TC. As a result, while arsenic levels are typically well below the TC, drinking water risks from contaminated groundwater due to releases from landfills and impoundments may still be high. Also, as discussed below, a considerable body of evidence has emerged indicating that the TCLP alone is not a good predictor

[5] Compiled from Tables 3–1, 3–3, 3–5 and 3–7, in: Technical Background Document for the Report to Congress on Remaining Wastes from Fossil Fuel Combustion: Waste Characteristics, March 15, 1999 (*http://www.epa.gov/epawaste/nonhaz/industrial/special/fossil/ffc2_399.pdf*).

[6] Compiled from: Table 3–5, in: An Evaluation of Flue Gas Desulfurization Gypsum for Abandoned Mine Land Reclamation, Rachael A. Pasini, Thesis, The Ohio State University, 2009.

[7] Compiled from: Table 10, in: Fate of Mercury in Synthetic Gypsum Used for Wallboard Production, J. Sanderson *et al.*, USG Corporation, Final Report prepared for NETL, June 2008.

of the mobility of metals in CCRs under a variety of different conditions. This issue is further discussed in the following subsection.

From Tables 2 and 3 above, it is evident that each of the main four types of CCRs, when subjected to a TCLP leach test, yields a different amount of trace element constituents. EPA is soliciting public comments on whether, in light of these differences in the mobility of hazardous metals between the four major types of CCRs, regulatory oversight should be equally applied to each of these CCR types when destined for disposal.

2. Recent EPA Research on Constituent Leaching From CCRs

Changes to fly ash and other CCRs are expected to occur as a result of increased use and application of advanced air pollution control technologies in coal-fired power plants. These technologies include flue gas desulfurization (FGD) systems for SO_2 control, selective catalytic reduction (SCR) systems for NO_X control, and activated carbon injection systems for mercury control. These technologies are being installed or are expected to be installed in response to federal regulations, state regulations, legal consent decrees, and voluntary actions taken by industry to adopt more stringent air pollution controls. Use of more advanced air pollution control technology reduces air emissions of metals and other pollutants in the flue gas of a coal-fired power plant by capturing and transferring the pollutants to the fly ash and other air pollution control residues. The impact of changes in air pollution control on the characteristics of CCRs and the leaching potential of metals is the focus of ongoing research by EPA's Office of Research and Development (ORD). This research is being conducted to identify any potential cross-media transfers of mercury and other metals and to meet EPA's commitment in the Mercury Roadmap (*http://www.epa.gov/hg/roadmap.htm*) to report on the fate of mercury and other metals from implementation of multi-pollutant control at coal-fired power plants.

Over the last few years, in cooperation with Electric Power Research Institute (EPRI) and the utility industry, EPA obtained 73 different CCRs from 31 coal-fired boilers spanning a range of coal types and air pollution control configurations. Samples of CCRs were collected to evaluate differences in air pollution control, such as addition of post-combustion NO_X controls (*i.e.,* selective catalytic reduction), FGD scrubbers, and enhanced sorbents for mercury capture. A series of reports have been developed to document the results from the ORD research: The first report (Characterization of Mercury-Enriched Coal Combustion Residuals from Electric Utilities Using Enhanced Sorbents for Mercury Control, EPA–600/R–06/008, February 2006; *http://www.epa.gov/ORD/NRMRL/pubs/600r06008/600r06008.pdf*) was developed to document changes in fly ash resulting from the addition of sorbents for enhanced mercury capture. The second report (Characterization of Coal Combustion Residuals from Electric Utilities Using Wet Scrubbers for Multi-Pollutant Control; EPA–600/R–08/077, July 2008, *http://www.epa.gov/nrmrl/pubs/600r08077/600r08077.pdf*) was developed to evaluate residues from the expanded use of wet scrubbers. The third report (Characterization of Coal Combustion Residues from Electric Utilities—Leaching and Characterization Data, EPA–600/R–09/151, December 2009, *http://www.epa.gov/nrmrl/pubs/600r09151/600r09151.html*) updates the data in the earlier reports and provides data on an additional 40 samples to cover the range of coal types and air pollution control configurations, including some not covered in the two previous reports.

Data from these studies is being used to identify potential trends in the composition and leaching behavior of CCRs resulting from changes in air pollution controls. Summary data on the higher volume CCRs is provided for 34 fly ashes (Table 4) and 20 FGD gypsum samples (Table 5). The report provides analysis of other types of CCRs (*i.e.,* non-gypsum scrubber residues (primarily scrubber sludge containing calcium sulfite), blended CCRs (non-gypsum scrubber residues, fly ash, and lime), and wastewater treatment filter cake). For each of the metals that are reported (Sb, As, Ba, B, Cd Cr, Co, Hg, Pb, Mo, Se, and Tl) from the leaching test results, "box and whisker" plots have been developed comparing the different materials and providing comparison to field leachate data.

The purpose of this research was to try to understand how power plant air pollution control residues, and their leaching potential, are likely to change with the increased use of multi-pollutant and mercury controls, anticipated in response to new Clean Air Act regulations. An initial focus was to identify appropriate leach testing methods to assess leaching potential under known or expected CCR management conditions (beneficial use or disposal). The EPA's Science Advisory Board and the National Academy of Sciences have in the past raised concerns over the use of single-point pH tests that do not reflect the range of actual conditions under which wastes are plausibly managed.[9] Because metal leaching rates change with changing environmental conditions (especially pH), single point tests may not be the most accurate predictor of potential environmental release of mercury or other metals because they do not provide estimates of leaching under some disposal or reuse conditions that can plausibly occur.

In response to these concerns, a review of available leaching test methods was conducted. A leaching test method [10] based on research conducted at Vanderbilt University in the United States and the Energy Research Center of the Netherlands, among others, was selected to address some of these concerns.

While EPA/ORD's research relied on the Vanderbilt method, similar methods (i.e, tests evaluating leaching at different plausible disposal pH values) have been used to evaluate the leaching behavior and support hazardous waste listings of other materials as well.[11] Because of their general utility, the research methods have been drafted into the appropriate format and are being evaluated for inclusion in EPA's waste analytical methods guidance, SW–846 [12]

[8] *See http://www.epa.gov/safewater/arsenic/regulations.html.*

[9] National Academy of Sciences, Managing Coal Combustion Residues in Mines; The National Academies Press, Washington, DC, 2006.

[10] Kosson, D.S.; Van Der Sloot, H.A.; Sanchez, F.; Garrabrants, A.C., An Integrated Framework for Evaluating Leaching in Waste Management and Utilization of Secondary Materials. Environmental Engineering Science 2002, 19, 159–204.

[11] *See* 65 FR 67100 (November 8, 2000) for a discussion of EPA's use of multi-pH leach testing in support of listing a mercury-bearing sludge from VCM–A production, and EPA/600/R–02/019, September 2001, *Stabilization and Testing of Mercury Containing Wastes: Borden Catalyst.*

[12] Five different methods have been developed for use depending upon the information needed and the waste form.

1. Draft Method 1313—Liquid-Solid Partitioning as a Function of Eluate pH using a Parallel Batch Extraction Test

2. Draft Method 1314—Liquid-Solid Partitioning as a Function of Liquid-Solid Ratio Using an Up-flow Column Test

3. Draft Method 1315—Mass Transfer in Monolithic or Compacted Granular Materials Using a Semi-dynamic Tank Leach Test

4. Draft Method 1316—Liquid-Solid Partitioning as a Function of Liquid-Solid Ratio Using a Parallel Batch Test

5. Draft Method 1317—Concise Test for Determining Consistency in Leaching Behavior

The test methods were developed to identify differences in the constituent leaching rate resulting from the form of the tested material, as well as the effects of pH and the liquid/solid ratio. Fine grained

Continued

to facilitate their routine use for evaluating other wastes or reuse materials (*http://www.epa.gov/osw/hazard/testmethods/sw846/index.htm*).

For the ORD research, equilibrium batch test methods that identify changes in leaching at different pH and liquid/solid ratio values were used to evaluate CCRs resulting from different air pollution controls at coal-fired power plants. This allowed evaluation of leaching potential over a range of field conditions under which CCRs are anticipated to be managed during either disposal or beneficial use applications. Landfill field leachate data from EPA [13] and EPRI [14] studies were used to establish the range of pH conditions expected to be found in actual disposal. From this data set, and excluding the extreme values (below 5th percentile and above 95th percentile), a pH range of 5.4 and 12.4 was determined to represent the range of plausible management conditions (with regard to pH) for CCRs. This means that approximately 5% of the values had a pH below 5.4 and approximately 5% of the values had a pH greater than 12.4. However, it is important to note that 9 of the 34 fly ash samples generated a pH in deionized water (*i.e.,* the pH generated by the tested material itself) below pH 5.4. Therefore, these results might understate CCR leaching potential if actual field conditions extend beyond the pH range of 5.4 and 12.4.

In Tables 4 and 5, the total metals content of the fly ash and FGD gypsum samples evaluated is provided along with the leach test results. Reference indicators (*i.e.,* MCL,[15] TC,[16] and DWEL [17]) are also provided to provide some context in understanding the leach results. It is critical to bear in mind that the leach test results represent a distribution of potential constituent release from the material as disposed or used on the land. The data presented do not include any attempt to estimate the amount of constituent that may reach an aquifer or drinking water well. Leachate leaving a landfill is invariably diluted in ground water to some degree when it reaches the water table, or constituent concentrations are attenuated by sorption and other chemical reactions in groundwater and sediment. Also, groundwater pH may be different from the pH at the site of contaminant release, and so the solubility and mobility of leached contaminants may change when they reach groundwater. None of these dilution or attenuation processes is incorporated into the leaching values presented. That is, no dilution and attenuation factor, or DAF,[18] has been applied to these results. Thus, comparisons with regulatory health values, particularly drinking water values, must be done with caution. Groundwater transport and fate modeling would be needed to generate an assessment of the likely risk that may result from the CCRs represented by these data.

In reviewing the data and keeping these caveats in mind, conclusions to date from the research include:

(1) Review of the fly ash and FGD gypsum data (Tables 4 and 5) show a range of total constituent concentration values that vary over a much broader range than do the leach data. This much greater range of leaching values only partially illustrates what more detailed review of the data shows: That for these CCRs, the rate of constituent release to the environment is affected by leaching conditions (in some cases dramatically so), and that leaching evaluation under a single set of conditions may, to the degree that single point leach tests fail to consider actual management conditions, lead to inaccurate conclusions about expected leaching in the field.

(2) Comparison of the ranges of totals values and leachate data from the complete data set supports earlier conclusions 51[19] [20] [21] that the rate of constituent leaching cannot be reliably estimated based on total constituent concentration alone.

(3) From the more complete data in Report 3, distinctive patterns in leaching behavior have been identified over the range of pH values that would plausibly be encountered for CCR disposal, depending on the type of material sampled and the element. This reinforces the above conclusions based on the summary data.

(4) Based on the data (summarized in Table 4), on the leach results from evaluation of 34 fly ashes across the plausible management pH range of 5.4 to 12.4,

- The leach results at the upper end of the leachate concentration range exceed the TC values for As, Ba, Cr, and Se (indicated by the shading in the table).

(5) Based on the data (summarized in Table 5), on the leach results from evaluation of 20 FGD gypsums across the plausible management pH range of 5.4 to 12.4,

- The leach results at the upper end of the leachate concentration ranges exceed the TC value for Se.

(6) The variability in total content and the leaching of constituents within a material type (*e.g.,* fly ash, gypsum) is such that, while leaching of many samples exceeds one or more of the available health indicators, many of the other samples within the material type may be lower than the available regulatory or health indicators.

materials (e.g., particle sizes of 2 mm or less) will have greater contact with leaching solutions (in a lab test) or rainfall (in the environment) than will solid materials such as concrete or CCRs that are pozzolanic when exposed to water. In applying these methods to CCRs or other materials, batch tests that are designed to reach equilibrium are used with fine-grained or particle-size reduced materials. For solid materials, the tests were designed to evaluate constituent leaching from the exposed surface (leaching of constituents that are either at the surface, or that have migrated over time to the surface), can be used. Testing at equilibrium provides an upper bound estimate of constituent leaching at each set of conditions tested. In some instances, these results may represent the real situation, since when rainfall percolation through a material in the environment is slow, the constituent concentration in the water passing through the materials may reach, or nearly reach equilibrium. Testing of solid (or "monolithic") materials evaluates constituent leaching from materials of low permeability for which most rainfall flows around the material rather than percolating through it. This results in less contact between the rainfall and the material, and so typically, a lower rate of constituent leaching. For monolithic materials, both the equilibrium and monolith tests are conducted to understand the likely initial rates of leaching from the monolith (while it remains solid), and the upper bound on likely leaching, when the monolith degrades over time, exposing more surface area to percolating rainwater, and typically, higher constituent leaching rates. It may also be possible to avoid the cost of testing solid, monolithic materials, if the material leaches at low constituent concentrations under the equilibrium testing conditions.

[13] U.S. EPA (2000) Characterization and evaluation of landfill leachate, Draft Report. 68–W6–0068, Sept 2000.

[14] EPRI (2006) Characterization of Field Leachates at Coal Combustion Product Management Sites: Arsenic, Selenium, Chromium, and Mercury Speciation, EPRI Report Number 1012578. EPRI, Palo Alto, CA and U.S. Department of Energy, Pittsburgh, PA.

[15] MCL is the maximum concentration limit for contaminants in drinking water.

[16] TC is the toxicity characteristic and is a threshold for hazardous waste determinations.

[17] DWEL is the drinking water equivalent level to be protective for non-carcinogenic endpoints of toxicity over a lifetime of exposure. DWEL was developed for chemicals that have a significant carcinogenic potential and provides the risk manager with evaluation on non-cancer endpoints, but infers that carcinogenicity should be considered the toxic effect of greatest concern (*http://www.epa.gov/safewater/pubs/gloss2.html#D*).

[18] For example, EPA used a generic DAF values of 100 in the Toxicity Characteristic final regulation. (*See:* 55 FR 11827, March 29, 1990)

[19] Senior, C; Thorneloe, S.; Khan, B.; Goss, D. Fate of Mercury Collected from Air Pollution Control Devices; EM, July 2009, 15–21.

[20] U.S. EPA, Characterization of Mercury-Enriched Coal Combustion Residuals from Electric Utilities Using Enhanced Sorbents for Mercury Control, EPA–600/R–06/008, Feb. 2006; *http://www.epa.gov/ORD/NRMRL/pubs/600r06008/600r06008.pdf.*

[21] U.S. EPA, Characterization of Coal Combustion Residuals from Electric Utilities Using Wet Scrubbers for Multi-Pollutant Control; EPA–600/R–08/077, July 2008, *http://www.epa.gov/nrmrl/pubs/600r08077/600r08077.pdf.*

Additional or more refined assessment of the dataset may allow some distinctions regarding release potential to be made among particular sources of some CCRs, which may be particularly useful in evaluating CCRs in reuse applications.

EPA anticipates development of a fourth report that presents such additional analysis of the leaching data to provide more insight into constituent release potential for a wider range of CCR management scenarios, including beneficial use applications. This will include calculating potential release rates over a specified time for a range of management scenarios, including use in engineering and commercial applications using probabilistic assessment modeling (Sanchez and Kosson, 2005).[22] This report will be made publicly available when completed.

Finally, the Agency recognizes that this research has generated a substantial amount of data, and believes this data set can be useful as a reference for assessing additional CCR samples in the future. The docket for today's rule therefore includes the full dataset, in the form of a database to provide easier access to EPA's updated leach data.[23]

Table 4. Preliminary Leach Results for 5.4<pH< 12.4 and at "own pH" from Evaluation of Thirty-Four Fly Ashes.

	Hg	Sb	As	Ba	B	Cd	Cr	Co	Pb	Mo	Se	Tl
Total in Material (mg/kg)	0.01 – 1.5	3 - 14	17 - 510	590 – 7,000	NA	0.3 – 1.8	66 - 210	16 - 66	24 - 120	6.9 - 77	1.1 - 210	0.72 - 13
Leach results (ug/L)	<0.01 - 0.50	<0.3 – 11,000	0.32 – 18,000	50 – 670,000	210 – 270,000	<0.1 - 320	<0.3 – 7,300	<0.3 - 500	<0.2 - 35	<0.5 – 130,000	5.7 – 29,000	<0.3 - 790
TC (ug/L)	200	-	5,000	100,000	-	1,000	5,000	-	5,000	-	1,000	-
MCL (ug/L)	2	6	10	2,000	7,000 DWEL	5	100	-	15	200 DWEL	50	2

Note: The dark shading is used to indicate where there could be a potential concern for a metal when comparing the leach results to the MCL, DWEL, or concentration level used to determine the TC. Note that MCL and DWEL values are intended to represent concentrations at a well and the point of exposure; leachate dilution and attenuation processes that would occur in groundwater before leachate reaches a well are not accounted for, and so MCL and DWEL values cannot be directly compared with leachate values.

[22] Sanchez, F., and D. S. Kosson, 2005. Probabilistic approach for estimating the release of contaminants under field management scenarios. *Waste Management* 25(5), 643–472 (2005).

[23] The database, called "Leach XS Lite" can be used to estimate the leaching potential of CCRs under any specified set of pH or infiltration conditions that may occur in the field. While the database is presented as a "Beta" version, and may be further developed, the data presented in the data base are final data, from the three EPA research reports cited above.

Table 5. Preliminary Leach Results for 5.4<pH< 12.4 and at "own pH" from Evaluation of Twenty FGD Gypsums.

	Hg	Sb	As	Ba	B	Cd	Cr	Co	Pb	Mo	Se	Tl
Total in Material (mg/kg)	0.01 – 3.1	0.14 – 8.2	0.95 - 10	2.4 - 67	NA	0.11 – 0.61	1.2 – 20	0.77 – 4.4	0.51 - 12	1.1 - 12	2.3 - 46	0.24 – 2.3
Leach results (ug/L)	<0.01 - 0.66	<0.3 - 330	0.32 – 1,200	30 - 560	12 – 270,000	<0.2 - 370	<0.3 – 240	<0.2 – 1,100	<0.2 - 12	0.36 – 1,900	3.6 – 16,000	<0.3 – 1,100
TC (ug/L)	200	-	5,000	100,000	-	1,000	5,000	-	5,000	-	1,000	-
MCL (ug/L)	2	6	10	2,000	7,000 DWEL	5	100	-	15	200 DWEL	50	2

Note: The dark shading is used to indicate where there could be a potential concern for a metal when comparing the leach results to the MCL, DWEL, or concentration level used to determine the TC. Note that MCL and DWEL values are intended to represent concentrations at a well and the point of exposure; leachate dilution and attenuation processes that would occur in groundwater before leachate reaches a well are not accounted for, and so MCL and DWEL values cannot be directly compared with leachate values.

G. Current Federal Regulations or Standards Applicable to the Placement of CCRs in Landfills and Surface Impoundments.

CCR disposal operations are typically regulated by state solid waste management programs, although in some instances, surface impoundments are regulated under the states water programs. However, there are limited regulations of CCRs at the federal level.

The discharge of pollutants from CCR management units to waters of the United States are regulated under the National Pollutant Discharge Elimination System (NPDES) at 40 CFR Part 122, authorized by the Clean Water Act (CWA). NPDES permits generally specify an acceptable level of a pollutant or pollutant parameter in a discharge. NPDES permits ensure that a state's mandatory standards for clean water and the federal minimums are being met. A number of the damage cases discussed in the preamble also involved surface water contamination, which were violations of the NPDES permit requirements.

II. New Information on the Placement of CCRs in Landfills and Surface Impoundments

A. New Developments Since the May 2000 Regulatory Determination.

Since publication of the May 2000 Regulatory Determination, new information and data have become available, including additional damage cases, risk modeling, updated information on current management practices and state regulations associated with the disposal of CCRs, petitions from environmental and citizens groups for EPA to develop rules for the management of CCRs, an industry voluntary agreement on how they would manage CCRs, and a proposal from environmental and citizens groups for a CCR rule. Much of this new information was made available to the public in August 2007 through a Notice of Data Availability (NODA) at 72 FR 49714 (*http://www.epa.gov/fedrgstr/EPA-WASTE/2007/August/Day-29/f17138.pdf*). EPA has received extensive comments from environmental groups, industry, states and others in response to the NODA and as we have moved toward rulemaking. All of the comments and subsequent information we have received are included in the docket to this proposal. The new information on risks and the damage cases are discussed briefly below and in more detail in subsequent sections of this proposed rule; a more detailed discussion of this new information is discussed in other sections of the preamble.

At the time of the May 2000 Regulatory Determination, the Agency was aware of 14 cases of proven damages [24] and 36 cases of potential damages resulting from the disposal of

[24] As discussed later in the preamble, 11 of these documented cases of damage were to human health and the environment, while four of these cases were cases of ecological damage, one of which has now been reclassified as a potential damage case.

CCRs. The Agency has since learned of an additional 13 cases of proven damages and 4 cases of potential damages, including a catastrophic release of CCRs from a disposal unit at the Tennessee Valley Authority (TVA) Kingston facility in Harriman, Tennessee in December 2008. In total, EPA has documented 27 cases of proven damages and 40 cases of potential damages resulting from the disposal of CCRs. Proven damage cases have been documented in 12 states, and potential damage cases—in 17 states. *See* section II.C. and the Appendix to this proposal for more detailed discussions of EPA's CCR damage cases.

As part of the process for making the May 2000 Regulatory Determination for CCRs, EPA prepared a draft quantitative risk assessment. However, because of time constraints, the Agency was unable to address public comments on the draft risk assessment in time for the Regulatory Determination. Between 2000 and 2006, EPA addressed the public comments and updated the quantitative risk assessment for the management of CCR in landfills and surface impoundments. The revised risk assessment was made available for public comment in the August 2007 draft report titled "Human and Ecological Risk Assessment of Coal Combustion Wastes."

In the May 2000 Regulatory Determination, the Agency concluded that the utility industry had made significant improvements in its waste management practices for new landfills and surface impoundments since the practices reflected in the 1999 Report to Congress, and that most state regulatory programs had similarly improved. To verify its conclusion, in 2005, the U.S. Department of Energy (DOE) and EPA conducted a joint study to collect more recent information on the management practices for CCRs by the electric power industry, and state programs in 11 states. The results of the study were published in the report titled "Coal Combustion Waste Management at Landfills and Surface Impoundments, 1994–2004." Additionally, we are aware of at least one state (Maryland) that has recently amended its regulatory requirements for the management of CCRs.

In February 2004, 125 environmental and citizens groups petitioned the EPA Administrator for a rulemaking prohibiting the disposal of coal power plant wastes into groundwater and surface water until such time as EPA promulgates federally enforceable regulations pursuant to RCRA. A copy of the petition is available at *http://www.regulations.gov/fdmspublic/component/main?/main=DocumentDetail&o=09000064801cf8d1.*

In October 2006, the utility industry through their trade association, the Utility Solid Waste Activities Group (USWAG) submitted to EPA a "Utility Industry Action Plan for the Management of Coal Combustion Products." The plan outlines the utility industry's commitment to adopt groundwater performance standards and monitoring, conduct risk assessments prior to placement of CCRs in sand and gravel pits, and to consider dry-handling prior to constructing new disposal units.

In January 2007, environmental and citizens groups submitted to EPA a "Proposal for the Federal Regulation of Coal Combustion Waste." The proposal provides a framework for comprehensive regulation under subtitle D of RCRA for waste disposed of in landfills and surface impoundments generated by coal-fired power plants. Then in July 2009, environmental and citizens groups filed a second petition requesting that the EPA Administrator promulgate regulations that designate CCRs as hazardous waste under subtitle C of RCRA.[25] In support of their petition, the environmental groups cited "numerous reports and data produced by the Agency since EPA's final Regulatory Determination * * * which quantify the waste's toxicity, threat to human health and the environment, inadequate state regulatory programs, and the damage caused by mismanagement." A copy of the petition is available in the docket to this proposal. The Agency has, as yet, not made a decision as to whether to lift the Bevill exemption, and, while it has determined that federal regulation is appropriate, it has not made a determination as to whether regulations should be promulgated under subtitles C or D of RCRA. Consequently, EPA is deferring its response to the petitioner. However, the preamble discusses the issues raised in these petitions at length. In addition, the Agency is deferring its proposed response to the petitioners' request regarding the placement of CCRs in minefills as the Agency will work with OSM to address the management of CCRs in minefills in a separate rulemaking action. (*See* discussion in other parts of the preamble for the Agency's basis for its decisions.)

In August 2007, EPA published a NODA (72 FR 49714, *http://www.epa.gov/fedrgstr/EPA-WASTE/2007/August/Day-29/f17138.htm*) which made public, and sought comment on, the new information we received since the May 2000 Regulatory Determination through 2007, except for the July 2009 petition entitled, *Petition for Rulemaking Pursuant to Section 7004(a) of the Resource Conservation and Recovery Act Concerning the Regulation of Coal Combustion Waste and the Basis for Reconsideration of the 2000 Regulatory Determination Concerning Wastes from the Combustion of Fossil Fuels.* The new information included the joint DOE and EPA report entitled: *Coal Combustion Waste Management at Landfills and Surface Impoundments, 1994–2004;* the draft risk assessment; and EPA's damage case assessment. EPA also included in the docket to the NODA the February 2004 Petition for Rulemaking submitted by a number of environmental and citizens' groups to prohibit the placement or disposal of CCRs into ground water and surface water; and two suggested approaches for managing CCRs in landfills and surface impoundments. One approach is the Voluntary Action Plan that was formulated by the electric utility industry. The second approach was the January 2007 framework prepared by a number of environmental and citizens' groups proposing federal regulation under subtitle D of RCRA for CCRs generated by U.S. coal-fired power plants and disposed of in landfills and surface impoundments. The Agency received a total of 396 comments on the NODA from 375 citizens and citizen and environmental groups, 16 industry groups, and 5 state and local government organizations. In general, citizens, citizens groups, and environmental groups commented that state regulations are inadequate and called on EPA to develop enforceable regulations for the disposal of CCRs under the hazardous waste provisions of RCRA. Industry groups, on the other hand, stated that the significant recent improvement in industry management and state regulatory oversight of CCR disposal demonstrates that the conditions that once led EPA to determine that federal subtitle D regulations were warranted no longer exist and therefore, further development of subtitle D regulations is no longer necessary. In September 2008, the Environmental Council of the States (ECOS) issued a resolution that states already have regulations in place that apply to CCRs, and a federal regulation is not necessary. The 2008 ECOS resolution was revised in March 2010 and calls upon EPA to conclude that

[25] This rulemaking petition was filed by: Earthjustice; the Sierra Club; the Environmental Integrity Project; the Natural Resources Defense Council; the Southern Environmental Law Center; and Kentucky Resources Council.

additional federal CCR regulations would be duplicative of most state programs, are unnecessary, and should not be adopted, but if adopted must be developed under RCRA subtitle D rather than RCRA subtitle C (*see http://www.ecos.org/files/4018_file_Resolution_08_14_2010_version.doc*). Comments on the NODA are available in the docket to the NODA at *http://www.regulations.gov,* docket number EPA–HQ–RCRA–2006–0796.

Finally, in July and August of 2008, EPA conducted a peer review of the 2007 draft risk assessment "Human and Ecological Risk Assessment of Coal Combustion Wastes." The peer review was conducted by a team of five experts in groundwater modeling, environmental fate and transport modeling, and human health and ecological risk assessment. EPA has revised its risk assessment based on the peer review comments. Results of the peer review and the revised risk assessment are included in the docket to this proposal. Also, *see* section II.B. below and the document titled "What Are the Environmental and Health Effects Associated with Disposing of CCRs in Landfills and Surface Impoundments?" available from the docket to this notice for more detailed discussions of the risk assessment.

In summary, since the May 2000 Regulatory Determination, the Agency has (1) Documented an additional 17 cases of damage from the disposal of CCRs (13 proven and 3 potential); (2) gathered additional information on industry practices; (3) revised its risk assessment, based on comments received on the 1999 Report to Congress, conducted a peer review of the revised risk assessment, and further revised its risk assessment based on peer review comments and comments received on the August 2007 NODA; (4) received a voluntary action plan from the utility industry; (5) received two petitions for rulemaking from environmental and citizens groups; and (6) received a proposal for regulating the management of CCRs in landfills and surface impoundments from environmental and citizens groups. EPA has considered all of this information in making the decisions on the proposals in this notice.

B. CCR Risk Assessment

In making the May 2000 Regulatory Determination for CCRs, EPA prepared a draft quantitative risk assessment based on groundwater modeling. However, commenters from all sides raised fundamental scientific questions with the study, and raised issues that went beyond groundwater modeling capability at the time. EPA was unable to address these issues in the available time, and therefore did not rely on the draft risk assessment as part of its basis in making its May 2000 Regulatory Determination; rather we relied on the damage cases identified, as well as other information. In this regard, it is worth noting that EPA did not conclude that the available information regarding the extent or nature of the risks were equivocal. Rather, EPA noted that we had not definitively assessed the ground water risks, due to the criticisms of our draft risk assessment, but still concluded that there were "risks from arsenic that we cannot dismiss." Largely what drove the risks in the original risk assessment were the old units that lacked liners and ground water monitoring (for landfills, only 57% of the units had liners and 85% of the units had ground water monitoring, while for surface impoundments, only 26% of the units had liners and only 38% of the units had ground water monitoring).

Between 2000 and 2006, EPA addressed public comments and updated the quantitative risk assessment for the management of CCRs in landfills and surface impoundments. The purpose of the risk assessment is to identify CCR constituents, waste types, liner types, receptors, and exposure pathways with potential risks and to provide information that EPA can use as we continue to evaluate the risks posed by CCRs disposed of in landfills and surface impoundments. The risk assessment was designed to develop national human and ecological risk estimates that are representative of onsite CCR management settings throughout the United States. A revised draft risk assessment was made available to the public through the August 2007 NODA (which is discussed in other sections of the preamble) and is available at *http://www.regulations.gov/fdmspublic/component/main?main=DocumentDetail&o=090000648027b9cc.*

EPA submitted the revised draft risk assessment report, together with public comments on the report in response to the 2007 NODA, to a peer review panel. EPA completed the risk assessment, taking into account peer review comments, in a final report titled "Human and Ecological Risk Assessment of Coal Combustion Wastes," (September 2009). The report, peer review comments, and EPA's response to the peer review comments are available in the docket for this proposal.

For purposes of this rulemaking, EPA defined the target level of protection for human health to be an incremental lifetime cancer risk of no greater than one in 100,000 (10^{-5}) for carcinogenic chemicals and a hazard quotient of 1.0 for noncarcinogenic chemicals. The hazard quotient is the ratio of an individual's chronic daily dose of a constituent to the reference dose for that constituent, where the reference dose is an estimate of the daily dose that is likely to be without appreciable risk of deleterious effects over a lifetime. These are the target levels that EPA typically uses in its listing decisions. (*See,* for example, the final rule for Nonwastewaters From Productions of Dyes, Pigments, and Food, Drug, and Cosmetic Colorants (70 FR 9144) at *http://www.epa.gov/wastes/laws-regs/state/revision/frs/fr206.pdf.*)

The results of this risk assessment provide further confirmation of the high risks presented in the mismanagement of CCRs disposed in landfills and surface impoundments. The assessment does confirm that there are methods to manage CCRs safely, although it calls into question the reliability of clay liners, especially in surface impoundments, and it points to very high potential risks from unlined surface impoundments.

Specifically, the revised draft CCR risk assessment presents results at a typical exposure (50th percentile), as well as a high-end exposure (90th percentile) risk based on a probabilistic analysis. The revised draft CCR risk assessment results at the 90th percentile suggest that the management of CCRs in unlined or clay-lined waste management units (WMUs) result in risks greater than the risk criteria of 10^{-5} for excess cancer risk to humans or an HQ greater than 1 for noncancer effects to both human and ecological receptors which are the criteria generally used in EPA's listing determination procedure.[26] While still above the criteria, clay-lined units tended to have lower risks than unlined units. However, it was the composite-lined units that effectively reduced risks from all pathways and constituents below the risk criteria. More specifically:

○ For humans exposed via the groundwater-to-drinking-water pathway, estimated risks from clay-lined landfills that dispose of CCRs or

[26] EPA's hazardous waste listing determination policy is described in the notice of proposed rulemaking for wastes from the dye and pigment industries at 59 FR 66075–66077 *available at http://www.epa.gov/fedrgstr/EPA-WASTE/1994/December/Day-22/pr-98.html* and in the final rule for Nonwastewaters From Productions of Dyes, Pigments, and Food, Drug, and Cosmetic Colorants (70 FR 9144) at *http://www.epa.gov/wastes/laws-regs/state/revision/frs/fr206.pdf.*

CCRs co-managed with coal refuse are lower than those for unlined landfills. However, the 90th percentile risk estimates, for arsenic that leaks from clay-lined landfills are still above the risk criteria—as high as 1 in 5,000 individual lifetime excess cancer risk.[27] When landfills are unlined, estimated risks above the criteria occur for antimony and molybdenum, as well as arsenic (as high as 1 in 2,000 individual lifetime excess cancer risk). In addition to arsenic, clay-lined fluidized bed combustion (FBC) landfills also presented estimated 90th percentile risks above the criteria for antimony. However, unlined FBC landfills differed in that they were estimated to exceed the risk criteria only for arsenic.[28] At the 50th percentile, only trivalent arsenic from CCRs codisposed with coal refuse was estimated to exceed the risk criteria with cancer risks of 1 in 50,000.

○ Arsenic and cobalt were the constituents with the highest estimated risks for surface impoundments. Clay-lined surface impoundments were estimated to present 90th percentile risks above the criteria for arsenic, boron, cadmium, cobalt, molybdenum, and nitrate. The 90th percentile clay-lined impoundment estimated risks and hazard quotients (HQs) were as follows: for arsenic, the estimated risk was as high as 1 in 140; cobalt's estimated HQ as high as 200, while the estimated HQs for boron, cadmium, molybdenum and nitrate ranged from 2 to 20. The 90th percentile unlined surface impoundment estimates were above the criteria for constituents that include arsenic, lead, cobalt and selenium: estimated arsenic cancer risks are as high as 1 in 50, and non-cancer effects estimates for cobalt ranged from an estimated HQ of 0.9 to 500 depending on whether CCRs were co-managed with coal refuse. At the 50th percentile, the only surface impoundment results estimated to exceed the risk criteria were arsenic and cobalt: unlined impoundments had estimated arsenic cancer risks as high as 6 in 10,000, while clay-lined impoundments had estimated arsenic cancer risks as high as 1 in 5,000. The 50th percentile noncancer HQs due to cobalt in drinking water were estimated to be as high as 20 and 6 for unlined and clay-lined surface impoundments, respectively.

○ Composite liners, as modeled in this assessment, effectively reduce risks from all constituents to below the risk criteria for both landfills and surface impoundments at the 90th and 50th percentiles.

○ The model generally predicts that groundwater risks will occur centuries later for landfills than for surface impoundments. For the groundwater-to-drinking water pathway for unlined landfills, arrival times of the peak concentrations at a receptor well peaked in the hundreds or thousands of years, while unlined surface impoundment risks typically peaked within the first 100 years. Clay liners resulted in later arrival of peak risks, nearly always in the thousands of years for landfills but still in the first few hundred years for surface impoundments. Finally, while composite liners often resulted in a failure of the plume to reach groundwater wells, composite-lined landfills with plumes that were estimated to reach groundwater wells eventually had peak arsenic-in-groundwater concentrations at approximately 10,000 years, while composite-lined surface impoundments' plumes peaked in the thousands of years.

○ For humans exposed via the groundwater-to-surface-water (fish consumption) pathway, unlined and clay-lined surface impoundments were estimated to pose risks above the criteria at the 90th percentile. For CCRs managed alone in surface impoundments, these exceedances came from selenium (estimated HQs of 3 and 2 for unlined and clay-lined units, respectively). For CCRs co-managed with coal refuse, these exceedences came from arsenic (3 in 100,000 and 2 in 100,000 estimated excess cancer risks for unlined and clay-lined units, respectively). All 50th percentile surface impoundment risks are estimated to be below the risk criteria. No constituents pose estimated risks above the risk criteria for landfills (including FBC landfills) at the 90th or 50th percentile.

○ EPA also conducted a separate draft fugitive dust screening assessment which indicates that, without fugitive dust controls, there could be exceedances of the National Ambient Air Quality Standards for fine particulate matter in the air at residences near CCR landfills.[29] The 1998 risk assessment[30] also showed risks from inhalation of chromium in fugitive dust but at levels below the criteria.[31]

EPA recognizes that there are significant uncertainties in national risk assessments of this nature, although it did attempt to address potential uncertainties through Monte Carlo and sensitivity analyses. Uncertainties discussed in the revised risk assessment include:

- The locations and characteristics of currently operating facilities;
- The failure to account for direct discharges to surface water;
- Changing conditions over the 10,000-year period modeled;
- Shifting populations and ecological receptors;
- Additive risks from multiple constituents or multiple pathways;
- Clean closure of surface impoundments;
- The speciation and bioavailability of constituents;
- The effect of compacting CCRs before disposal;
- The assumption that all disposal units are above the water table;
- Full mixing of the groundwater plume;
- The choice of iron sorbent in the soil;
- The appropriateness of the leachate data used and the treatment of nondetects;
- The distance to receptor wells and surface water bodies; and
- The potential conservativeness of human health benchmarks.

The Agency, however, does solicit comment on several specific aspects of the underlying risk assessment. In particular, EPA requests comment on whether clay liners designed to meet a $1x10^{-7}$ cm/sec hydraulic conductivity might perform differently in practice than modeled in the risk assessment. Thus, EPA solicits specific data on the hydraulic conductivity of clay liners associated with CCR disposal units. In addition to the effectiveness of various liner systems, the hydraulic conductivity of coal ash can be reduced with the appropriate addition of moisture followed by compaction to attain 95% of the standard Proctor

[27] Excess cancer risk means risk in addition to pre-existing, "background" risk from other exposures.

[28] Unlined FBC landfills showed less risk as modeled; note that the number of FBC landfills modeled was very small (seven).

[29] EPA's decision to address fugitive dust was based on a peer review comment to the draft Risk Assessment, stakeholder NODA comments, photographic documentation of fugitive dust associated with the hauling and disposal of CCRs, Agency efforts to control fugitive dust emissions from the TVA Kingston spill (see e.g., *http://www.epakingstontva.com/EPA%20Air%20Audits%20and%20Reviews/Kingston%20Fly%20Ash%20-%20EPA%20Audit.pdf*), and OSHA's requirement for MSDS sheets for coal ash.

[30] Non-Groundwater Pathways, Human Health and Ecological Risk Analysis for Fossil Fuel Combustion Phase 2 (FFC2): Draft Final Report (*http://www.epa.gov/osw/nonhaz/industrial/special/fossil/ngwrsk1.pdf*).

[31] All chromium present in the particulate matter was assumed to be in the more toxic, hexavalent form.

maximum dry density value.[32] This concept, it has been reported, could potentially be taken further with the use of compaction coupled with the addition of organosilanes. According to recent studies, organosilanes could take the hydraulic conductivity to zero.[33] EPA solicits comments on the effectiveness of such additives, including any analysis that would reflect long-term performance, as well as the appropriateness of a performance standard that would allow such control measures in lieu of composite liners. EPA has also observed that surface impoundments are often placed right next to surface water bodies which may present complex subsurface environments not considered by the groundwater model, and therefore EPA seeks data on the distance of surface impoundments to water bodies, site specific groundwater risk analysis which accounts for the presence of a nearby surface water body, and groundwater monitoring data associated with such sites.

In characterizing CCRs and utilizing such data for the risk analysis, EPA gathered a variety of data over a long period of time. As a general matter, EPA finds these data to be an accurate characterization, and that the values are in line with recent studies EPA has conducted to characterize new air pollution controls. However, with respect to a few of the highest surface impoundment porewater concentrations (for arsenic in particular), questions have been raised regarding the representativeness of these individual data points. In one case, a facility with the highest arsenic pore water concentration (86.0 mg/L) involved values that were measured in a section of a surface impoundment where coal refuse (defined as coal waste from coal handling, crushing, and sizing operations) was disposed of at the water surface. Pore water samples taken in the coal ash sediment beneath the coal refuse involved concentrations of arsenic as low as 0.003 mg/L. Thus, there is the question of whether those pore water samples measured in the coal refuse represent what leaches out of the bottom of the surface impoundment.

The next highest arsenic values (an average of 5.37 mg/L over 4 samples with the highest concentration being 15.5 mg/L) came from site CASJ (known as SJA in the EPRI report). The concern is that arsenic in the pore water was orders of magnitude higher than in the pond water. That type of change doesn't appear to occur for other constituents in these samples or for arsenic in samples from other surface impoundments. EPA recently attempted to obtain further information that could assist us to better characterize these specific data, but the data are old, the impoundment is no longer in operation, and there are apparently no additional records upon which to draw conclusions.

Additional high concentration values, especially for lead, are associated with ash data provided by Freeman United Mining, which acquired ash for a minefilling project. None of this ash data is associated with electric utilities, but rather with other coal combusters such as John Deere, American Cyanamid, and Washington University in St. Louis, Missouri. The Agency is uncertain whether the high lead levels are associated with lead levels in the source coal, the operations at these facilities, or whether other wastes were mixed with the CCRs.

While these concerns are associated with a small fraction of the data, these data reflect the highest concentrations, and thus can be important considerations in the risk analysis. Based on the above concerns, EPA solicits comment on several questions.

- For the highest concentrations in EPA's database, such as the examples mentioned above, are there values that do not appropriately represent leaching to groundwater, and if so, why not?
- Are there any additional data that are representative of CCR constituents in surface impoundment or landfill leachate (from literature, state files, industry or other sources) that EPA has not identified?
- EPA understands that the disposal practices associated with coal refuse in surface impoundments may have improved based on the development of an industry guide.[34] EPA solicits information on the degree to which coal refuse management practices have changed since the issuance of the guide and the impacts of those changes (*e.g.,* have concentrations of arsenic been reduced in leach samples that have been taken at facilities operating in concert with the industry guide).
- For CCR surface impoundments, are there any examples of pore water concentrations for arsenic increasing orders of magnitude over pond water concentrations?

For more detailed discussions of the CCR risk assessment, *see* the document titled: "What Are the Environmental and Health Effects Associated with Disposing of CCRs in Landfills and Surface Impoundments?" and the report titled "Human and Ecological Risk Assessment of Coal Combustion Wastes" which are included in the docket to this notice.

C. Damage Cases

Under the Bevill Amendment for the "special waste" categories of RCRA, EPA was statutorily required to examine "documented cases in which danger to human health or the environment from surface runoff or leachate has been proved" from the disposal of coal combustion wastes (RCRA Section 8002(n)). The criteria used to determine whether danger to human health and the environment has been proven are described in detail in the May 2000 Regulatory Determination at 65 FR 32224.[35]

At the time of the May 2000 Regulatory Determination, the Agency was aware of 11 documented cases of proven damage to ground water and 36 cases of potential damage to human health and the environment from the improper management of CCRs in landfills and surface impoundments. Additionally, the Agency determined that another four cases were documented cases of ecological damages.[36] However, for the May 2000 Regulatory Determination, EPA did not consider these ecological damage cases because all involved some form of discharge from waste management units to nearby lakes or creeks that would be subject to the Clean Water Act regulations. Moreover, EPA concluded that the threats in those cases were not substantial enough to cause large scale, system level ecological disruptions. On review, EPA has concluded that the ecological damage cases are appropriate for consideration because, while they might involve CWA violations, they nevertheless reflect damages from CCR disposal that might be handled under RCRA controls. And, while they may or may not have involved "systems-level"

[32] The standard and modified Proctor compaction tests (ASTM D 698 and D 1557 respectively) are used to determine the maximum achievable density of soils and aggregates by compacting the soil or aggregate in a standardized mould at a standardized compactive force. The maximum dry density value (or maximum achievable dry density value) is determined by dividing the mass of the compacted material (weight divided by the gravitational force) by the volume of the compacted material.

[33] "Organo-silane Chemistry: A Water Repellant Technology for Coal Ash and Soils," John L. Daniels, Mimi S. Hourani, and Larry S. Harper, 2009 World of Coal Ash Conference. *Available at http://www.flyash.info/2009/025-daniels2009.pdf* and in the docket to this proposal.

[34] Guidance for Comanagement of Mill Rejects at Coal-Fired Power Plants, Electric Power Research Institute, 1999. Available in the docket to this proposal.

[35] For definition of "proven damage case," see section C in the Supplementary Information section.

[36] Ecological damages are damages to mammals, amphibians, fish, benthic layer organisms and plants.

disruption, they were significant enough to lead to state response actions, *e.g.,* fish advisories. EPA now believes that ecological damages warranting state environmental response are generally appropriate for inclusion as damage cases, and to fail to include them would lead to an undercounting of real and recognized damages. Accordingly, at the time of the May 2000 Regulatory Determination, in total, 15 cases of proven damages had occurred. Subsequently, one of the 15 proven damage cases has been reclassified as a potential damage case, resulting in a total of 14 proven cases of damage, as of the May 2000 Regulatory Determination.

Since the May 2000 Regulatory Determination, additional damage cases, including ecological damage cases, have occurred, and were discussed in the August 2007 NODA. Specifically, EPA has gathered or received information on 135 alleged damage cases. Six of the alleged damage cases have been excluded from this analysis because they involved minefills, a management method which is outside the scope of this proposal, while sixty-two of the damage cases have not been further assessed because there was little or no information supporting the concerns identified. Of the remaining 67 damage cases evaluated, EPA determined that 24 were proven cases of damage (which includes the 14 proven damage cases from the May 2000 Regulatory Determination); of the 24 damage cases, eight were determined to be proven damages to surface water and sixteen were determined to be proven damages to ground water, with four of the cases to groundwater being from unlined landfills, five coming from unlined surface impoundments, one was from a surface impoundment where it was unclear whether it was lined, and the remaining six cases coming from unlined sand and gravel pits. Another 43 cases (which includes the 36 potential damage cases from the May 2000 Regulatory Determination) were determined to be potential damages to groundwater or surface water; however, four of the potential damage cases were attributable to oil combustion wastes and thus are outside the scope of this proposal; therefore, resulting in 39 CCR potential damage cases. The remaining 10 alleged damage cases were not considered to be proven or potential damage cases due to a lack of evidence that damages were uniquely associated with CCRs; therefore, they were not considered to be CCR damage cases.

Finally, within the last couple of years, EPA has learned of an additional five cases of claimed damage. Two of the cases involve the structural failure of the surface impoundment; *i.e.,* dam safety and structural integrity issues, a pathway which EPA did not consider at the time of the May 2000 Regulatory Determination. These cases are (1) a 0.5 million cubic yard release of water and fly ash to the Delaware River at the Martin's Creek Power Plant in Pennsylvania in 2005, leading to a response action costing $37 million, and (2) the catastrophic failure of a dike at TVA's Kingston, Tennessee facility, leading to the release of 5.4 million cubic yards of fly ash sludge over an approximately 300 acre area and into a branch of the Emory River, followed by a massive cleanup operation overseen by EPA and the state of Tennessee. EPA classifies these as proven damage cases. Another case involved the failure of a discharge pipe at the TVA Widows Creek plant in Stevenson, Alabama, resulting in a 6.1 million gallon release from an FGD pond, leading to $9.2 million in cleanup costs. EPA did not classify this as a damage case, because samples at relevant points of potential exposure did not exceed applicable standards. Two other cases involved the placement of coal ash in large scale fill operations. The first case, the BBBS Sand and Gravel Quarries in Gambrills, Maryland, involved the disposal of fly ash and bottom ash (beginning in 1995) in two sand and gravel quarries. EPA considers this site a proven damage case, because groundwater samples from residential drinking wells near the site include heavy metals and sulfates at or above groundwater quality standards, and the state of Maryland is overseeing remediation. The second case is the Battlefield Golf Course in Chesapeake, Virginia where 1.5 million yards of fly ash were used as fill and for contouring of a golf course. Groundwater contamination above drinking water levels has been found at the edges and corners of the golf course, but not in residential wells. An EPA study in April 2010 established that residential wells near the site were not impacted by the fly ash and, therefore, EPA does not consider this site a proven damage case. However, due to the onsite groundwater contamination, EPA considers this site to be a potential damage case. Thus, the Agency has classified three of the five new cases as proven damage cases, one as a potential damage case, and the other as not being a damage case (*i.e.,* not meeting the criteria to be considered either a proven or potential damage case). This brings the total number of proven damage cases to 27 and 40 potential cases of damage from the mismanagement of CCRs being disposed.

The Martins Creek and TVA Kingston fly ash impoundment failures underscore the need for surface impoundment integrity requirements. In the case of the Martins Creek failure, 0.5 million cubic yards of fly ash slurry was released into the Delaware River when a dike failed. Fortunately, there are no homes in the path of the release and all the damage was confined to power plant property and the Delaware River. On the other hand, the 5.4 million cubic yards of fly ash sludge released as a result of the TVA Kingston impoundment failure covered an area of approximately 300 acres, flowed into a branch of the Emory River, disrupted power, ruptured a gas line, knocked one home off its foundation and damaged others. Fortunately, there were no injuries.

While much of our risk modeling deals with ground water contamination, based on historical facts, EPA recognizes that failures of large CCR impoundments can lead to catastrophic environmental releases and large cleanup costs. It is critical to understand as well, however, that the structural integrity requirements and the requirements for conversion or retrofitting of existing or new impoundments are designed to avoid such releases and that the benefits of avoiding such catastrophic failures are very significant. As discussed in more detail in Section XII of today's proposal and as fully explained in our Regulatory Impact Analysis (RIA), EPA estimated the benefits of avoiding the future cleanup costs of or impoundment failures. Depending on the regulatory option chosen, the annualized benefits range from $29 million to $1,212 million per year, and the net present value of these ranges from $405 million to $16,732 million. In addition, the RIA did not quantify or monetize several other additional benefits consisting of future avoided social costs associated with ecological and socio-economic damages. These include avoided damages to natural resources, damages to property and physical infrastructure, avoided litigation costs associated with such events, and reduction of toxic chemical-contaminated effluent discharges from impoundments to surface waters.

In December 2009, EPA received a new report from EPRI challenging our conclusions on many of the proven damage cases often noting that there was not significant off-site contamination.

The report, "Evaluation of Coal Combustion Product Damage Cases (Volumes 1 and 2), Draft Report,

November 2009," is available in the docket to this proposal. EPA solicits comments on EPRI's report and welcomes additional data regarding the proven damage cases identified by EPA, especially the degree to which there was off-site contamination.

EPA notes that several stakeholders have very recently identified additional claimed damage cases, and the agency has not had the time to review them closely.[37] Similarly, other stakeholders have recently provided valuable information on CCR risks, costs of different possible options, and characterization data, which EPA has also not had time to review in detail or to respond to. Generally, these reports include information that is relevant to today's proposal. EPA will review this information carefully as we proceed to a final rule, and we encourage commenters on the proposal to consider this material, which EPA has placed in the rulemaking docket, as they prepare comments.

For a more detailed discussion of the damage cases, *see* the Appendix to this notice, the table "Summary of Proven Cases with Damages to Groundwater and to Surface Water" at the end of the Appendix, and the document "Coal Combustion Wastes Damage Case Assessments" available at *http://www.regulations.gov/fdmspublic/component/main?main=DocumentDetail&d=EPA-HQ-RCRA-2006-0796-0015*.

III. Overview and Summary of the Bevill Regulatory Determination and the Proposed Subtitle C and Subtitle D Regulatory Options

In today's notice, EPA is reevaluating its August 1993 and May 2000 Bevill Regulatory Determinations regarding CCRs generated at electric utilities and independent power producers. In the May 2000 determination, EPA concluded that disposal of CCRs did not warrant regulation under RCRA subtitle C as a hazardous waste, but did warrant federal regulation as a solid waste under subtitle D of RCRA. However, EPA never issued federal regulations under subtitle D of RCRA for CCRs. (As noted previously, today's proposal could result in the development of subtitle D standards consistent with the May 2000 Regulatory Determination, or with a revision of the determination, or the issuance of subtitle C standards under RCRA.) Today, EPA is reconsidering this determination, and is soliciting comments on two alternative options: (1) to reverse the Bevill determination (with respect to disposal of CCRs in surface impoundments and landfills), and regulate such CCRs as special wastes under RCRA subtitle C, and (2) to leave the Bevill determination in place and regulate CCRs going to disposal under federal RCRA subtitle D standards. Today's co-proposal provides regulatory text for both options.

In determining whether or not to exclude a Bevill waste from regulation under RCRA subtitle C, EPA must evaluate and weigh eight factors. In section IV. B. of this preamble, EPA discusses CCRs from electric utilities in light of these factors, and we highlight the considerations that might lead us to reversing the August 1993 and May 2000 Regulatory Determinations (and therefore regulate CCR disposal under RCRA subtitle C), or to leave the determination in place (and regulate CCR disposal under RCRA subtitle D).

At the same time, EPA continues to believe the Bevill exclusion should remain in place for CCRs going to certain beneficial uses, because of the important benefits to the environment and the economy from these uses, and because the management scenarios for these products are very different from the risk case being considered for CCR disposal in surface impoundments and landfills. EPA makes it clear that CCRs in sand and gravel pits, quarries, and other large fill operations is not beneficial use, but disposal. As such, it would be regulated under whichever option is finalized. EPA solicits comments, however, on whether unencapsulated uses of CCRs warrant tighter federal control.

A. Summary of Subtitle C Proposal

In combination with its proposal to reverse the Bevill determination for CCRs destined for disposal, EPA is proposing to list as a special waste, CCRs from electric utilities and independent power producers when destined for disposal in a landfill or surface impoundment. These CCRs would be regulated under the RCRA subtitle C rules (as proposed to be amended here) from the point of their generation to the point of their final disposition, which includes both during and after closure of any disposal unit. In addition, EPA is proposing that all existing units that have not closed in accordance with the criteria outlined in this proposal, by the effective date of the final rule, would be subject to all of the requirements of subtitle C, including the permitting requirements at 40 CFR parts 124 and 270. As such, persons who generate, transport and treat, store or dispose of CCRs would be subject to the existing cradle-to-grave subtitle C waste management requirements at 40 CFR parts 260 through 268, parts 270 to 279, and part 124 including the generator and transporter requirements and the requirements for facilities managing CCRs, such as siting, liners (with modification), run-on and run-off controls, groundwater monitoring, fugitive dust controls, financial assurance, corrective action, including facility-wide corrective action, closure of units, and post-closure care (with certain modifications). In addition, facilities that dispose of, treat, or, in many cases, store, CCRs also would be required to obtain permits for the units in which such materials are disposed, treated, and stored. EPA is also considering and seeking comment on a modification, which would not require the closure or installation of composite liners in existing surface impoundments; rather, these surface impoundments could continue to operate for the remainder of their useful life. The rule would also regulate the disposal of CCRs in sand and gravel pits, quarries, and other large fill operations as a landfill.

To address the potential for catastrophic releases from surface impoundments, we also are proposing requirements for dam safety and stability for impoundments that, by the effective date of the final rule, have not closed consistent with the requirements. Finally, we are proposing land disposal restrictions and treatment standards for CCRs, as well as a prohibition on the disposal of treated CCRs below the natural water table.

B. Summary of Subtitle D Proposal

In combination with its proposal to leave the Bevill determination in place, EPA is proposing to regulate CCRs disposed of in surface impoundments or landfills under the RCRA subtitle D requirements, which would establish national criteria to ensure the safe disposal of CCRs in these units. The units would be subject to, among other things, location standards, composite liner requirements (new landfills and surface impoundments would require composite liners; existing surface impoundments without liners would have to retrofit within five years, or cease receiving CCRs and close); groundwater monitoring and corrective action for releases from the unit standards; closure and post-closure care requirements; and requirements to address the stability of surface impoundments. We solicit comments on requiring financial assurance and on

[37] On February 24, the Environmental Integrity Project and EarthJustice issued a report on 31 'new' alleged CCRs damage cases which is available at: *http://www.environmentalintegrity.org/news_reports/documents/OutofControl-MountingDamagesFromCoalAshWasteSites.pdf.*

how the requirements apply to surface impoundments that continue to receive CCRs after the effective date of the rule; specifically, EPA is requesting comment on an alternative under which existing surface impoundments would be allowed to continue to operate without requiring the facility to retrofit the unit to install a composite liner. The rule would also regulate the disposal of CCRs in sand and gravel pits, quarries, and other large fill operations as a landfill. The rule would not regulate the generation, storage or treatment of CCRs prior to disposal. Because of the scope of subtitle D authority, the rule would not require permits, nor could EPA enforce the requirements. Instead, states or citizens could enforce the requirements under RCRA citizen suit authority; the states could also enforce any state regulation under their independent state enforcement authority.

EPA is also considering, and is seeking comment on, a potential modification to the subtitle D option, called "D prime." Under the "D prime" option, existing surface impoundments would not have to close or install composite liners but could continue to operate for their useful life. In the "D prime" option, the other elements of the subtitle D option would remain the same.

IV. Bevill Regulatory Determination Relating to CCRs From Electric Utilities

As discussed in the preceding sections, EPA originally conditioned its May 2000 Regulatory Determination on continued review of, among other factors, "the extent to which [the wastes] have caused damage to human health or the environment; and the adequacy of existing regulation of the wastes." (*See* 65 FR 32218.) Review of the information developed over the past ten years has confirmed EPA's original risk concerns, and has raised significant questions regarding the accuracy of the Agency's predictions regarding anticipated improvements in management and state regulatory oversight of these wastes. Consequently, the Agency has determined that reconsideration of its May 2000 Regulatory Determination is appropriate, and is revaluating whether regulation of CCRs under RCRA subtitle C is necessary in light of the most recent information. The scientific analyses, however, are complex and present legitimate questions for comment and further consideration. Thus, while EPA has concluded that federal regulation of this material is necessary, the Agency has yet not reached a conclusion as to whether the Bevill determination should be revised, or whether regulation under RCRA subtitle C or D is appropriate, but is soliciting comments on the two options described in the previous section.

As stated earlier, EPA's application of its discretion in weighing the eight Bevill factors—and consequently our ultimate decision—will be guided by the following principles. The first is that EPA's actions must be protective of human health and the environment. Second, any decision must be based on sound science. Finally, in conducting this rulemaking, EPA will ensure that its decision processes are transparent, and encourage the greatest degree of public participation. Consequently, to further the public's understanding and ability to comment on the issues facing the Agency, EPA provides an extensive discussion of the technical issues associated with the available information, as well as the policy considerations and the key factors that will weigh in the Agency's ultimate decision.

A. Basis for Reconsideration of May 2000 Regulatory Determination

EPA decided in May 2000 that regulation under RCRA subtitle C was not warranted in light of the trends in present disposal and utilization practices, the current and potential utilization of the wastes, and the concerns expressed against duplication of efforts by other federal and state agencies. In addition, EPA noted that the utility industry has made significant improvements in its waste management practices with respect to new management units over recent years, and most state regulatory programs are similarly improving. In particular, EPA noted that, of the new units constructed between 1985 and 1995, 60% of the new surface impoundments were lined and 65% had groundwater monitoring. Further, the risk information available was limited, although we also noted that we expected that the limited number of damage cases identified in the Regulatory Determination was an underestimate. However, EPA did not conclude that the available information regarding the extent or nature of the risks were equivocal. However, the Agency noted that "* * * we identified a potential for risks from arsenic that we cannot dismiss * * *."[38] EPA further noted that "[i]n the absence of a more complete groundwater risk assessment, we are unable at this time to draw quantitative conclusions regarding the risks due to arsenic or other contaminants posed by improper waste management." Existing older units that lacked liners and groundwater monitoring (for surface impoundments, only 26% of all units had liners and only 38% of all units had groundwater monitoring) were the major risk drivers in the study.

As discussed in greater detail in section II.B, EPA has revised the draft quantitative risk assessment made available when it solicited public comment on the 1999 Report to Congress to account for the concerns raised by the public during the public comment period. The results of these risk analyses show that certain management practices—the disposal of both wet and dry CCRs in unlined waste management units, but particularly in unlined surface impoundments, and the prevalence of wet handling, can pose significant risks to human health and the environment from releases of CCR toxic constituents to ground water and surface water. The Agency has estimated that there are approximately 300 CCR landfills and 584 CCR surface impoundments or similar management units in use at roughly 495 coal-fired power plants. (Data also indicate that a small number of utilities dispose of CCRs off-site, typically near the generating utility.) Many of these units—particularly surface impoundments—lack liners and groundwater monitoring systems. EPA's revised CCR risk assessment[39] estimated the cancer risk from arsenic[40] that leaches into groundwater from CCRs managed in units without composite liners to exceed EPA's typical risk thresholds of 10^{-4} to 10^{-6}. For example, depending on various assumptions about disposal practices (*e.g.,* whether CCRs are co-disposed with coal refuse), groundwater interception and arsenic speciation, the 90th percentile risks from unlined surface impoundments ranged from 2×10^{-2} to 1×10^{-4}. The risks from clay-lined surface impoundments ranged from 7×10^{3} to 4×10^{-5}. Similarly, estimated risks from unlined landfills ranged between 5×10^{-4} to 3×10^{-6}, and

[38] *See* 65 FR 32216 at *http://www.epa.gov/epawaste/nonhaz/industrial/special/fossil/ff2f-fr.pdf.*

[39] "Human and Ecological Risk Assessment of Coal Combustion Wastes," (April 2010).

[40] The risk estimates for arsenic presented in the revised risk assessment are based on the existing cancer slope factor of 1.5 mg/kg/d^{-1} in EPA's Integrated Risk Information System (IRIS). However, EPA is currently evaluating the arsenic cancer slope factor and it is likely to increase. In addition, the National Resources Council (NRC) of the National Academy of Sciences (NAS) made new recommendations regarding new toxicity information in the NRC document, "Arsenic in Drinking Water, 2001 Update." Using this NRC data analysis, EPA calculated a new cancer slope factor of 26 mg/kg/d^{-1} which would increase the individual risk estimates by about 17 times.

from 2×10^{-4} to 5×10^{-9} for clay-lined landfills. EPA's risk assessment also estimated HQs above 1 for other metals, including selenium and lead in unlined and clay-lined units. EPA also notes in this regard that recent research indicates that traditional leach procedures (*e.g.,* TCLP and SPLP) may underestimate the actual leach rates of toxic constituents from CCRs under different field conditions.

Recent events also have demonstrated that, if not properly controlled, these wastes have caused greater damage to human health and the environment than EPA originally estimated in its risk assessments. On December 22, 2008, a failure of the northeastern dike used to contain fly ash occurred at the dewatering area of the TVA's Kingston Fossil Plant in Harriman, Tennessee. Subsequently, approximately 5.4 million cubic yards of fly ash sludge was released over an approximately 300 acre area. The ash slide disrupted power, ruptured a gas line, knocked one home off its foundation and damaged others. A root-cause analysis report developed for TVA, accessible at *http://www.tva.gov/kingston/rca/index.htm,* established that the dike failed because it was expanded by successive vertical additions, to a point where a thin, weak layer of fly ash ('slime') on which it had been founded, failed by sliding. The direct costs to clean up the damage from the TVA Kingston incident are well into the billions, and is currently estimated to exceed $1.2 billion.[41]

Although the TVA spill was the largest, it was not the only damage case to involve impoundment stability. A smaller, but still significant incident occurred in August 2005, when a gate in a dam confining a 40-acre CCR surface impoundment in eastern Pennsylvania failed. The dam failure, a violation of the facility's state-issued solid waste disposal permit and Section 402 of the Clean Water Act, resulted in the discharge of 0.5 million cubic yards of coal-ash and contaminated water into the Oughoughton Creek and the Delaware River.

Moreover, documented cases of the type of damage that EPA originally identified to result from improper management of CCR have continued to occur, leading EPA to question whether the risks that EPA originally identified have been sufficiently mitigated since our May 2000 Regulatory Determination. As discussed in more detail below, and in materials contained in the docket, there is a growing record of proven damage cases to groundwater and surface water, as well as a large number of potential damage cases. Since the May 2000 Regulatory Determination, EPA has documented an additional 13 proven damage cases and 4 potential damage cases.

Further, recently collected information regarding the existing state regulatory programs[42] calls into question whether those programs, in the absence of national minimum standards, have sufficiently improved to address the gaps that EPA had identified in its May 2000 Regulatory Determination such that EPA can continue to conclude that in the absence of federal oversight, the management of these wastes will be adequate to protect human health and the environment. Many state regulatory programs for the management of CCRs, including requirements for liners and groundwater monitoring, are lacking, and while industry practices may be improving, EPA continues to *see* cases of inappropriate management or cases in which key protections (*e.g.,* groundwater monitoring at existing units) are absent. Although the joint DOE and EPA study entitled, Coal Combustion Waste Management at Landfills and Surface Impoundments, 1994–2004, indicates that most new units appear to be better designed, in that they are lined and have installed groundwater monitoring systems, and therefore the total percentages of unprotected units have decreased, it appears that a large amount of waste is still being disposed into units that lack the necessary protections of liners, and groundwater monitoring. Furthermore, while corrective action has generally been taken at the proven damage cases, the RCRA regulatory program is designed to prevent contamination in the first place, if at all practicable, rather than one in which contamination is simply remedied after discovery.[43] This information also highlights that EPA still lacks details regarding the manner and degree to which states are regulating the management of this material. All of these factors emphasize the need for prompt federal rulemaking and have led EPA to reconsider its May 2000 Regulatory Determination.

In sum, as a result of the significant new information accumulated on two of the four considerations specifically identified in the May 2000 Regulatory Determination (65 FR 32218), the Agency has determined that reevaluation of its original conclusions in light of all of the RCRA Section 8002(n) study factors is necessary. Based on its consideration of these statutory factors, EPA has not yet reached a decision on whether to revise the Bevill Regulatory Determination. Rather, EPA has summarized the information available for each of the factors, and identifies those considerations on which EPA believes that critical information is lacking. Accordingly, EPA is soliciting further information and public input on each of these considerations that will factor into the Agency's determination as to whether regulation under RCRA subtitle C or D is warranted.

As stated previously and as fully explained in Section XII of today's proposal and in our Regulatory Impact Analysis, our proposed requirements for surface impoundment structural stability and conversion or retrofitting of units, will have substantial benefits in avoided future clean up costs.

B. RCRA Section 8002(n) Study Factors

Section 8002(n) of RCRA requires the Administrator to conduct a detailed and comprehensive study and submit a report 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 by-product materials generated primarily from the combustion of coal or other fossil fuels. The study was to include an analysis of the eight factors required under section 8002(n) of RCRA. EPA addressed these study factors in the 1988 and 1999 Reports to

[41] $3.0 billion is EPA's "social cost" estimate assigned in the April 2010 RIA to the December 2008 TVA Kingston, TN impoundment release event. Social cost represents the opportunity costs incurred by society, not just the monetary costs for cleanup. OMB's 2003 "Circular A–4: Regulatory Analysis" (page 18) instructs Federal agencies to estimate "opportunity costs" for purpose of valuing benefits and costs in RIAs. This $3.0 billion social cost estimate is larger than TVA's $933 million to $1.2 billion cleanup cost estimate (i.e., TVA's estimate as of 03 Feb 2010), because EPA's social cost estimate consists of three other social cost elements in addition to TVA's cleanup cost estimate: (a) TVA cleanup cost, (b) response, oversight and ancillary costs associated with local, state, and other Federal agencies, (c) ecological damages, and (d) local (community) socio-economic damages. Appendix Q to the April 2010 RIA provides EPA's documentation and calculation of these four cost elements, which total $3.0 billion in social cost.

[42] ASTSWMO Survey Conducted Feb.—Mar. 2009 (Excel spreadsheet) available in the docket for this proposal.

[43] As noted in Appendix I on Damage Cases, of the 16 proven cases of damages to groundwater, the Agency has been able to confirm that corrective actions have been completed in seven cases and are ongoing in the remaining nine cases. Corrective action measures at these CCR management units vary depending on site specific circumstances and include formal closure of the unit, capping, re-grading of ash and the installation of liners over the ash, groundwater treatment, ground-water monitoring, installation of a barrier wall, and combinations of these measures.

Congress. The findings of these two Reports to Congress were the basis for our decisions in the August 1993 and the May 2000 Regulatory Determinations to maintain the Bevill exemption for CCRs. In considering whether to retain or to reverse the August 1993 and May 2000 Regulatory Determinations regarding the Bevill exemption of CCRs destined for disposal, we have reexamined the RCRA section 8002(n) study factors against the data on which we made the May 2000 Regulatory Determination, as well as the most recent data we have available.

1. Source and volumes of CCR generated per year: In the mid-1990s, according to various sources, between 62 and 71 million tons of CCRs were generated by coal-fired electric power plants.[44] In comparison, much larger volumes are being generated now (primarily due to the increase in coal-fired power plants), with 136 million tons of CCRs generated by coal-fired electric power plants in 2008.[45]

2. Present disposal and utilization practices: In 2008, 34% (46 million tons) of CCRs were landfilled, 22% (29.4 million tons) were disposed into surface impoundments,[46] nearly 37% (50.1 million tons) were beneficially used (excluding minefill operations), and nearly 8% (10.5 million tons) were placed in mines. This compares to approximately 23% (26.2 million tons) landfilled, 46% (53.2 million tons) disposed of into surface impoundments, 23% beneficially used (excluding minefill operations), and 8% (9 million tons) placed in mines in 1995. Thus, while the overall volume of CCRs going to disposal in surface impoundments and landfills has remained relatively constant, the total volume going to surface impoundments has decreased, and the total volume going to landfills has increased.

The Agency has estimated that there are approximately 300 CCR landfills and 584 CCR surface impoundments or similar management units in use at roughly 495 coal-fired power plants. The age of the disposal units varies considerably. For example, while there are new surface impoundments, 75% are greater than 25 years old, with 10% being greater than 50 years old. Similarly, information from an EPRI survey used in the 1999 Report to Congress indicates that the average planned life expectancy of a landfill is approximately 31 years, with about 12% having planned life expectancy over 50 years (with one planning for over 100 years). Many of these units—particularly surface impoundments, lack liners and ground water monitoring systems. EPA has estimated that in 2004, 31% of the CCR landfills and 62% of the CCR surface impoundments lacked liners, and 10% of the CCR landfills and 58% of the CCR surface impoundments lacked groundwater monitoring.[47] In the mid-1990s, there were approximately 275 CCR landfills and 286 CCR surface impoundments in use.[48] EPA does not believe the increased number of surface impoundments identified in today's rule reflects an actual change of practice, but rather more stringent definitions, as well as possibly, the greater availability of more accurate information. For example, much of the increase in surface impoundments likely results from counting units that receive wastewater that has been in contact with even small amounts of coal ash, and thus includes many units which were not included in EPA's mid-1990 estimates.

a. *Existing State Regulatory Oversight.* The results of the joint DOE and EPA study entitled, Coal Combustion Waste Management at Landfills and Surface Impoundments, 1994–2004 indicates that of the states evaluated in this report, state regulations have generally improved since 2000. In addition, it would appear that the industry itself is changing and improving its management practices. For example, all new surface impoundments and nearly all new landfills (97%) identified in the survey that were constructed between 1994 and 2004 were constructed with liners. Regarding the prevalence of groundwater monitoring at new units, the joint DOE/EPA study suggests that nearly all new landfills (98%) and most new surface impoundments (81%) constructed between 1994 and 2004 were constructed with groundwater monitoring systems. Moreover, the frequency of dry handling in landfills appears to have increased; approximately two-thirds of the new units are landfills, while the remaining one-third are surface impoundments. The number of new units from 1994 to 2004 was 56. Assuming that replacement continued at a rate of 5.6 per year since 2004, we would have an additional 34 new units, but it would still be decades at this rate to replace the large collection of older units.

The DOE/EPA study also identifies significant gaps that remain under existing state regulation. For example, only 19% (3 out of 19) of the surveyed surface impoundment unit permits included requirements addressing groundwater protection standards (*i.e.,* contaminant concentrations that cannot be exceeded) or closure/post-closure care, and only 12% (2 out of 12) of surveyed units were required to obtain bonding or financial assurance. The EPA/DOE report also concluded that approximately 30 percent of the net disposable CCRs generated is potentially entirely exempt from the state solid waste permitting requirements[49] (EPA/DOE Report at pages 45–46). For example, Alabama does not currently regulate CCR disposal under any state waste authority and does not currently have a dam safety program (although the state has an initiative to develop one). Texas (the largest coal ash producer) does not require permits for waste managed on-site.[50] Tennessee currently does not regulate surface impoundments under its waste authority, but is now reconsidering this, in light of the TVA spill. Finally, a number of states only regulate surface impoundments under Clean Water Act authorities, and consequently primarily address the risks from effluent discharges to navigable waters, but do not require liners or groundwater monitoring.

The Agency recognizes that these statistics may be difficult to interpret due to the limitations of the study. The study focused on only eleven states, which account for approximately half the CCRs generated in the U.S., and it may not address all of the existing regulatory requirements that states may or could impose through other authorities to control these units. As one example, the DOE/EPA report notes that four of the six states that do not require solid waste permits rely on other state authorities to regulate these units: "In

[44] Cited in "Technical Background Document for the Report to Congress on Remaining Wastes from Fossil Fuel Combustion: Industry Statistics and Waste Management Practices," March 1999.

[45] ACAA (American Coal Ash Association). 2009. *2008 Coal Combustion Product (CCP) Production & Use Survey Report. http://acaa.affiniscape.com/associations/8003/files/2008_ACAA_CCP_Survey_Report_FINAL_100509.*

[46] Estimated from the 2009 ACAA survey and Energy Information Administration 2005 F767 Power Plant database.

[47] Estimated from the 1995 data reported in the May 2000 Regulatory Determination and the data for new units from 1994 to 2004 reported in the 2006 DOE/EPA report "*Coal Combustion Waste Management at Landfills and Surface Impoundments, 1994–2004.*"

[48] Technical Background Document, Ibid.

[49] 38.7 million tons of out of 129 million tons generated CCRs (Based on DOE/EIA 2004 data).

[50] In Texas, on-site means the same or geographically contiguous property which may be divided by public or private rights-of-way, provided the entrance and exit between the properties is at a cross-roads intersection, and access is by crossing, as opposed to going along, the right-of-way. Noncontiguous properties owned by the same person but connected by a right-of-way which he controls and to which the public does not have access, is also considered on-site property. (Title 30 TAC 335.1)

Florida, if CCWs are disposed in an on-site landfill at a coal-fired electric generating plant authorized under the Florida Power Plant Siting Act (PPSA), no separate permits, including solid waste construction and operation permits, are required. Instead, the entire facility is covered under the PPSA certification, which will contain the same substantive requirements as would otherwise have been imposed by other permits." (EPA/DOE Report at page 46). The DOE/EPA report identified whether states tightened, relaxed, or were neutral with regard to program changes. From the time of the 1999 Report to Congress to 2005, most all programs were neutral, with a couple of programs tightening requirements and none relaxing requirements. Going back to the period of the 1988 Report to Congress to 2005, two states (Alabama and Florida) are reported to have relaxed portions of their standards, while not tightening any other portions of their program. Part of the difficulty in interpreting this information stems from the fact that the survey responses contained little or no details of the state requirements; rather, the responses merely indicated (by checking a box) whether states imposed some sort of requirement relating to the issue. Consequently, the Agency lacks detailed information on the content of the requirements, and whether, for example, performance based requirements or other state programs are used to address the risks from these units. EPA also received detailed comments on this report authored by several environmental groups, who criticized several of the general conclusions. These comments are included in the rule docket (*see* comment attachment submitted by Marty Rustan on behalf of Lisa Evans, Attorney, Earthjustice; EPA–HQ–RCRA–2006–0796–0446.5).

A more recent survey conducted by the Association of State and Territorial Solid Waste Management Officials (ASTSWMO) seems to support the view that the states still have not yet adequately implemented regulatory programs over CCR management units, although like the DOE/EPA study, it lacks details on the substance of the state requirements. According to a 2009 ASTSWMO survey of states with coal ash generation [51] (available in the docket), of the 42 states with coal fired utilities, at least 36 have permit programs for landfills used to manage CCRs, and of the 36 states that have CCR surface impoundments, 25 have permit programs. Permitting is particularly important to provide oversight and to approve implementation plans such as the placement of groundwater monitoring wells. Without a state permit program, regulatory flexibility is limited, and certification by an independent registered professional engineer is necessary. With regard to liner requirements, 36% (15 of the 42 states that responded to this question) do not have minimum [52] liner requirements for CCR landfills, while 67% (24 of the 36 states that responded to this question) do not have CCR liner requirements for surface impoundments. Similarly, 19% (8 of the 42 states that responded to this question) do not have minimum groundwater monitoring requirements for landfills and 61% (22 of the 36 states that responded to this question) do not have groundwater monitoring requirements for surface impoundments.[53] These findings are particularly significant as groundwater monitoring for these kinds of units is a minimum for any credible regulatory regime. The 2009 ASTSWMO survey also indicates that only 36 percent of the states regulate the structural stability of surface impoundments, and only 31 percent of the states require financial assurance for surface impoundments. Because structural stability of surface impoundments is largely regulated by state dam safety programs which are separate from state solid waste programs, EPA recognizes that information from the dam safety programs would be a much more meaningful measure of state regulation of the structural stability of surface impoundments, and solicits such information.

Thus, while the states seem to be regulating landfills to a greater extent, given the significant risks associated with surface impoundments, these results suggest that there continue to be significant gaps in state regulatory programs for the disposal of CCRs. (*See* Letter from ASTSWMO to Matt Hale dated April 1, 2009, a copy of which is in the docket to today's proposed rule for complete results of the survey.)

EPA is also aware of some additional information from ASTSWMO. There are 15 states (Colorado, Florida, Indiana, Iowa, Kansas, Kentucky, Maryland, Minnesota, Mississippi, Montana, New York, North Carolina, Ohio, Pennsylvania, and Virginia) that were considering changes to their CCR regulations at the time of the ASTSWMO survey (February 2009). In late November 2009, ASTSWMO also identified 15 states (Arizona, Delaware, Georgia, Idaho, Iowa, Kansas, Louisiana, Maryland, Mississippi, North Dakota, South Carolina, Tennessee, Washington, Wisconsin, and West Virginia) that had revised their CCR requirements since 2000. Finally, ASTSWMO identified 8 states (Georgia, Illinois, Indiana, Iowa, Montana, Ohio, Pennsylvania, and South Carolina) which are requiring groundwater monitoring at existing facilities that previously did not have groundwater monitoring.

Several issues complicate this assessment, however. As noted previously, EPA lacks any real details regarding how states, in practice, oversee the management of these materials when treated as wastes. For example, some states may use performance based standards or implement requirements to control CCR landfills and surface impoundments under other state programs. Also, most of the new data primarily focuses on the requirements applicable to *new* management units, which represent approximately 10% of the disposal units. EPA has little, if any information, that describes the extent to which states and utilities have implemented requirements—such as groundwater monitoring, for existing units, for the many landfills and surface impoundments that receive CCRs. The information currently in the record with respect to existing units is fifteen years old. EPA expects that it would be unlikely that states would have required existing units to install liners, states would have been more likely to have imposed groundwater monitoring for such units over the last 15 years. Finally, as discussed in the next section, the fact that many of the surface impoundments are located adjacent to water bodies—which is not accounted for in EPA's groundwater risk assessment—may affect our assessment of the extent of the liner and groundwater monitoring requirements that would be necessary. Therefore, EPA solicits detailed comments specifically on the current management practices of state programs, not only under state waste authorities, but under other authorities as well. The adequacy of state regulation is one of the key issues before the Agency, as it will address some of the more significant questions remaining regarding the extent of the

[51] ASTSWMO Survey Conducted Feb.–Mar. 2009 (Excel spreadsheet).

[52] For both landfills and surface impoundments, most of the states that responded to questions addressing their liner and groundwater monitoring program provisions had less stringent requirements, *e.g.,* allowing variance, exemption, or a case-by-case evaluation. In the absence of state-specific information, we are unable to translate these statistics into a concrete number of affected waste units.

[53] Additionally, the July 2009 Petition pointed out deficiencies in state regulatory programs.

risks presented by the disposal of CCRs. Accordingly, the Agency specifically solicits information, whether from state regulatory authorities or from members of the public, regarding details on the entire state regulatory structure, including the specific requirements that states have in place to regulate CCRs, and to provide oversight of these units. EPA would also welcome more detailed information regarding the states' historic practice in implementing its existing requirements, including for example, the states' record of enforcement and its practice in providing for public participation in the development and implementation of any existing permitting requirements. EPA is particularly interested in information on the extent to which states have implemented requirements applicable to the older, existing units, which represent the majority of the units into which CCRs are currently disposed (approximately 90%). EPA also requests information on the extent to which EPA's current information adequately reflects changes in industry practices, adopted independent of state requirements.

b. *Beneficial Use.* In the May 2000 Regulatory Determination, EPA stated: "The Agency has concluded that no additional regulations are warranted for coal combustion wastes that are used beneficially (other than for minefilling) and for oil and gas combustion wastes. We do not wish to place any unnecessary barriers on the beneficial use of fossil fuel combustion wastes so that they can be used in applications that conserve natural resources and reduce disposal costs." (65 FR 32214) (*See* separate discussion regarding minefilling in section IV. E of this preamble.) EPA identified specific beneficial uses as covered by the May 2000 determination. In particular, EPA stated that: "Beneficial purposes include waste stabilization, beneficial construction applications (*e.g.,* cement, concrete, brick and concrete products, road bed, structural fill, blasting grit, wall board, insulation, roofing materials), agricultural applications (*e.g.,* as a substitute for lime) and other applications (absorbents, filter media, paints, plastics and metals manufacture, snow and ice control, waste stabilization)." (*See* 65 FR 32229) These beneficial uses are described in more detail in EPA's Report to Congress on Wastes from the Combustion of Fossil Fuels in March 1999 (*see* Volume 2, Section 3.3.5).

Since EPA's Regulatory Determination in May 2000, there has been a significant increase in the use of CCRs and the development of established commercial sectors that utilize and depend on the beneficial use of CCRs. Additional uses have been identified; for example, the use of CCRs as ingredients in specific products, such as resin-bound products or mineral filler in asphalt. New applications of CCRs have been developed, which may hold great green house gas (GHG) benefits (for example, fly ash bricks and a process to use CO_2 emissions to produce cement). Further, EPA expects that uses could shift in the future because the composition and characteristics of CCRs are likely to change due to the addition of new air pollution controls at coal-fired utilities. (*See* section IV. D. below for a more detailed discussion on the beneficial use of CCRs.)

3. Potential danger, if any, to human health and the environment from the disposal and reuse of CCRs:

a. *From Disposal.* The contaminants of concern in CCRs include antimony, arsenic, barium, beryllium, cadmium, chromium, lead, mercury, nickel, selenium, silver and thallium. Potential human exposure pathways for these contaminants from the disposal of CCRs are ground water ingestion, inhalation, and the consumption of fish exposed to contaminants. Ecological impacts include surface water contamination, contamination of wetlands, and aquatic life exposure to contaminants of concern. As discussed in section II. B, V., and the Regulatory Impact Analysis, the risks modeled for the 2010 risk assessment often exceeded EPA's typical regulatory levels of concern. With very few exceptions, the risks modeled for the 2010 risk assessment correspond with ground water exceedances of constituents observed in EPA's damage case assessments (*e.g.,* arsenic, boron, cadmium, lead, molybdenum, and selenium were modeled and found to exceed the risk criteria in at least some instances, and were also found in at least some of the damage cases). Additionally, as discussed in section I.F.2, the potential exists for the chemical characteristics of certain CCRs (*e.g.,* fly ash and FGD) to increase, which could result in increases in releases from management units, particularly if such wastes are placed in old unlined units, as a result of the increased use and application of advanced air pollution control technologies in coal-fired power plants. Further details on the results of EPA's quantitative groundwater risk assessment, and the technical issues that remain to be addressed, and on the unquantified human and ecological risks can be found in section II and in the Regulatory Impact Analysis for today's proposal.

EPA also conducted a population risk assessment for the groundwater-arsenic pathway, as a complement to the individual risk analysis. While the RCRA program necessarily focuses on individual risks, and individual risks have been the basis of previous Bevill and hazardous waste determinations, the population risk estimate provides perspective, and was used to develop the Agency's cost benefit analyses of different regulatory approaches (discussed in section XII.A of this preamble). In this analysis, EPA calculated a best estimate that current risks from arsenic via the groundwater used as drinking water pathway are 2,509 total excess cancers, over a 75-year period.[54] (A 75-year period was used in this analysis to capture peak risk while the RIA generally covers 50 years.) These estimates are based on a cancer slope factor which represents the most recent science derived from a 2001 National Resources Council review of arsenic toxicity. It should be noted that the analysis did not include risks from other pathways or constituents, as explained in section 5A of the Regulatory Impact Analysis for this proposal.

Of the approximately 584 surface impoundments currently operating in the United States, a certain percentage of these have a great potential for loss of human life and environmental damage in the event of catastrophic failure. Based on the information collected from EPA's recent CERCLA 104(e) information request letters 109 impoundments have either a high or significant hazard potential rating,[55] thirteen of which were not designed by a professional engineer. Of the total universe of surface impoundments, approximately 186 of these units were not designed by a professional engineer. Surface impoundments are generally designed to last the typical operating life of coal-fired boilers, on the order of 40 years. However, many impoundments are aging: 56 units are older than 50 years, 96 are older than 40 years, and 340 are between 26 and 40 years old. In recent years, problems have continued to arise from these units, which appear to be related to the aging infrastructure, and the fact that many units may be nearing the end of

[54] Chapter 5, Page 121 of the Regulatory Impact Analysis for this proposal.

[55] 429 of these impoundments currently have no rating. Thus, the Agency expects the number of surface impoundments with a high or significant hazard rating may increase as additional impoundments are assigned ratings. See the definitions in the Summary section of this notice for the definitions of high and significant hazard potential.

their useful lives. For example, as a result of the administrative consent order issued after the December 2008 spill, TVA conducted testing which showed that another dike at TVA's Kingston, Tennessee plant had significant safety deficiencies. Further, in response to EPA's CERCLA 104(e) information request letter, a total of 35 units at 25 facilities reported historical releases. These range from minor spills to a spill of 0.5 million cubic yards of water and fly ash. Additional details regarding these releases can be found in the docket for this rulemaking. EPA continues its assessments of CCR surface impoundments. The most recent information on these can be found on EPA's internet site at *http://www.epa.gov/epawaste/nonhaz/industrial/special/fossil/surveys2/index.htm#surveyresults.*

b. *From Beneficial Use.* The risks associated with the disposal of CCRs stem from the specific nature of that activity and the specific risks it involves; that is, the disposal of CCRs in (often unlined) landfills or surface impoundments, with hundreds of thousands, if not millions, of tons placed in a single concentrated location. And in the case of surface impoundments, the CCRs are managed with water, under a hydraulic head, which promotes more rapid leaching of contaminants into neighboring groundwater than do landfills. The beneficial uses identified as excluded under the Bevill amendment for the most part present a significantly different picture, and a significantly different risk profile.

In 1999 EPA conducted a risk assessment of certain agricultural uses of CCRs,[56] since the use of CCRs in this manner was considered the most likely to raise concerns from a human health and environmental point of view. EPA's risk assessment estimated the risks associated with such uses to be within the range of 1×10^{-6}. The results of the risk assessment, as well as EPA's belief that the use of CCRs in agricultural settings was the most likely use to raise concerns, resulted in EPA concluding that none of the identified beneficial uses warranted federal regulation, because "we were not able to identify damage cases associated with these types of beneficial uses, nor do we now believe that these uses of coal combustion wastes present a significant risk to human health or the environment." (65 FR 32230, May 22, 2000.) EPA also cited the importance of beneficially using secondary materials and of resource conservation, as an alternative to disposal.

To date, EPA has still seen no evidence of damages from the beneficial uses of CCRs that EPA identified in its original Regulatory Determination. For example, there is wide acceptance of the use of CCRs in encapsulated uses, such as wallboard, concrete, and bricks because the CCRs are bound into products. The Agency believes that such beneficial uses of CCRs offer significant environmental benefits.

As we discuss in other sections of this preamble, there are situations where large quantities of CCRs have been used indiscriminately as unencapsulated, general fill. The Agency does not consider this a beneficial use under today's proposal, but rather considers it waste management.

Environmental Benefits

The beneficial use of CCRs offers significant environmental benefits, including greenhouse gas (GHG) reduction, energy conservation, reduction in land disposal (*i.e.,* avoidance of potential CCR disposal impacts), and reduction in the need to mine and process virgin materials and the associated environmental impacts. Specifically:

Greenhouse Gas and Energy Benefits. The beneficial use of CCRs reduces energy consumption and GHG emissions in a number of ways. One of the most widely recognized beneficial applications of CCRs is the use of coal fly ash as a substitute for Portland cement in the manufacture of concrete. Reducing the amount of cement produced by beneficially using fly ash as a substitute for cement leads to large supply chain-wide reductions in energy use and GHG emissions.[57] For example, fly ash typically replaces between 15 and 30 percent of the cement in concrete, although the percentages can and have been higher. However, assuming a 15 to 30 percent fly ash to cement replacement rate, and considering the approximate amount of cement that is produced each year, would result in a reduction of GHG emissions by approximately 12.5 to 25 million tons of CO_2 equivalent and a reduction in oil consumption by 26.8 to 53.6 million barrels of oil.[58] This estimate is likely to underestimate the total benefits that can be achieved. As an added benefit, the use of fly ash generally makes concrete stronger and more durable. This results in a longer lasting material, thereby marginally reducing the need for future cement manufacturing and corresponding avoided emissions and energy use.

Benefits From Reducing the Need To Mine and Process Virgin Materials. CCRs can be substituted for many virgin materials that would otherwise have to be mined and processed for use. These virgin materials include limestone to make cement, and Portland cement to make concrete; mined gypsum to make wallboard, and aggregate, such as stone and gravel for uses in concrete and road bed. Using virgin materials for these applications requires mining and processing them, which can impair wildlife habitats and disturb otherwise undeveloped land. It is beneficial to use secondary materials—provided it is done in an environmentally sound manner—that would otherwise be disposed of, rather than to mine and process virgin materials, while simultaneously reducing waste and environmental footprints. Reducing mining, processing and transport of virgin materials also conserves energy, avoids GHG emissions, and reduces impacts on communities.

Benefits From Reducing the Disposal of CCRs. Beneficially using CCRs instead of disposing of them in landfills and surface impoundments also reduces the need for additional landfill space and any risks associated with their disposal. In particular, the U.S. disposed of over 75 million tons of CCRs in landfills and surface impoundments in 2008, which is equivalent to the space required of 26,240 quarter-acre home sites under 8 feet of CCRs.

While the Agency recognizes the need for regulations for the management of CCRs in landfills and surface impoundments, we strongly support the beneficial use of CCRs in an environmentally sound manner because of the significant environmental benefits that accrue both locally and globally. As discussed below in section XII.A, the current beneficial use of CCRs as a replacement for industrial raw materials (*e.g.,* Portland cement, virgin stone aggregate, lime, gypsum) provides substantial annual life cycle environmental benefits for these industrial applications. Specifically,

[56] 1998 Draft Final Report; Non-groundwater Pathways, Human Health and Ecological Risk Analysis for Fossil Fuel Combustion Phase 2 (FFC2) and its appendices (A through J); available at *http://www.epa.gov/osw/nonhaz/industrial/special/fossil/fsltech.htm.*

[57] Waste and Materials-Flow Benchmark Sector Report: Beneficial Use of Secondary Materials—Coal Combustion Products, February 12, 2008.

[58] Avoided GHG and energy saving estimates based on energy and environmental benefits estimates in the EPA report entitled, "Study on Increasing the Usage of Recovered Mineral Components in Federally Funded Projects Involving Procurement of Cement or Concrete" available at *http://www.epa.gov/osw/conserve/tools/epg/pdf/rtc/report4-08.pdf.*

beneficially using CCRs as a substitute for industrial raw materials contributes (a) $4.89 billion per year in energy savings, (b) $0.081 billion per year in water savings, (c) $0.239 billion per year in GHG [59] (*i.e.,* carbon dioxide and methane) emissions reduction, and (d) $17.8 billion per year in other air pollution reduction. In addition, these applications also result in annual material and disposal cost savings of approximately $2.93 billion. All together, the beneficial use of CCRs provides $25.9 billion in annual national economic and environmental benefits (relative to 2005 tonnage).[60]

However, as discussed in the next section, there are cases where large quantities of CCRs have been "used" indiscriminately as unencapsulated "fill," *e.g.,* to fill sand and gravel pits or quarries, or as general fill (*e.g.,* Pines, Indiana and the Battlefield Golf Course in Chesapeake, Virginia [61]). Although EPA does not consider these practices to be legitimate beneficial uses, others classify them as such. In any case, EPA has concluded that these practices raise significant environmental concerns.

4. Documented cases in which danger to human health or the environment from surface runoff or leachate has been proved: As described previously, EPA has identified 27 proven damage cases: 17 cases of damage to groundwater, and ten cases of damage to surface water, seven of which are ecological damage cases. Sixteen of the 17 proven damage cases to groundwater involved disposal in unlined units—for the one additional unit, it is unknown whether there was a liner. We have also identified 40 potential damage cases to groundwater and surface water. These numbers compare to 14 proven damage cases and 36 potential cases of damage when the Agency announced its Regulatory Determination in May 2000. The Agency believes that these numbers likely underestimate the number of proven and potential damage cases and that it is likely that additional cases of damage would be found if a more comprehensive evaluation was conducted, particularly since much of this waste has been (and continues to be) managed in unlined disposal units.

Several of the new damage cases involve activities that differ from prior damage cases, which were focused on groundwater contamination from landfills and surface impoundments. These new cases present additional risk concerns that EPA did not evaluate in the May 2000 Regulatory Determination. Specifically, some of the recent proven damage cases involved the catastrophic release due to the structural failure of CCR surface impoundments, such as the dam failures that occurred in Martins Creek, Pennsylvania and Kingston, Tennessee.

In addition, a number of proven damage cases involve the large-scale placement, akin to disposal, of CCRs, under the guise of "beneficial use." The "beneficial use" in these cases involved the filling of old, unlined quarries or gravel pits, or the regrading of landscape with large quantities of CCRs. For example, the 216-acre Battlefield Golf Course was contoured with 1.5 million yards of fly ash to develop the golf course. In late 2008, groundwater and surface water sampling was conducted. There were exceedances of primary drinking water standards in on-site groundwater for contaminants typically found in fly ash. In addition, there were exceedances of secondary drinking water standards in both on-site and off-site groundwater (in nine residential wells); however, the natural levels of both manganese and iron in the area's shallow aquifer are very high (0.14 mg/L to 0.24.mg/L and 5.0 mg/L to 13.0 mg/L, respectively), and, thus, it could not be ruled out that the elevated levels of manganese and iron are a result of the natural background levels of these two contaminants. Surface water samples showed elevated levels of aluminum, chromium, iron, lead, manganese, and thallium in one or more on-site samples. The lone off-site surface water sample had elevated levels of aluminum, iron, and manganese. In April 2010 EPA issued a Final Site Inspection Report [62] which concluded that (i) metals contaminants were below MCLs and Safe Drinking Water Act action levels in all residential wells that EPA tested; (2) the residential well data indicate that metals are not migrating from the fly ash to residential wells; and (iii) there are no adverse health effects expected from human exposure to surface water or sediments on the Battlefield Golf Course site as the metal concentrations were below the ATSDR standards for drinking water and soil. Additionally, the sediments samples in the ponds were below EPA Biological Technical Assistance Group screening levels and are not expected to pose a threat to ecological receptors. Similarly, beginning in 1995, the BBBS sand and gravel quarries in Gambrills, Maryland, used fly ash and bottom ash from two Maryland power plants to fill excavated portions of two sand and gravel quarries. Groundwater samples collected in 2006 and 2007 from residential drinking water wells near the site indicated that, in certain locations, contaminants, including heavy metals and sulfates, were present at or above groundwater quality standards. Private wells in 83 homes and businesses in areas around the disposal site were tested. MCLs were exceeded in 34 wells [arsenic (1), beryllium (1), cadmium (6), lead (20),[63] and thallium (6)]. SMCLs were exceeded in 63 wells [aluminum (44), manganese (14), and sulfate (5)]. The state concluded that leachate from the placement of CCRs at the site resulted in the discharge of pollutants to waters of the state.

Further details on these additional damage cases are provided in section II. C (above), and in the Appendix to this notice.

As mentioned in section II.C, during the development of this proposal, EPA received new reports from industry and citizen groups regarding damage cases. Industry provided information that, they suggested, shows that many of EPA's listed proven damage cases do not meet EPA's criteria for a damage case to be proven. On the other hand, citizen groups recently identified additional alleged damage cases. The Agency has not yet had an opportunity to evaluate this additional information. EPA's analysis, as well as the additional information from industry and citizen groups, all of which is available in the docket to this proposed rule, would

[59] The RIA monetizes the annual tonnage of greenhouse gas effects associated with the CCR beneficial use life cycle analysis, based on the 2009 interim social cost of carbon (i.e., interim SCC) of Table III.H.6–3, page 29617 of the joint EPA and DOT–NHTSA "Proposed Rulemaking to Establish Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards," **Federal Register**, Volume 74, No. 186, 28 Sept 2009. The value applied in the RIA is the $19.50 per ton median value from the $5 to $56 per ton range displayed in the 2007 column in that source. Furthermore, the RIA updated the 2007$ median value from 2007 to 2009 dollars using the NASA Gross Domestic Product Deflator Inflation Calculator at *http://cost.jsc.nasa.gov/inflateGDP.html.* EPA is aware that final SCC values were published on March 9, 2010 in conjunction with a Department of Energy final rule. EPA intends to use the final SCC values for the CCR final rule RIA. The final SCC values are published in the Department of Energy, Energy Efficiency & Renewable Energy Building Technologies Program, "Small Electric Motors Final Rule Technical Support Document: Chapter 16—Regulatory Impact Analysis," March 9, 2010 at *http://www1.eere.energy.gov/buildings/appliance_standards/commercial/sem_finalrule_tsd.html*).

[60] These benefits estimates are further discussed in Chapter 5C of the RIA which is available in the docket for this proposal.

[61] These instances are associated with 7 proven damage cases and 1 potential damage case.

[62] *http://www.epa.gov/reg3hwmd/CurrentIssues/finalr-battlefield_golf_club_site/redacted_DTN_0978_Final_Battlefield_SI_Report.pdf.*

[63] It is uncertain whether lead exceedances were due to CCRs or lead in the plumbing and water holding tanks.

benefit from public input and further review, in the interest of reaching a more complete understanding of the nature and number of damage cases. EPA encourages commenters to consider all of these analyses in developing their comments.

5. Alternatives to current disposal methods: There are no meaningful disposal alternatives other than land disposal. Improved disposal management practices are practical (*e.g.,* liners, groundwater monitoring, dust control), although EPA has not identified meaningful or practical treatment options prior to disposal, other than dewatering. (There are, however, available technologies, or technologies under development, to process CCRs now likely destined for disposal so that they can effectively be converted to appropriate beneficial uses.) The beneficial use of these materials as products continues to be an important alternative to disposal.

6. The cost of such alternative disposal methods: The Agency has estimated the nationwide costs to the electric utility industry (or to electric rate payers) for each alternative considered for this proposal. These estimates are discussed in the regulatory impact analysis presented within section XII.A of this preamble.

7. The impact of the alternative disposal methods on the use of coal and other natural resources: The alternative disposal methods mentioned above are not expected to impact the use of coal or other natural resources. However, we would note that some surface impoundments at coal-fired utilities are also used as wastewater treatment systems for other non-CCR wastewaters. Therefore, if facilities switch from wet to dry handling of CCRs, construction of alternative wastewater treatment systems could become necessary for other non-CCR wastewaters, especially if they involved acidic wastes that are currently neutralized by the coal ash. (Note that the issue of beneficial uses of CCRs is discussed below; if the effect of a subtitle C approach is to increase beneficial uses, it could lead to a decrease in the use of virgin materials like ingredients in cement making, aggregate, mined gypsum, etc. On the other hand, if the effect of that approach were to decrease beneficial uses, as some commenters suggested, it would have the opposite effect on the use of natural resources.)

8. The current and potential utilization of CCRs: In 2008, nearly 37% (50.1 million tons) of CCRs were beneficially used (excluding minefill operations) and nearly 8% (10.5 million tons) were placed in minefills. (This compares to 23% of CCRs that were beneficially used, excluding minefilling, at the time of the May 2000 Regulatory Determination, and represents a significant increase.)

Parties have commented that any regulation of CCRs under RCRA subtitle C will impose a crippling stigma on their beneficial use, and eliminate or significantly curtail these uses, even if EPA were to regulate only CCRs destined for disposal, without modifying the regulatory status of beneficial reuse. On the other hand, other parties have commented that increasing the cost of disposal of CCRs through regulation under subtitle C will actually increase their usage in non-regulated beneficial uses, simply as a result of the economics of supply and demand. States, at the same time, have commented that, by operation of state law, the beneficial use of CCRs would be prohibited under the states' beneficial use programs, if EPA designated CCRs as hazardous waste when disposed of in landfills or surface impoundments. At the time of the May 2000 Regulatory Determination, commenters had raised this similar concern, and without agreeing that regulation under RCRA subtitle C would necessarily affect the beneficial reuse of this material, EPA nevertheless strongly expressed concern that beneficial use not be adversely affected.

EPA is interested in additional information supporting the claims that "stigma" will drive people away from the use of valuable products, or that states will prohibit the reuse of CCRs under their beneficial use programs if EPA regulates any aspect of CCR management under subtitle C. Specifically, the Agency requests that commenters provide analyses and other data and information that demonstrate this to be the case. To date, we have received statements and declarations that regulation under subtitle C will have devastating effects on beneficial uses of CCRs. In addition, for those commenters who suggest that regulating CCRs under subtitle C of RCRA would raise liability issues, EPA requests that commenters describe the types of liability and the basis, data, and information on which these claims are based. The issue of beneficial use and stigma are more fully discussed in section VI, where we discuss the alternative of regulating CCRs under subtitle C of RCRA. EPA would also be interested in suggestions on methods by which the Agency could reduce any stigmatic impact that might indirectly arise as a result of regulation of CCRs destined for disposal as a "special" waste under RCRA subtitle C.

C. Preliminary Bevill Conclusions and Impact of Reconsideration

The Agency is proposing two different approaches to regulating CCRs: Regulation as a "special" waste listed under RCRA subtitle C if EPA decides to lift the Bevill exemption with respect to disposal; and regulation as a solid waste under RCRA subtitle D, if the Bevill exemption is retained for disposal. Under both of these approaches, requirements for liners and groundwater monitoring would be established, although there are differences with respect to the other types of requirements that can be promulgated by EPA under RCRA subtitle C and D. In addition, as discussed in greater detail below, one of the primary differences between the various approaches relates to the degree and extent of federal oversight, as this varies considerably between the alternatives. As noted previously, EPA has not yet reached a decision on whether to regulate CCRs under RCRA subtitle D or C, but continues to evaluate each of these options in light of the 8002(n) factors.

In determining the level of regulation appropriate for the management of CCRs, several considerations weigh heavily with the Agency; information on these issues will therefore be important for commenters to consider as they prepare their comments. One particularly critical question relates to the extent of the risks posed by the current management of this material, along with the corresponding degree of Federal oversight and control necessary to protect human health and the environment. As discussed in the preceding sections, since EPA's Regulatory Determination in May 2000, new information has called into question EPA's original assessment of the risks posed by the current management of CCRs that are disposed of. In summary, this includes (1) The results of EPA's 2010 risk assessment, which indicates that certain management practices—particularly units without composite liners and the prevalence of wet handling can pose significant risks; (2) the growing record of proven damage cases to ground water and surface water, as well as a large number of potential damage cases; (3) recent events, which have demonstrated that these wastes have caused greater damage to human health and the environment than originally estimated (*i.e.,* catastrophic environmental impacts from surface impoundment breaches, and damage resulting from "sham beneficial uses"); and (4) questions regarding the adequacy of

state regulatory programs for the management of CCRs, as many states appear to lack key protective requirements for liners and groundwater monitoring and a permitting program to ensure that such provisions are being properly implemented, even though overall industry practices appear to be improving. All of these considerations illustrate that in many cases CCRs have not been properly managed. The question is whether federal regulation is more appropriate under subtitle C or subtitle D of RCRA.

Several significant uncertainties remain with respect to all of the identified considerations. For example, as discussed previously, the data and analyses associated with this proposal are complex, and several uncertainties remain in EPA's quantitative risk analysis. One of these uncertainties is the evolving character/composition of CCRs due to electric utility upgrades and retrofits needed to comply with the emerging CAA requirements, which could present new or otherwise unforeseen contaminant issues (*e.g.,* hexavalent chromium from post-NO_X controls). Other uncertainties relate to the extent to which some sampled data with high concentrations used in the risk assessment accurately reflect coal ash leaching from landfills or surface impoundments, and the extent to which releases from surface impoundments located in close proximity to water bodies intercept drinking water wells. For example, as explained earlier in the preamble, some data reflected pore water taken in the upper section of a surface impoundment where coal refuse was placed. There were acid generating conditions and high concentrations of arsenic, but the data demonstrated that the underlying coal ash neutralized the acid conditions and greatly reduced the arsenic which leached from the bottom of the impoundment. There are also technical issues associated with releases from surface impoundments located in close proximity to water bodies which intercept drinking water wells. For example, surface impoundments are commonly placed next to rivers, which can intercept the leachate plume and prevent contamination of drinking water wells on the other side of the river. Also, in such circumstances the direction of groundwater flow on both sides of the river may be towards the river; thus, the drinking water well on the opposite side of a river may not be impacted.

As mentioned previously, EPA has received additional reports on damage cases, one from industry and one from citizen groups. Closer analyses of these reports could have the potential to significantly affect the Agency's conclusions.

An equally significant component of the overall picture, if not more so, relates to how effectively state regulatory programs address the risks associated with improper management of this material. As discussed earlier in this preamble, the continued damage cases and the reports on state regulatory programs call into question whether the trend in improving state regulatory regimes that EPA identified in May 2000 has materialized to the degree anticipated in the Regulatory Determination. Although recent information indicates that significant gaps remain, EPA continues to lack substantial details regarding the full extent of state regulatory authority over these materials, and the manner in which states have in practice, implemented this oversight. Nevertheless, based on the information made available on state programs, the Agency is reticent to establish a regulatory program without any federal oversight. Thus, EPA seeks additional details on regulation of CCRs by states to ensure that EPA's understanding of state programs is as complete as possible. While EPA recognizes that the extent of regulation of CCRs varies between states, EPA is not yet prepared to draw overall conclusions on the adequacy of state programs, as a general matter. EPA is, therefore, requesting that commenters, and particularly state regulatory authorities, provide detailed information regarding the extent of available state regulatory authorities, and the manner in which these have been, and are currently implemented. In this regard, EPA notes that "survey" type information that does not provide these details is unlikely to be able to resolve the concerns arising from the recent information developed since the May 2000 Regulatory Determination. EPA is also soliciting comments on the extent to which the information currently available to the Agency reflects current industry practices at both older and new units. For example, EPA would be particularly interested in information that indicates how many facilities currently have groundwater monitoring systems in place, how those systems are designed and monitored, and what, if anything, they have detected.

EPA has identified several issues that will be relevant as it continues to evaluate the overall adequacy of state regulatory programs. Specifically, EPA intends to consider how state regulatory programs have, in practice, evaluated and imposed requirements to address: (1) Leachate collection; (2) groundwater monitoring; (3) whether a unit must be lined, and the type of liner needed; (4) the effectiveness of existing management units as opposed to new management units; (5) whether the state requires routine analysis of CCRs; (6) whether financial responsibility requirements are in place for the management of CCRs; (7) the extent of permit requirements, including under what authorities these disposal units are permitted, the types of controls that are included in permits, and the extent of oversight provided by the states, (8) whether state programs include criteria for siting new units; (9) the extent of requirements for corrective action, post-closure monitoring and maintenance; (10) the state's pattern of active enforcement and public involvement; and (11) whether or not these facilities have insurance against catastrophic failures.

Directly related to the level of risk presented by improper management of CCRs, EPA is also weighing the differing levels of Federal oversight and control, and the practical implementation challenges, associated with the level and type of regulation under RCRA subtitles C and D. In the interest of furthering the public understanding of this topic, EPA presents an extensive discussion of the differences and concerns raised between regulation under subtitles C and D of RCRA, including a comparison of the advantages and disadvantages of each.

The subtitle C approach proposed today would provide full national cradle-to-grave control over CCRs destined for disposal, consistently managed under federally enforceable standards and through federal permits, or permits issued by the states that EPA has authorized to regulate CCRs in lieu of EPA. Permits can be a particularly important mechanism, because they allow the regulatory Agency to scrutinize the design of disposal units and the management practices of the permit applicant. They also allow the regulator to tailor the permit conditions to the facility site conditions, including the ability to impose additional specific conditions where it deems current or proposed facility practices to be inadequate to protect human health or the environment, pursuant to the omnibus authority in RCRA section 3005(c). Additionally, permitting processes provide the public and the local community the opportunity to participate in regulatory decisions. The combined requirements under subtitle C would effectively phase-out all wet handling of CCRs and prohibit the disposal of CCRs in surface impoundments. Moreover, the subtitle C approach is the only approach that

allows direct federal enforcement of the rule's requirements. The many damage cases, including more recent damage cases, suggest the value of control and oversight at the federal level.

At the same time, EPA acknowledges concerns with a subtitle C approach on the part of states, the utilities, and users of CCR-derived products. The states have expressed concern that any federal approach, including a subtitle D approach, has the potential to cause disruption to the states' implementation of CCR regulatory programs under their own authority. For example, the state of Maryland has recently upgraded its disposal standards for CCRs under its state solid waste authority, and the new state regulations address the major points in today's proposal (except the stability requirement for impoundments and the prohibition against surface impoundments). The state has expressed concern about having to revise its regulations again, and re-permit disposal units under subtitle C of RCRA. A subtitle D approach, as described in today's proposal, would eliminate or significantly reduce these concerns. EPA acknowledges these concerns, and certainly does not wish to force the states to go through unnecessary process steps. EPA nevertheless solicits comment on this issue, including more specifics on the potential for procedural difficulties for state programs, and measures that EPA might adopt to try to mitigate these effects.

Two additional substantive concerns with regulation of CCRs under subtitle C have been raised by commenters: the effect of listing CCRs as hazardous waste under RCRA on beneficial uses, and the availability of existing subtitle C landfill capacity to manage CCRs. As explained previously, EPA shares the concern that beneficial uses not be inadvertently adversely affected by the regulation of CCRs destined for disposal. EPA continues to believe that certain beneficial use, when performed properly, is the environmentally preferable destination for these materials and, therefore, wants to address any potential stigma that might arise from designating CCRs as hazardous wastes. Thus, EPA is seeking data and information, including detailed analyses, of why the subtitle C regulation outlined in today's proposal will have the impact that some commenters have identified. As explained at length in section VI of this preamble, EPA believes it can generally address the concerns that have been raised regarding the effect of subtitle C regulation on legitimate beneficial uses in today's proposal through several of the actions outlined in today's proposal. The most important of these is that EPA is not proposing to revise its May 2000 Regulatory Determination that beneficial uses retain the Bevill exemption and do not warrant federal regulation. Nevertheless, EPA agrees that "stigma" is an important consideration in the Agency's decision, and solicits information and data that will help the Agency quantify the potential effects of any stigma arising from association with CCR disposal regulated under subtitle C.

On the question of hazardous waste disposal capacity, EPA believes that management patterns of CCRs will continue: That landfills and surface impoundments currently receiving CCRs will obtain interim status and convert to RCRA subtitle C status, and that the proposal will not shift disposal patterns in a way that substantially increases the disposal of CCRs off-site from generating utilities to commercial hazardous waste landfills. Therefore, EPA's regulatory analysis assumes disposal patterns will remain generally the same. As commenters have pointed out, CCRs do, in theory, have the potential to overwhelm the current hazardous waste capacity in the United States. EPA's Biennial Report indicates that approximately two million tons of hazardous waste are disposed of annually in hazardous waste landfills, and EPA estimates that the current total national commercial hazardous waste landfill disposal capacity is between 23.5 and 30.3 million tons, while the annual amount of CCRs currently going to land disposal is 46 million tons (with an additional 29.4 million tons going to surface impoundments).[64] These figures illustrate the very large volume of CCR material involved, and how it could overwhelm existing subtitle C disposal capacity. While a DOE survey reports that 70% of disposal involves "company on-site" disposal units and 30% involves "off-site" disposal units, DOE indicated that off-site disposal capacity can be company owned or commercial disposal units. In communications with USWAG, they indicated, in some cases smaller facilities may send ash to a commercial operation, but believed that is in no way representative of the industry as a whole. In some cases, the disposal facility may be operated by a contractor for the utility, and the landfill is a captive facility that does not receive other industrial wastes. At the same time, EPA points out that, to the extent that new capacity is needed, the implementation of today's rule, if the subtitle C alternative is selected, will take place over a number of years, providing time for industry and state permitting authorities to address the issue. However, this is an issue on which EPA would find further information to be helpful. Therefore, EPA solicits detailed information on this topic, to aid in further quantifying the extent to which existing capacity may be insufficient. For example, EPA is interested in detailed information on the volume of CCRs now going off-site for disposal; the nature of off-site disposal sites (*e.g.,* commercial subtitle D landfills versus dedicated CCR landfills owned by the utility); and the amount of available land on utility sites for added disposal capacity.

Finally, the states have expressed concern that the RCRA subtitle C requirements will be considerably more expensive for them to implement than a RCRA subtitle D regulation, without providing commensurate benefits. For example, the states have reported that regulation under RCRA subtitle C, versus subtitle D, would cost them an additional $17 million per year to implement. EPA acknowledges the concern that the RCRA subtitle C requirements can be costly to implement, and could put more pressure on diminishing state budgets. However, were states to utilize the subtitle D requirements of today's proposal, the cost of implementing a RCRA subtitle D program will also be expensive. Thus, EPA is aware of the pressures on state budgets and will consider potential impacts when making a final determination for this rulemaking. Nevertheless, in the event that EPA determines that RCRA subtitle C regulation is warranted, it will be because EPA has determined that there are serious environmental and human health risks that can only be remedied by regulation under subtitle C. Further, under the subtitle C scenario, we believe that most states should be able to address any shortfalls through hazardous waste generator or disposal fees. EPA specifically solicits comments from states as to the extent to which such fees would be able to offset the costs of administering permit, inspection, and enforcement programs.

EPA notes that its estimates of costs of compliance with the subtitle C requirements have increased since its estimates in the 1999 Report to Congress; as explained later in this preamble, EPA believes these costs are commensurate with the benefits to be derived from the controls, and that the costs of regulation under RCRA subtitle D are substantial as well. For example,

[64] These figures reflect the total current capacity, not annual capacity. The annual capacity is significantly less: modifications to annual capacity would require modifications to existing permits.

one of the major potential costs under either the subtitle C or subtitle D option is associated with the required closure of all existing surface impoundments that do not meet the rule's technical requirements, which EPA is proposing under both the subtitle C and subtitle D co-proposals. Further, the technical unit design and groundwater monitoring requirements that will effectively protect human health and the environment under either option are quite similar. Finally, EPA is proposing to modify certain aspects of the RCRA subtitle C framework to address some of the practical implementation challenges associated with applying the existing regulatory framework to these wastes. However, commenters have suggested that EPA has underestimated the costs of compliance under the subtitle C requirements upstream of surface impoundments and landfills (*e.g.,* for storage). Commenters, however, have not provided specific cost estimates associated with storage of CCRs. EPA specifically solicits substantiating detail from commenters.

One disadvantage of a RCRA subtitle C approach, compared to a RCRA subtitle D approach, is that the subtitle C approach, in most states, will not go into effect as quickly as subtitle D. That is, the subtitle C regulations require an administrative process before they become effective and federally enforceable (except in the two states that are not authorized to manage the RCRA program). The RCRA hazardous waste implementation and authorization process is described in detail in sections VII and VIII of this preamble. But to summarize, federal regulations under subtitle C would not go into effect and become federally enforceable until RCRA-authorized states [65] have adopted the requirements under their own state laws, and EPA has authorized the state revisions. Under the RCRA subtitle C regulations, when EPA promulgates more stringent regulations, states are required to adopt those rules within one year, if they can do so by regulation, and two years if required by legislative action. If a state does not adopt new regulations promptly, EPA's only recourse is to withdraw the entire state hazardous waste program. If EPA determines that a subtitle C rule is warranted, the Agency will place a high priority on ensuring that states promptly pick up the new rules and become authorized, and EPA will work aggressively toward this end. Three decades of history in the RCRA program, however, suggest that this process will take two to five years (if not longer) for rules to become federally enforceable.[66]

At the same time, EPA believes there may be benefits in a RCRA subtitle D approach that establishes specific self-implementing requirements that utilities and others managing regulated CCRs would have to comply with, even in the absence of permitting or direct regulatory oversight. EPA recognizes that many of the states have regulatory programs in place, albeit with varying requirements, for the disposal of CCRs, and that industry practices have been improving. The RCRA subtitle D approach would complement existing state programs and practices by filling in gaps, and set forth criteria for disposing of CCRs to meet the national minimum standards that are designed to address key risks identified in damage cases and the risk assessment—including the risk of surface impoundment failure, which has been identified as a concern appropriate for control.

The co-proposed RCRA subtitle D option is less costly than the co-proposed RCRA subtitle C option, according to EPA's Regulatory Impact Assessment. The main differences in the costs are based on the assumption that there will be less compliance, or slower compliance, under a RCRA subtitle D option. In addition, the industry and state commenters suggested that a RCRA subtitle D approach would eliminate two of their concerns: (1) That a RCRA subtitle C approach would inappropriately stigmatize uses of CCRs that provide significant environmental or economic benefits, or that (according to those commenters) hold significant potential promise, and (2) that the volume of CCR wastes generated—particularly if requirements of a RCRA subtitle C regulation led to more off-site disposal—would overwhelm existing subtitle C capacity based on the large volumes of CCRs that are generated and would need to be disposed of. It would also reduce or eliminate expressed industry concerns about the effect of RCRA subtitle C requirements on plant operations, and state concerns related to the burden of the RCRA subtitle C permitting process. Related to the capacity issue, these same commenters have also suggested that, under the RCRA subtitle C regulations, future cleanup of poorly sited or leaking disposal sites (including historical or legacy sites) would be considerably more expensive, especially where off-site disposal was chosen as the option. (EPA's RIA does not quantify this last issue, but the RIA does discuss two recent cases as examples; EPA solicits more detailed comment on this issue, preferably with specific examples.) As stated earlier, EPA does not have sufficient information to conclude that regulation under RCRA subtitle C will stigmatize CCRs destined for beneficial use, for the reasons discussed elsewhere in today's preamble, and the Agency does not at this point have reason to assume that use of off-site commercial disposal of CCRs will increase significantly.

EPA also notes that many of the requirements discussed above would go into effect more quickly under RCRA subtitle D. Under subtitle D of RCRA, EPA would set a specific nationwide compliance date and industry would be subject to the requirements on that date, although as discussed elsewhere in today's preamble, EPA's ability to enforce those requirements is limited. (Of course, certain requirements, such as closure of existing surface impoundments, would have a delayed compliance date set to reflect practical compliance realities, but other requirements, for example, groundwater monitoring or the requirement that new surface impoundments be constructed with composite liners could be imposed substantially sooner than under a RCRA subtitle C rule.) The possible exception would be if EPA decided to establish financial assurance requirements through a regulatory process currently underway that would establish financial assurance requirements for several industries pursuant to CERCLA 108(b), including the Electric Power Generation, Transmission and Distribution Industry. For a more detailed discussion of these issues *see* section IX.

However, there are also disadvantages to any approach under RCRA subtitle D. Subtitle D provides no Federal oversight of state programs as it relates to CCRs. It establishes a framework for Federal, state, and local government cooperation in controlling the management of nonhazardous solid waste. The Federal role in this arrangement is to establish the overall regulatory direction, by providing minimum nationwide standards for protecting human health and the environment, and to provide technical assistance to states for planning and developing their own environmentally sound waste management practices. The co-proposed subtitle D alternative in this proposal would establish national minimum

[65] Currently, all but two states are authorized for the base RCRA program.

[66] In addition, existing facilities would generally operate under self-implementing interim status provisions until the state issued a RCRA permit, which is a several year process, although presumably the facility might remain under state solid waste permits, depending on state law.

standards specifically for CCRs for the first time. The actual planning and direct implementation of solid waste programs under RCRA subtitle D, however, remain state and local functions, and the act authorizes states to devise programs to deal with state-specific conditions and needs.

In further contrast to subtitle C, RCRA subtitle D requirements would regulate only the disposal of solid waste, and EPA does not have the authority to establish requirements governing the transportation, storage, or treatment of such wastes prior to disposal. Under RCRA sections 4004 and 4005(a), EPA cannot require that facilities obtain a permit for these units. EPA also does not have the authority to determine whether any state permitting program for CCR facilities is adequate. This complicates the Agency's ability to develop regulations that can be effectively implemented and tailored to individual site conditions. Moreover, EPA does not have the authority to enforce the regulations, although, the "open dumping" prohibition may be enforced by states and citizens under section 7002 of RCRA.

D. EPA Is Not Reconsidering the Regulatory Determination Regarding Beneficial Use

As noted previously, in the May 2000 Regulatory Determination, EPA concluded that federal regulation was not warranted for the beneficial uses identified in the notice, because: "(a) We have not identified any other beneficial uses that are likely to present significant risks to human health or the environment; and (b) no documented cases of damage to human health or the environment have been identified. Additionally, we do not want to place any unnecessary barriers on the beneficial uses of coal combustion wastes so they can be used in applications that conserve natural resources and reduce disposal costs." (*See* 65 FR 32221) EPA did not conduct specific risk assessments for the beneficial use of these materials, except as noted below and elsewhere in this preamble. Instead, it generally described the uses and benefits of CCRs, and cited the importance of beneficially using secondary materials and of resource conservation, as an alternative to disposal. However, EPA did conduct a detailed risk assessment of certain agricultural uses of CCRs,[67] since the use of CCRs in this manner is most likely to raise concerns from an environmental point of view. Overall, EPA concluded at the time that the identified uses of CCRs provided significant benefits (environmental and economic), that we did not want to impose an unnecessary stigma on these uses and therefore, we did not see a justification for regulating these uses at the federal level.

Since EPA's Regulatory Determination in May 2000, the Agency has gathered additional information. In addition to the evolving character/composition of CCRs due to electric utility upgrades and retrofits needed to comply with the emerging CAA requirements, which could present new or otherwise unforeseen contaminant issues (*e.g.,* hexavalent chromium from post-NO_X controls), changes include: (1) A significant increase in the use of CCRs, and the development of established commercial sectors that utilize and depend on the beneficial use of CCRs, (2) the recognition that the beneficial use of CCRs (and, in particular, specific beneficial uses of CCRs, such as using fly ash as a substitute for Portland cement in the production of concrete) provide significant environmental benefits, including the reduction of GHG emissions, (3) the development of new applications of CCRs, which may hold even greater GHG benefits (for example, fly ash bricks and a process to use CO_2 emissions to produce cement), (4) new research by EPA and others indicating that the standard leach tests—*e.g.,* the Toxicity Characteristic Leaching Procedure (TCLP) that have generally been used may not accurately represent the performance of varying types of CCRs under variable field conditions, (5) new studies and research by academia and federal agencies on the use of CCRs, including studies on the performance of CCR-derived materials in concrete, road construction,[68] and agriculture,[69] and studies of the risks that may or may not be associated with the different uses of CCRs, including uses of unencapsulated CCRs, and (6) the continuing development of state "beneficial use" regulatory programs under state solid waste authorities.

Some of these changes confirm or strengthen EPA's Regulatory Determination in May 2000 (*e.g.,* the growth and maturation of state beneficial use programs and the growing recognition that the beneficial use of CCRs is a critical component in strategies to reduce GHG emissions); other developments raise critical questions regarding this determination (*e.g.,* the potentially changing composition of CCRs as a result of improved air pollution control and the new science on metals leaching). EPA solicits information and data on these developments and how the beneficial use of CCRs will be affected (*e.g.,* increased use of fly ash in cement and concrete).

However, on balance, after considering all of these issues and the information available to us at this time, EPA believes that the most appropriate approach toward beneficial use is to leave the May 2000 Regulatory Determination in place, as the Agency, other federal agencies, academia, and society more broadly investigate these critical questions and clarify the appropriate beneficial use of these materials. This section provides EPA's basis for leaving the Bevill exemption in place for these beneficial uses, although as discussed throughout this section, EPA is also soliciting comment on unencapsulated uses of CCRs and whether they should continue to be exempted as a beneficial use under the Bevill exemption.

EPA is proposing this approach in recognition that some uses of CCRs, such as encapsulated uses in concrete, and use as an ingredient in the manufacture of wallboard, provide benefits and raise minimal health or environmental concerns. That is, from information available to date, EPA believes that encapsulated uses of CCR, as is common in many consumer products, does not merit regulation. On the other hand, unencapsulated uses have raised concerns and merit closer attention. For example, the placement of unencapsulated CCRs on the land, such as in road embankments or in agricultural uses, presents a set of issues, which may pose similar concerns as those that are causing the Agency to propose to regulate CCRs destined for disposal. Still, the amounts and, in some cases, the manner in which they are used—*i.e.,* subject to engineering specifications and material requirements rather than landfilling techniques—are very different from land disposal. EPA also notes that stakeholders, such as Earthjustice have petitioned EPA to ban particular uses of CCR; for example, the placement of CCRs in direct contact with water bodies.

Due to such issues as the changing characteristics of CCRs, as a result of more widespread use of air pollution control technologies and the new information becoming available on the

[67] Draft Final Report; Non-groundwater Pathways, Human Health and Ecological Risk Analysis for Fossil Fuel Combustion Phase 2 (FFC2) and its appendices (A through J); available at *http://www.epa.gov/osw/nonhaz/industrial/special/fossil/fsltech.htm.*

[68] *See http://www.epa.gov/osw/partnerships/c2p2/cases/index.htm.*

[69] *See http://www.epa.gov/osw/partnerships/c2p2/pubs/fgd-fs.pdf.*

leaching of metals from CCRs, we are considering approaches such as, better defining beneficial use or developing detailed guidance on the beneficial use of CCRs to supplement the regulations. The Agency solicits information and data on these and other approaches that EPA could take in identifying when uses of CCRs constitute a "beneficial use," and consequently will remain exempt.

Other alternative approaches—for example, to regulate the beneficial use of CCRs under the regulations that apply to "use constituting disposal," to prohibit unencapsulated uses outright, including CCRs used in direct contact with water matrices, including the seasonal high groundwater table, or to require front-end CCR and site characterization through the use of leach tests adapted for specific uses of CCR, prior to CCR management decisions—could address concerns that have been expressed over the land placement of CCRs. However, EPA is trying to balance concerns that proposing one or more of these alternatives might have the effect of stifling economic activities and innovation in areas that have potential for environmental benefits, while also providing adequate protection of human health and the environment.

At the same time, EPA recognizes that seven proven damage cases involving the large-scale placement, akin to disposal, of CCRs has occurred under the guise of "beneficial use"—the "beneficial" use being the filling up of old quarries or gravel pits, or the regrading of landscape with large quantities of CCRs. EPA did not consider this type of use as a "beneficial" use in its May 2000 Regulatory Determination, and does not consider this type of use to be covered by the exclusion. Therefore, today's proposed rule explicitly removes these types of uses from the category of beneficial use, such that they would be subject to the management standards that EPA finally promulgates. EPA also seeks information and data on whether it should take a similar approach in today's proposal to unencapsulated uses of CCRs, such as the placement of unencapsulated CCRs on the land—*e.g.,* agricultural uses. Alternatively, EPA is also soliciting comment on whether the Agency should promulgate standards allowing such uses, on a site-specific basis, based on a site specific risk assessment, taking into consideration, inter alia, the CCRs character and composition, their leaching potential under the range of conditions under which CCRs will be managed, and the context in which the CCRs will be applied, such as location, volume, rate of application, and proximity to water.

Before getting into a detailed discussion of the materials in question, EPA would reiterate that CCRs, when beneficially used will conserve resources, provide improved material properties, reduce GHG emissions, lessen the need for waste disposal units, and provide significant domestic economic benefits (as noted above in section XII). At the same time, EPA recognizes that there are important issues and uncertainties associated with specific uses of specific CCRs, that there has been considerable recent and ongoing research on these uses, and that the composition of CCRs are likely changing as a result of more aggressive air pollution controls. EPA is particularly concerned that we avoid the possibility of cross-media transfers stemming from CAA regulations requiring the removal of hazardous air pollutants (*e.g.,* arsenic, mercury, selenium) from utility stacks being released back into the soil and groundwater media through inappropriate "beneficial" uses.

EPA has received numerous comments on specific uses of CCRs, and we have been working with states to help them develop effective beneficial use programs (which apply to a wide range of secondary materials, not just CCRs). EPA, other federal agencies, and academia have conducted research on specific uses, and have provided guidance and best management practices on using CCRs in an environmentally sound manner in a range of applications. For example, EPA, working with the Federal Highway Administration (FHWA), DOE, the American Coal Ash Association (ACAA), and USWAG issued guidance in April 2005 on the appropriate use of coal ash in highway construction. EPA understands that the composition of CCRs, the nature of different CCR uses, and the specific environment in which CCRs are used, can affect the effectiveness and the environmentally sound use of particular projects. In today's proposal, EPA is suggesting that an appropriate balance can be met by (1) determining that the placement of CCRs in sand and gravel pits, as well as the use of large volumes of CCRs in restructuring landscapes to constitute disposal, rather than the beneficial use of CCRs, and at the same time (2) leaving in place its determination that the beneficial uses of CCRs—*e.g.,* those identified in the May 2000 Regulatory Determination as clarified in this notice—should not be prohibited from continuing. As described later in this section of today's notice, EPA solicits comment on whether an alternative approach is appropriate, particularly for unencapsulated uses of CCRs on the land.

1. Why is EPA not proposing to change the determination that CCRs that are beneficially used do not warrant federal regulation?

As an initial matter, we would note that for some of the beneficial uses, CCRs are a raw material used as an ingredient in a manufacturing process that have never been "discarded,[70]" and thus, would not be solid wastes under the existing hazardous waste rules. For example, synthetic gypsum is a product of the FGD process at coal-fired power plants. In this case, the utility designs and operates its air pollution control devices to produce an optimal product, including the oxidation of the FGD to produce synthetic gypsum. In this example, after its production, the utility treats FGD as a valuable input into a production process, *i.e.,* as a product, rather than as something that is intended to be discarded. Wallboard plants are sited in close proximity to power plants for access to raw material, with a considerable investment involved. Thus, FGD gypsum used for wallboard manufacture is a product rather than a waste or discarded material. This use and similar uses of CCRs that meet product specifications would not be affected by today's proposed rule in any case, regardless of the option taken.

With that said, today's proposed action would leave in place EPA's May 2000 Regulatory Determination that beneficially used CCRs do not warrant federal regulation under subtitle C or D of RCRA. As EPA stated in the May 2000 Regulatory Determination, "In the [Report to Congress], we were not able to identify damage cases associated with these types of beneficial uses, nor do we now believe that these uses of coal combustion wastes present a significant risk to human health and the environment. While some commenters disagreed with our findings, no data or other support for the commenters' position was provided, nor was any information provided to show risk or damage associated with agricultural use. Therefore, we conclude that none of the beneficial uses of coal combustion wastes listed above pose risks of concern." (*See* 65 FR 32230.) Since that time, EPA is not aware of data or other information to indicate that existing

[70] In order for EPA to regulate a material under RCRA, the material must be a solid waste, which the statute defines as materials that have been discarded. *See* Section 1004(27) of RCRA for definition of solid waste.

efforts of states, EPA and other federal agencies are not adequate to address environmental issues associated with the beneficial uses of CCRs, that were originally identified in the Regulatory Determination. Therefore, at this time, EPA is not proposing to reverse that determination. Specifically: (1) EPA believes today's proposal will ensure that inappropriate beneficial use situations, like the Gambrills, MD site, will be regulated as disposal; (2) many states are developing effective beneficial use programs which, in many cases, allow the use of CCRs as long as they are demonstrated to be non-hazardous materials, and (3) EPA does not wish to inhibit or eliminate the significant and measurable environmental and economic benefits derived from the use of this valuable material without a demonstration of an environmental or health threat.

EPA also wants to make clear that wastes that consist of or contain these Bevill-exempt beneficially used materials, including demolition debris from beneficially used CCRs in wallboard or concrete that were generated because the products have reached the end of their useful lives—would also not be listed as a special waste subject to subtitle C of RCRA, from the point of their generation to their ultimate disposal.

In summary, EPA continues to believe that the beneficial use of CCRs, when performed properly and in an environmentally sound manner, is the environmentally preferable outcome for CCRs and, therefore, is concerned about regulatory decisions that would limit beneficial uses, including research on beneficial uses. Thus, EPA is not proposing to modify the existing Bevill exemption for CCRs (sometimes referred to as CCPs when beneficially used), and instead is proposing to leave the current determination in place. However, EPA recognizes that there is a disparity in the quality of state programs dealing with beneficial uses, uncertainty relative to the future characteristics of CCRs and, therefore, uncertainty concerning the risks associated with some beneficial uses. At the same time, EPA recognizes the potential environmental benefits with regard to the uses of CCRs. For these reasons, EPA is requesting information and data on the appropriate means of characterizing beneficial uses that are both protective of human health and the environment and provide benefits. EPA is also requesting information and data demonstrating where the federal and state programs are or have been inadequate in being environmentally protective and, conversely, where states have, or are developing, increasingly effective beneficial use programs.

As previously discussed, and discussed in section VI, some stakeholders have commented that EPA should not regulate CCRs when disposed of in landfills or surface impoundments as a hazardous waste, because such an approach would stigmatize the beneficial use of CCRs, and these uses would disappear. Although it remains unclear whether any stigmatic effect from regulating CCRs destined for disposal as hazardous waste would decrease the beneficial use of CCRs, and irrespective of whether EPA ultimately concludes to promulgate regulations under RCRA subtitles C or D, EPA is convinced that regulating the beneficial use of CCRs under RCRA subtitle C as hazardous waste would be unnecessary, in light of the potential risks associated with these uses. For example, use of fly ash as a replacement for Portland cement is one of the most environmentally beneficial uses of CCRs (as discussed below), yet regulating this beneficial use under RCRA subtitle C requirements would substantially increase the cost and regulatory difficulties of using this material, without providing any corresponding risk reduction. Regulating the use of coal ash as a cement ingredient under RCRA subtitle C would subject the coal ash to full hazardous waste requirements up to the point that it is made into concrete, including requirements for generators, manifesting for transportation, and permits for storage. In addition, ready-mix operators would be subject to the land disposal restrictions and other requirements, as use of the concrete would constitute disposal if placed on the land. EPA instead is proposing an approach that would allow beneficial uses to continue, under state controls, EPA guidance, and current industrial standards and practices. Where specific problems are identified, EPA believes they can be safely addressed, but we do not believe that an approach that eliminates a wide range of uses that would add considerably to the costs of the rule, and that would disrupt and potentially close ongoing businesses legitimately using CCRs is justified, on the strength of the existing evidence.

EPA's May 2000 Regulatory Determination not to regulate various beneficial uses under the hazardous waste requirements, and today's proposal to leave that determination in place, does not conflict with EPA's view that certain beneficial uses, *e.g.,* use in road construction or agriculture, should be conducted with care, according to appropriate management practices, and with appropriate characterization of the material and the site where the materials would be placed. In this respect, CCRs are similar to other materials used in this manner—including raw materials derived from quarried aggregates, secondary materials from other industrial processes, and materials derived from natural ores. Rather, EPA concludes that, based on our knowledge of how CCRs are used, that potential risks of these uses do not warrant federal regulation, but can be addressed, if necessary, in other ways, as discussed previously, such as the State of Wisconsin has an extensive beneficial use program that supports the use of CCRs in a variety of circumstances, including in road base construction and agriculture uses, provided certain criteria are met. Similarly, EPA is working with the U.S. Department of Agriculture to develop guidance on the use of FGD gypsum in agriculture.

2. What constitutes beneficial use?

As discussed previously, EPA is not proposing to change the regulatory status of those CCRs that are beneficially used. However, because EPA is proposing to draw a distinction between CCRs that are destined for disposal and those that are beneficially used, we believe it is necessary and appropriate to distinguish between beneficial use and operations that would constitute disposal operations—such as large volumes of CCRs that are used in sand and gravel pits or for restructuring the landscape. EPA believes the following criteria can be used to define legitimate beneficial uses appropriately, and are consistent with EPA's approach in the May 2000 Regulatory Determination, although such criteria were not specifically identified at that time:

○ The material used must provide a functional benefit. For example, CCRs in concrete increase the durability of concrete—and are more effective in combating degradation from salt water; synthetic gypsum serves exactly the same function in wallboard as gypsum from ore, and meets all commercial specifications; CCRs as a soil amendment adjusts the pH of soil to promote plant growth.

○ The material substitutes for the use of a virgin material, conserving natural resources that would otherwise need to be obtained through practices, such as extraction. For example, the use of FGD gypsum in the manufacture of wallboard (drywall) decreases the need to mine natural gypsum, thereby conserving the natural resource and conserving energy that otherwise would be needed to mine natural gypsum; the use of fly ash in

lieu of portland cement reduces the need for cement. CCRs used in road bed replace quarried aggregate or other industrial materials. These CCRs substitute for another ingredient in an industrial or commercial product.

○ Where relevant product specifications or regulatory standards are available, the materials meet those specifications, and where such specifications or standards have not been established, they are not being used in excess quantities. Typically, when CCRs are used as a commercial product, the amount of CCRs used is controlled by product specifications, or the demands of the user. Fly ash used as a stabilized base course in highway construction is part of many engineering considerations, such as the ASTM C 593 test for compaction, the ASTM D 560 freezing and thawing test, and a seven day compressive strength above 2760 (400 psi). If excessive volumes of CCRs are used—*i.e.,* greater than were necessary for a specific project,—that could be grounds for a determination that the use was subject to regulations for disposal.

○ In the case of agricultural uses, CCRs would be expected to meet appropriate standards, constituent levels, prescribed total loads, application rates, etc. EPA has developed specific standards governing agricultural application of biosolids. While the management scenarios differ between biosludge application and the use of CCRs as soil amendments, EPA would consider application of CCRs for agriculture uses not to be a legitimate beneficial use if they occurred at constituent levels or loading rates greater than EPA's biosolids regulations allow.[71] EPA also recognizes that the characteristics of CCRs are such that total concentrations of metals, as biosolids are assessed, may not be the most appropriate standard, as CCRs have been shown to leach metals with significant variability.

EPA is proposing that these criteria be included in the regulations as part of the definition of beneficial use. EPA requests comment on these criteria, as well as suggestions for other criteria that may need to be included to ensure that legitimate beneficial uses can be identified and enforcement action can be taken against inappropriate uses.

Each of the uses identified in the May 2000 Regulatory Determination, CCRs can and have been utilized in a manner that is beneficial. The discussion that follows provides a brief summary of how certain of the beneficial uses meet the various criteria. EPA solicits comment on the need to provide a formal listing of all beneficial uses. To this end, EPA solicits comment on whether additional uses of CCRs have been established since the May 2000 Regulatory Determination that have not been discussed elsewhere in today's preamble should be regarded as beneficial. Of particular concern in this regard are reports that CCRs are being used in producing counter tops, bowling balls, and in the production of makeup. The Agency solicits comment on whether use of CCRs in consumer products of this kind can be safely undertaken. The Agency further solicits comments for any new uses of CCR, as well as the information and data that supports that it is beneficially used in an environmentally sound manner. The concern with such an alternative is that new and innovative uses that are not on the list would be subject to disposal regulations, until EPA revised its rule.

In the uses where the CCR is encapsulated in the product, such as cement, concrete, brick and concrete products, wallboard, and roofing materials—the CCRs provide a functional benefit—that is, the CCRs provide a cementitious or structural function, the CCRs substitute for cement, gypsum, and aggregate and thus save resources that would otherwise need to be mined and processed, and the CCRs are subject to product specifications, such as ASTM standards. Some of the uses, such as CCRs in paints and plastics not only provide benefits, but EPA generally does not consider materials used in these ways to be waste—that is, they have not been discarded. Use of CCRs in highway projects is a significant practice covering road bed and embankments. CCRs used according to FHA/DOT standards provide an important function in road building, replacing material that would otherwise need to be obtained, such as aggregate or clay. In many cases, the CCRs can lead to better road performance. For snow and ice controls, the beneficial use is limited to boiler slag and bottom ash, which replaces fine aggregate that would otherwise need to be used to prevent skidding, and amounts used are in line with the materials they replace.[72]

3. Disposal of CCRs in Sand and Gravel Pits and Large Scale Fill Operations Is Not Considered a Beneficial Use

As indicated earlier, EPA has identified several proven damage cases associated with the placement of CCRs in sand and gravel pits. There has also been significant community concern with large-scale fill operations. Because of the damage cases and the concern that sand and gravel pits and large scale fill operations are essentially landfills under a different name, EPA is clarifying and, thus, proposing to define the placement of CCRs in sand and gravel pits and large scale fill projects as land disposal that would be subject to either the proposed RCRA subtitle C or D regulations. Sites that are excavated so that more coal ash can be used as fill are also considered CCR landfills.

However, EPA recognizes that we need to define or provide guidance on the meaning of "a large scale fill operation." EPA solicits comments on appropriate criteria to distinguish between legitimate beneficial uses and inappropriate operations, such as, for example, a comparison to features associated with relatively small landfills used by the utility industry, and whether characteristics of the materials would allow their safe use for a particular application in a particular setting (*i.e.,* characterize both the materials for the presence of leachable metals and the area where the materials will be placed).

4. Issues Associated With Unencapsulated Beneficial Uses

Since the May 2000 Regulatory Determination, the major issues associated with the placement of CCRs on the land for beneficial use has involved the Gambrills, MD site which involves a sand and gravel pit and the Battlefield golf course, which was a large scale fill operation. These are the types of operations that EPA is proposing would be subject to any disposal regulations proposed in today's rule. However, because the Gambrills and Battlefield sites involved the unencapsulated placement of CCRs on the land, it raises questions regarding the beneficial use of unencapsulated uses of CCRs; accordingly, in this section, the Agency presents information on the issues on which it is specifically soliciting comment.

First, we identify the array of environmental issues associated with unencapsulated uses. CCRs can leach toxic metals at levels of concern, so depending on the characteristics of the CCR, the amount of material placed, how it is placed, and the site conditions, there is a potential for environmental concern.

• The importance of characterizing CCRs prior to their utilization is that CCRs from certain facilities may be acceptable under particular beneficial

[71] *See* 40 CFR part 503.

[72] According to the ACAA survey, 80% of boiler slag—a vitreous material often used as an abrasive—is reused, although industry has reported that the demand for boiler slag products is high, and virtually all of the slag is currently used.

use scenarios, while the same material type from a different facility or from the same facility, but generated under different operating conditions (*e.g.,* different air pollution controls or configurations) may not be acceptable for the same management scenario. Changes in air pollution controls will result in fly ash and other CCRs presenting new contaminant issues (*e.g.,* hexavalent chromium from post-NOx controls). Additionally, as described in section I. F. 2, there is significant variability in total metals content and leach characteristics.

- The amount of material placed can significantly impact whether placement of unencapsulated CCRs causes environmental risks. There are great differences between the amount of material disposed of in a landfill and in beneficial use settings. For example, a stabilized fly ash base course for roadway construction may be on the order of 6 to 12 inches thick under the road where it is used—these features differ considerably from the landfill and sand and gravel pit situations where hundreds of thousands to millions of tons of CCRs are disposed of and for which damage cases are documented.
- Unencapsulated fly ash used for structural fill is moistened and compacted in layers, and placed on a drainage layer. By moistening and compacting the fly ash in layers, the hydraulic conductivity can be greatly reduced, sometimes achieving levels similar to liner systems. This limits the transport of water through the ash and thus acts to protect groundwater. The drainage layer prevents capillary effects and thus also limits the amount of water that remains in contact with the fly ash. Although EPA is not aware of the use of organosilanes for beneficial use operations in the U.S., if mixed with fly ash, it is reported to be able to essentially render the fly ash impermeable to water, and thus there may be emerging placement techniques that can also greatly influence the environmental assessment.
- Site conditions are important factors. Hydraulic conductivity of the subsurface, the rainfall in the area, the depth to groundwater, and other factors (*e.g.,* changes in characteristics due to the addition of advanced air pollution controls) are important considerations in whether a specific beneficial use will remain protective of the environment.

Second, EPA notes the work and research being done by states, federal agencies, and academics to assess, provide guidance on, or regulate to address the environmental issues that may be associated with beneficial use. In addition to the recent EPA research on constituent leaching from CCRs described earlier in the preamble, a few highlights include:

- Many states have beneficial use programs. The ASTSWMO 2006 Beneficial Use Survey Report states: "A total of 34 of the 40 reporting States, or 85 percent, indicated they had either formal or informal decision-making processes or beneficial use programs relating to the use of solid wastes."[73] (*http://www.astswmo.org/files/publications/solidwaste/2007BUSurveyReport11–30–07.pdf*) For example, Wisconsin's Department of Natural Resources has developed a regulation (NR 538 Wis. Adm. Code), which includes a five-category system to allow for the beneficial use of industrial by-products, including coal ash. The state has approved CCRs in a full range of uses, including road construction and agricultural uses.
- EPA and USDA are conducting a multi-year study on the use of FGD gypsum in agriculture. The results of that study should be available in late 2012.
- EPA developed an easy to use risk model for assessing the use of recycled industrial materials in highways. This model is shared with states to facilitate assessments to determine if such beneficial use projects will be environmentally protective.[74]
- There is also considerable study and research by states and academic institutions, which EPA views as valuable in not only guiding the parties to appropriate uses, but also in informing EPA. A few examples are:

○ Li L, Benson CH, Edil TB, Hatipoglu B. Groundwater impacts from coal ash in highways. Waste and Management Resources 2006;159(WR4):151–63.

○ Friend M, Bloom P, Halbach T, Grosenheider K, Johnson M. Screening tool for using waste materials in paving projects (STUWMPP). Office of Research Services, Minnesota Dept. of Transportation, Minnesota; 2004. Report nr MN/RC–2005–03.

○ Sauer JJ, Benson CH, Edil TB. Metals leaching from highway test sections constructed with industrial byproducts. University of Wisconsin—Madison, Madison, WI: Geo Engineering, Department of Civil and Environmental Engineering; 2005 December 27, Geo Engineering Report No. 05–21.

Overall, federal agencies, states, and others are doing a great amount of work to promote environmentally sound beneficial use practices, to advance our understanding, and to consider emerging science and practices. Furthermore, the beneficial use of CCRs is a world wide activity, so there is also considerable work and effort from around the globe. In Europe, nearly all CCRs are beneficially used, and when used are considered to be products rather than wastes. Sweden, for example, actively supports the use of CCRs in road construction, and has conducted long-term tests of its use in this manner.

While recognizing the many beneficial use opportunities for CCRs, EPA believes it is imperative to gather a full range of views on the issue of unencapsulated uses in order to ensure the protection of human health and the environment. EPA is fully prepared to reconsider our proposed approach for these uses if comments provide information and data to demonstrate that it is inappropriate. For example, previous risk analyses do not address many of the use applications currently being implemented, and have not addressed the changes to CCR composition with more advanced air pollution control methods and improved leachate characterization. In addition, some scientific literature indicates that the uncontrolled (*i.e.,* excessive) application of CCRs can lead to the potentially toxic accumulation of metals (*e.g.,* in agricultural applications[75] and as fill material[76]). Thus, while EPA does not want to negatively impact the legitimate beneficial use of CCRs unnecessarily, we are also aware of the need to fully consider the risks, management practices, state controls, research, and any other pertinent information. Thus, to help EPA determine whether to revise

[73] Part of EPA's efforts with the states is to support the development of a national database on state beneficial use determinations. Information on the beneficial use determination database can be found on the Northeast Waste Management Officials' Association (NEWMOA) Web site at *http://www.newmoa.org/solidwaste/bud.cfm.* This database helps states share information on beneficial use decisions providing for more consistent and informed decisions.

[74] *See* a Final Report titled, "Use of EPA's Industrial Waste Management Evaluation Model (IWEM) to Support Beneficial Use Determinations" at *http://www.epa.gov/partnerships/c2p2/pubs/iwem-report.pdf* and the Industrial Waste Management Evaluation Model (IWEM) at *http://www.epa.gov/osw/nonhaz/industrial/tools/iwem.*

[75] *See,* for example, "Effects of coal fly ash amended soils on trace element uptake in plant," S.S. Brake, R.R. Jensen, and J. M. Mattox, Environmental Geology, November 7, 2003 *available at http://www.springerlink.com/content/3c5gaq2qrkr5unvp/fulltext.pdf.*

[76] *See* information regarding the Town of Pines Groundwater Plume at *http://www.epa.gov/region5superfund/npl/sas_sites/INN000508071.htm. Also see* additional information for this site at *http://www.epa.gov/region5/sites/pines/#updates.*

its approach and regulate, for example, unencapsulated uses of CCRs on the land, we solicit comments on whether to regulate, and if so, the most appropriate regulatory approach to be taken. For example, EPA might consider a prohibition on these uses, except where, as part of a case-by-case, or material-by-material petition process where appropriate characterization of the material is used (including taking into account the pH to which the material will be exposed) and a risk assessment, approved by a regulatory Agency, shows that the risks were within acceptable ranges.[77] Moreover, if regulating these uses under the RCRA hazardous waste authority is deemed warranted, the risk assessment would have to be approved, through a notice-and-comment process, by EPA or an authorized state. EPA expects that the risk assessment would be based on actual leach data from the material. (*See* request for comment below on material characterization.)

In reaching its decision on whether to regulate unencapsulated uses, EPA would be interested in comments and data on the following:

- We would like comment on whether persons should be required to use a leaching assessment tool in combination with the Draft SW–846 leaching test methods described in Section I. F. 2 and other tools (*e.g.,* USEPA's *Industrial Waste Management Evaluation Model* (IWEM)) to aid prospective beneficial users in calculating potential release rates over a specified period of time for a range of management scenarios, including use in engineering and commercial applications using probabilistic assessment modeling.
- As discussed previously, EPA is working with USDA to study agricultural use of FGD gypsum to provide further knowledge in this area. The Agency is interested in comments relating to the focus of these assessments, the use of historical data, the impact of pH on leaching potential of metals, the scope of management scenarios, the variable and changing nature of CCRs, and variable site conditions. Commenters interested in the EPA/USDA effort should consider the characteristics of FGD gypsum (*see http://www.epa.gov/epawaste/partnerships/c2p2/pubs/fgdgyp.pdf*) and information on the current study (*see http://www.epa.gov/epawaste/partnerships/c2p2/pubs/fgd-fs.pdf*).
- If EPA determines that regulations are needed, should EPA consider removing the Bevill exemption for such unencapsulated uses and regulate these under RCRA subtitle C or should EPA develop regulations under RCRA subtitle D?
- If materials characterization is required, what type of characterization is most appropriate? If the CCRs exceed the toxicity characteristic at pH levels different from the TCLP, should they be excluded from beneficial use? When are total levels relevant? EPA solicits information and data on the extent to which states request and evaluate CCR characterization data prior to the use of unencapsulated CCRs (keeping in mind that EPA ORD studies generally show that measurement of total concentrations for metals do not correlate well with metal leachate concentrations).
- If regulations are developed, should they cover specific practices, for example, restricting fill operations to those that moisten and compact fly ash in layers to attain 95% of the standard Proctor maximum dry density value and provide a drainage layer? Are such construction practices largely followed now?
- Historically, EPA has proposed or imposed conditions on other types of hazardous wastes destined for land placement (*e.g.,* maximum application rates and risk-based concentration limits for cement kiln dust used as a liming agent in agricultural applications (*see* 64 FR 45639; August 20, 1999); maximum allowable total concentrations for non-nutritive and toxic metals in zinc fertilizers produced from recycled hazardous secondary materials (*see* 67 FR 48393; July 24, 2002). Comments are solicited as to whether EPA should establish standards or rely on implementing states to impose CCR-/site-specific limits based on front-end characterization that ensures individual beneficial uses remain protective.
- Whether to exclude from beneficial use unencapsulated uses in direct contact with water bodies (including the seasonal high groundwater table)?

E. Placement of CCRs in Minefilling Operations

In today's proposal, EPA is not addressing its Regulatory Determination on minefilling, and instead will work with the OSM to develop effective federal regulations to ensure that the placement of coal combustion residuals in minefill operations is adequately controlled. In doing so, EPA and OSM will consider the recommendations of the National Research Council (NRC), which, at the direction of Congress, studied the health, safety, and environmental risks associated with the placement of CCRs in active and abandoned coal mines in all major U.S. coal basins. The NRC published its findings on March 1, 2006, in a report entitled "Managing Coal Combustion Residues (CCRs) in Mines," which is available at *http://books.nap.edu/openbook.php?isbn=0309100496.*

The report concluded that the "placement of CCRs in mines as part of coal mine reclamation may be an appropriate option for the disposal of this material. In such situations, however, an integrated process of CCR characterization, site characterization, management and engineering design of placement activities, and design and implementation of monitoring is required to reduce the risk of contamination moving from the mine site to the ambient environment." The NRC report recommended that enforceable federal standards be established for the disposal of CCRs in minefills to ensure that states have specific authority and that states implement adequate safeguards. The NRC Committee on Mine Placement of Coal Combustion Wastes also stated that OSM and its SMCRA state partners should take the lead in developing new national standards for CCR use in mines because the framework is in place to deal with mine-related issues. Consistent with the recommendations of the National Academy of Sciences, EPA anticipates that the U.S. Department of the Interior (DOI) will take the lead in developing these regulations. EPA will work closely with DOI throughout that process. Therefore, the Agency is not addressing minefilling operations in this proposed rule.

F. EPA Is Not Proposing To Revise the Bevill Determination for CCRs Generated by Non-Utilities

In this notice, EPA is not proposing to revise the Bevill exclusion for CCRs generated at facilities that are not part of the electric power sector and which use coal as the fuel in non-utility boilers, such as manufacturing facilities, universities, and hospitals. The Agency lacks sufficient information at this time to determine an appropriate course of action for the wastes from these facilities.

Industries that primarily burn coal to generate power for their own purposes (*i.e.,* non-utilities), also known as combined heat and power (CHP) plants, are primarily engaged in business activities, such as agriculture, mining, manufacturing, transportation, and education. The electricity that they generate is mainly for their own use, but

[77] As part of the petition application, the petitioner would also need to demonstrate that the CCRs are being beneficially used.

any excess may be sold in the wholesale market.[78] According to the Energy Information Administration (EIA), CHPs produced 2.7% of the total electricity generated from coal combustion in 2007 [79] and burned 2.3% of the total coal consumed for electricity generation (24 million tons) [80] at 2,967 facilities.[81] EPA estimates that CHPs generate approximately 3 million tons of CCRs annually or an average of just over 1,000 tons per facility. This is in comparison to electric utilities, which generated 136 million tons of CCRs in 2008, or an average of approximately 275,000 tons per facility. In addition, these manufacturing facilities generate other types of waste, many of which are generated in much larger quantities than CCRs, and thus, they are likely to be mixed or co-managed together. As a result, the composition of any co-managed waste might be fundamentally different from the CCRs that are generated by electric utilities. Presently, EPA lacks critical data from these facilities sufficient to address key Bevill criteria such as current management practices, damage cases, risks, and waste characterization. Thus, EPA solicits information and data on CCRs that are generated by these other industries, such as volumes generated, characteristics of the CCRs, whether they are co-managed with other wastes generated by the industry, as well as other such information. In addition, EPA does not currently have enough information on non-utilities to determine whether a regulatory flexibility analysis would be required under the Regulatory Flexibility Act, nor to conduct one if it is necessary. Therefore, the Agency has decided not to assess these operations in today's proposal, and will instead focus on the nearly 98% of CCRs that are generated at electric utilities.

V. Co-Proposed Listing of CCRs as a Special Waste Under RCRA Subtitle C and Special Requirements for Disposal of CCRs Generated by Electric Utilities

One of the alternatives in today's co-proposal is to add a new category of wastes that would be subject to regulation under subtitle C of RCRA, by adding to 40 CFR part 261, Subpart F—Special Wastes Subject to Subtitle C Regulations for CCRs destined for disposal. Under this alternative, the Agency further proposes to list CCRs destined for disposal as a special waste and CCRs would then be subject to regulation under 40 CFR parts 260 through 268 and 270 to 279 and 124, and subject to the notification requirements of section 3010 of RCRA. This listing would apply to all CCRs destined for disposal. This section provides EPA's basis for regulating CCRs under subtitle C of RCRA when disposed. As described in this preamble, the proposed listing would not apply to CCRs that are beneficially used (*see* section IV), CCRs that are part of a state or federally required cleanup that commenced prior to the effective date of the final rule (*see* section VI), or CCRs generated by facilities outside the electric power sector (*see* section IV).

A. What is the basis for listing CCRs as a special waste?

Many of the underlying facts on which EPA would rely on to support its proposed special waste listing have been discussed in the previous sections, which lay out reasons why the Agency may decide to reverse the Bevill Regulatory Determination and exemption. Rather than repeat that discussion here, EPA simply references the discussion in the earlier sections. In addition, EPA would be relying on the various risk assessments conducted on CCRs to provide significant support for a listing determination. EPA's risk assessment work includes four analyses: (1) U.S. EPA 1998, "Draft Final Report: Non-groundwater Pathways, Human Health and Ecological Risk Analysis for Fossil Fuel Combustion Phase 2 (FFC2)" (June 5, 1998) referred to hereafter as the 1998 Non-groundwater risk assessment (available in docket # F–1999–FF2P–FFFFF in the RCRA Information Center, and on the EPA Web site at *http://www.epa.gov/osw/nonhaz/industrial/special/fossil/ngwrsk1.pdf*); (2) preliminary groundwater and ecological risk screening of selected constituents in U.S. EPA 2002, "Constituent Screening for Coal Combustion Wastes," (contractor deliverable dated October 2002, available in docket EPA–HQ–RCRA–2006–0796 as Document # EPA–HQ–RCRA–2006–0796–0470); referred to hereafter as the 2002 screening analysis; (3) U.S. EPA 2010a, "Human and Ecological Risk Assessment of Coal Combustion Wastes" (April 2010) available in the docket for this proposed rule, and referred to hereafter as the 2010 risk assessment; and (4) U.S. EPA 2010b, "Inhalation of Fugitive Dust: A Screening Assessment of the Risks Posed by Coal Combustion Waste Landfills—DRAFT" available in the docket for this proposed rule. As explained below, the 2010 risk assessment correlates closely with the listing criteria in EPA's regulations.

1. Criteria for Listing CCRs as a Special Waste and Background on 2010 Risk Assessment

In making listing determinations under subtitle C of RCRA, the Agency considers the listing criteria set out in 40 CFR 261.11. EPA considered these same criteria in making the proposed special waste listing decision.

The criteria provided in 40 CFR 261.11(a)(3) include eleven factors that EPA must consider in determining whether the waste poses a "substantial present or potential hazard to human health and the environment when improperly treated, stored, transported or disposed of or otherwise managed." Nine of these factors, as described generally below, are incorporated or are considered in EPA's risk assessment for the waste streams of concern:

- Toxicity (Sec. 261.11(a)(3)(i)) is considered in developing the health benchmarks used in the risk assessment modeling.
- Constituent concentrations (Sec. 261.11(a)(3)(ii)) and the quantities of waste generated (Sec. 261.11(a)(3)(viii)) are combined in the calculation of the levels of the CCR constituents that pose a hazard.
- Potential of the hazardous constituents and any degradation products to migrate, persist, degrade, and bioaccumulate (sections 261(a)(3)(iii), 261.11(a)(3)(iv), 261.11(a)(3)(v), and 261.11(a)(3)(vi)) are all considered in the design of the fate and transport models used to determine the concentration of the contaminants to which individuals are exposed.
- Two of the factors, plausible mismanagement and the regulatory actions taken by other governmental entities based on the damage caused by the constituents ((§§ 261.11(a)(3)(vii) and 261.11(a)(3)(x)), were used in establishing the waste management scenario(s) modeled in the risk assessment.

One of the remaining factors of the eleven listed in 261.11(a)(3) is consideration of damage cases (§ 261.11(a)(3)(ix)); these are discussed in section II. C. The final factor allows EPA to consider other factors as appropriate (§ 261.11(a)(3)(xi)).

As discussed earlier, EPA conducted analyses of the risks posed by CCRs and determined (subject to consideration of public comment) that it would meet the criteria for listing set forth in 40 CFR 261.11(a)(3). The criteria for listing determinations found at 40 CFR part

[78] Energy Information Administration (*http://www.eia.doe.gov/cneaf/electricity/page/prim2/toc2.html#non*).

[79] *http://www.eia.doe.gov/cneaf/electricity/epa/epaxlfile1_1.pdf.*

[80] *http://www.eia.doe.gov/cneaf/electricity/epa/epaxlfile4_1.pdf.*

[81] *http://www.eia.doe.gov/cneaf/electricity/epa/epaxlfile2_3.pdf.*

261.11 require the Administrator to list a solid waste as a hazardous waste (and thus subject to subtitle C regulation) upon determining that the solid waste meets one of three criteria in 40 CFR 261.11(a)(1)-(3). As just noted, the criteria considered by EPA in determining that listing is warranted pursuant to 40 CFR 261.11(a)(3) are:

- Whether the waste contains any of the toxic constituents listed in Appendix VIII of 40 CFR part 261 (Hazardous Waste Constituents) and, after considering the following factors, the Administrator concludes that the waste is capable of posing a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported or disposed of, or otherwise managed:

(i) The nature of the toxicity presented by the constituent.

(ii) The concentration of the constituent in the waste.

(iii) The potential of the constituent or any toxic degradation product of the constituent to migrate from the waste into the environment under the types of improper management considered in paragraph (vii).

(iv) The persistence of the constituent or any toxic degradation product of the constituent.

(v) The potential for the constituent or any toxic degradation product of the constituent to degrade into non-harmful constituents and the rate of degradation.

(vi) The degree to which the constituent or any degradation product of the constituent bioaccumulates in ecosystems.

(vii) The plausible types of improper management to which the waste could be subjected.

(viii) The quantities of the waste generated at individual generation sites or on a regional or national basis.

(ix) The nature and severity of the human health and environmental damage that has occurred as a result of the improper management of wastes containing the constituent.

(x) Action taken by other governmental agencies or regulatory programs based on the health or environmental hazard posed by the waste or waste constituent.

(xi) Such other factors as may be appropriate.

In 1994, EPA published a policy statement regarding how the Agency uses human health and environmental risk estimates in making listing decisions, given the uncertainty that can co-exist with risk estimates. Specifically:

"* * * the Agency's listing determination policy utilizes a "weight of evidence" approach in which risk is a key factor * * * however, risk levels themselves do not necessarily represent the sole basis for a listing. There can be uncertainty in calculated risk values and so other factors are used in conjunction with risk in making a listing decision. * * *. EPA's current listing determination procedure * * * uses as an initial cancer risk "level of concern" a calculated risk level of 1×10^{-5} (one in one hundred thousand) * * * (1) Waste streams for which the calculated high-end individual cancer-risk level is 1×10^{-5} or higher generally are considered candidates for a list decision * * * (2) Waste streams for which these risks are calculated to be 1×10^{-4} or higher * * * generally will be considered to pose a substantial present or potential hazard to human health and the environment and generally will be listed as hazardous waste. Such waste streams fall into a category presumptively assumed to present sufficient risk to require their listing as hazardous waste. However, even for these waste streams there can in some cases be factors which could mitigate the high hazard presumption. These additional factors * * * will also be considered by the Agency in making a final determination. (3) Waste streams for which the calculated high-end individual cancer-risk level is lower than 1×10^{-5} generally are considered initial candidates for a no-list decision. (4) Waste streams for which these risks are calculated to be 1×10^{-6} or lower, and lower than 1.0 HQs or EQs for any non-carcinogens, generally will be considered not to pose a substantial present or potential hazard to human health and the environment and generally will not be listed as hazardous waste. Such waste streams fall into a category presumptively assumed not to pose sufficient risk as to require their listing as hazardous waste. However, even for these waste streams, in some cases, there can be factors that could mitigate the low hazard presumption. These also will be considered by the Agency in making a final determination. (5) Waste streams where the calculated high-end individual cancer-risk level is between 1×10^{-4} and 1×10^{-6} fall in the category for which there is a presumption of candidacy for either listing (risk > 10^{-5}) or no listing (risk < 10^{-5}). However, this presumption is not as strong as when risks are outside this range. Therefore, listing determinations for waste streams would always involve assessment of the additional factors discussed below. * * * Additional factors. b. The following factors will be considered in making listing determinations, particularly for wastes falling into the risk range between 1×10^{-4} and 1×10^{-6}. (1) Certainty of waste characterization; (2) Certainty in risk assessment methodology; (3) Coverage by other regulatory programs; (4) Waste volume; (5) Evidence of co-occurrence; (6) Damage cases showing actual impact to human health or the environment; (7) Presence of toxicant(s) of unknown or unquantifiable risk." *See* 59 FR 66075–66077, December 22, 1994.

B. Background on EPA's 2010 Risk Assessment

1. Human Health Risks

Individuals can be exposed to the constituents of concern found in CCRs through a number of exposure routes. Potential contaminant releases from landfills and surface impoundments include: leaching to ground water; overland transport from erosion and runoff; and air emissions. The potential of human exposure from any one of these exposure pathways for a particular chemical is dependent on the physical and chemical characteristics of the chemical, the properties of the waste stream, and the environmental setting. EPA has conducted a peer-reviewed risk assessment of potential human health risks from CCR constituents leaching to groundwater that subsequently migrate either to a nearby drinking water well, or to nearby surface water, and is ingested as drinking water or through fish consumption (U.S. EPA 2010a). EPA has also performed preliminary analyses of human health effects from CCR constituents that have eroded or have run off from CCR waste management units (U.S. EPA 2002), and of human health effects from breathing windblown particulate matter from CCR landfill disposal operations (the 1998 risk assessment and U.S. EPA 2010b).

Longstanding EPA policy is for EPA risk assessments to include a characterization of the risks at two points on a distribution (*i.e.,* range) of risk estimates: a central tendency estimate that represents conditions likely to be encountered in a typical exposure situation, and a high end estimate that represents conditions likely to be encountered by individuals with higher exposures (U.S. EPA 1995).[82] Examples of factors that would influence a nearby resident's exposure are the residence's distance from a CCR waste management unit, and an individual's behavior or activity patterns. In the 2010 risk assessment, the high end risk estimates are the 90th percentile estimates from a probabilistic analysis.

The comparisons that EPA used in this rule to judge whether either a high end or central tendency estimated risk

[82] *Guidance for Risk Characterization,* U.S. Environmental Protection Agency, 1995; accessible at *http://www.epa.gov/OSA/spc/pdfs/rcguide.pdf,* which states that "For the Agency's purposes, high end risk descriptors are plausible estimates of the individual risk for those persons at the upper end of the risk distribution," or conceptually, individuals with "exposure above about the 90th percentile of the population distribution". As suggested in the *Guidance,* we also provide 50th percentile results as the central tendency estimate of that risk distribution.

is of concern are the risk criteria discussed in the 1995 policy. As noted under that policy, for an individual's cancer risk, the risk criteria are in the range of 1×10^{-6}, or one in one million "excess" (above and beyond pre-existing risk) probability of developing cancer during a lifetime, to 1×10^{-4} (one in ten thousand),[83] with 1×10^{-5} (one in one hundred thousand) being the "point of departure" for listing a waste and subjecting it to regulation under subtitle C of RCRA.[84] For human non-cancer hazard, the risk criterion is an estimated exposure above the level at which no adverse health effects would be expected to occur (expressed as a ratio of the estimated exposure to the exposure at which it is likely that there would be no adverse health effects; this ratio is also called a hazard quotient (HQ), and a risk of concern equates to a HQ greater than one, or, in certain cases of drinking water exposure, water concentrations above the MCL established under the Safe Drinking Water Act.

The exposure pathways for humans that EPA has evaluated for CCR landfills and surface impoundments are nearby residents' groundwater ingestion and air inhalation, and fish consumption by recreational fishers.

2. Ecological Risks

For ecological non-cancer hazards that are modeled, the risk criterion is a hazard quotient that represents impacts on individual organisms, with a risk of concern being an estimated HQ greater than one. In some instances, EPA also considered documented evidence of ecological harm, such as field studies published in peer-reviewed scientific literature. Such evidence is often sufficient to determine adverse ecological effects in lieu of or in addition to modeling potential ecological risks.

Two types of exposures can occur for ecological receptors: exposures in which ecological receptors inhabit a waste management unit directly, and exposures in which CCRs or its chemical constituents migrate, or move, out of the waste management unit and contaminate nearby soil, surface water, or sediment.

C. Consideration of Individual Listing Criteria

CCRs contain the following Appendix VIII toxic constituents: antimony, arsenic, barium, beryllium, cadmium, chromium, lead, mercury, nickel, selenium, silver, and thallium. These Appendix VIII constituents are frequently found in CCRs, as has been reported by the U.S. EPA (1988, 1999, 2002, 2006, 2008, and 2010).[85] These are discussed below with respect to the factors outlined in § 261.11(a)(3)(i)–(xi), and the Agency's findings. In the following discussion of the eleven listing factors, we combined factors iii (Migration), iv (Persistence), v (Degradation) and vi (Bioaccumulation); and factors vii (Plausible Types of Mismanagement), viii (Quantities of the Waste Generated), and ix (Nature and Severity of Effects from Mismanagement) for a more lucid presentation of our arguments.

1. Toxicity—Factor (i)

Toxicity is considered in developing the health benchmarks used in risk assessment modeling. The Agency for Toxic Substances and Disease Registry (ATSDR) ToxFAQs,[86] the EPA Integrated Risk Information System (IRIS),[87] and the Toxicology Data Network (TOXNET) of the National Institutes of Health[88] are all sources of toxicological data on the Appendix VIII hazardous constituents found in CCRs. (The information from these data sources on the toxicity of the metals identified is included in the docket to today's proposed rule.) Two types of ingestion benchmarks are developed. For carcinogens, a cancer slope factor (CSF) is developed. A CSF is the slope of the curve representing the relationship between dose and cancer risk. It is used to calculate the probability that the toxic nature of a constituent ingested at a specific daily dose will cause cancer. For non-carcinogens, a reference dose (RfD) is developed. The RfD (expressed in units of mg of substance/kg body weight-day) is defined as an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. The constituents of concern associated with CCRs include antimony, arsenic, barium, beryllium, cadmium, hexavalent chromium, lead, mercury, nickel, selenium, silver, and thallium. Based on the information in ASTDR's Tox FAQs, EPA's IRIS system and TOXNET, the Agency believes that the metals identified are sufficiently toxic that they are capable of posing a substantial present or potential hazard to human health and the environment when improperly treated, stored, transported disposed of, or otherwise managed. A brief summary of the toxic effects associated with these constituents is presented below, including for the four Appendix VIII hazardous constituents that were estimated in the draft groundwater risk assessment to pose high-end (90th percentile) risks at or above the risk criteria in one or more situations, and that were also found to present risk to human health in one or more damage cases (arsenic, cadmium, lead, and selenium):

Arsenic. Ingestion of arsenic has been shown to cause skin cancer and cancer in the liver, bladder and lungs.[89]

Antimony. Antimony is associated with altered glucose and cholesterol levels, myocardial effects, and spontaneous abortions. EPA has set a limit of 145 ppb in lakes and streams to protect human health from the harmful effects of antimony taken in through water and contaminated fish and shellfish.[90]

Barium. Barium has been found to potentially cause gastrointestinal disturbances and muscular weaknesses when people are exposed to it at levels above the EPA drinking water standards for relatively short periods of time.[91]

[83] *See* 40 CFR 300.430.

[84] As noted previously, EPA's hazardous waste listing determination policy is described in the notice of proposed rulemaking for wastes from the dye and pigment industries at 59 FR 66075–66077.

[85] Full references: U.S. EPA (Environmental Protection Agency). 1988. *Wastes from the Combustion of Coal by Electric Utility Power Plants—Report to Congress.* EPA–530–SW–88–002. U.S. EPA Office of Solid Waste and Emergency Response. Washington, DC. November.

U.S. EPA (Environmental Protection Agency). 1999. *Report to Congress: Wastes from the Combustion of Fossil Fuels—Volume II,* EPA 530–S–99–010. Office of Solid Waste. March.

U.S. EPA (Environmental Protection Agency). 2002. *Constituent Screening for Coal Combustion Wastes.* Draft Report prepared by Research Triangle Institute for Office of Solid Waste, Washington, DC. September.

U.S. EPA (Environmental Protection Agency). 2006. *Characterization of Mercury-Enriched Coal Combustion Residuals from Electric Utilities Using Enhanced Sorbents for Mercury Control.* EPA 600/R–06/008. Office of Research and Development. Research Triangle Park, NC. January.

U.S. EPA (Environmental Protection Agency). 2008. *Characterization of Coal Combustion Residuals from Electric Utilities Using Wet Scrubbers for Multi-Pollutant Control.* EPA/600/R–08/077. Report to U.S. EPA Office of Research and Development, Air Pollution Control Division. Research Triangle Park, NC. July.

U.S. EPA (Environmental Protection Agency). 2010. *Human and Ecological Risk Assessment of Coal Combustion Wastes.* Office of Resource Conservation and Recovery, Washington, DC. April.

[86] *http://www.atsdr.cdc.gov/toxfaq.html.*

[87] *http://cfpub.epa.gov/ncea/iris/index.cfm?fuseaction=iris.showSubstanceList&list_type=alpha&view=B.*

[88] *http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB.*

[89] ATSDR ToxFAQs. *Available at: http://www.atsdr.cdc.gov/toxfaq.html.*

[90] *Ibid.*

[91] *Ibid.*

Beryllium. Beryllium can be harmful if you breathe it. If beryllium air levels are high enough (greater than 1,000 ug/m3), an acute condition can result. This condition resembles pneumonia and is called acute beryllium disease.[92]

Cadmium and Lead. Cadmium and lead have the following effects: kidney disease, lung disease, fragile bone, decreased nervous system function, high blood pressure, and anemia.[93]

Hexavalent Chromium. Hexavalent chromium has been shown to cause lung cancer when inhaled.[94]

Mercury. Exposure to high levels of metallic, inorganic, or organic mercury can permanently damage the brain, kidneys, and developing fetus.[95]

Nickel. The most common harmful health effect of nickel in humans is an allergic reaction. Approximately 10–20% of the population is sensitive to nickel. The most common reaction is a skin rash at the site of contact. Less frequently, some people who are sensitive to nickel have asthma attacks following exposure to nickel. Some sensitized people react when they consume food or water containing nickel or breathe dust containing it.[96]

Selenium. Selenium is associated with selenosis.[97]

Silver. Exposure to high levels of silver for a long period of time may result in a condition called arygria, a blue-gray discoloration of the skin and other body tissues.[98]

Thallium. Thallium exposure is associated with hair loss, as well as nervous and reproductive system damage.[99]

2. Concentration of Constituents in Waste—Factor (ii)

A CCR constituent database was developed for the Regulatory Determination in May 2000 and in followup work leading to today's co-proposal. This database contained data on the total CCR constituents listed above, as well as many others, with the Appendix VIII constituents found in varying concentrations (*see* Table 6).[100]

TABLE 6—TOTAL METALS CONCENTRATIONS FOUND IN CCRS

[ppm]

Constituent	Mean	Minimum	Maximum
Antimony	6.32	0.00125	3100
Arsenic	24.7	0.00394	773
Barium	246.75	0.002	7230
Beryllium	2.8	0.025	31
Cadmium	1.05	0.000115	760.25
Chromium	27.8	0.005	5970
Lead	25	0.0074	1453
Mercury	0.18	0.000035	384.2
Nickel	32	0.0025	54055
Selenium	2.4075	0.0002	673
Silver	0.6965	0	3800
Thallium	1.75	0.09	100

The data in Table 6 show that many of these metals are contained in CCRs at relatively high concentrations, such that if CCRs were improperly managed, they could leach out and pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported or disposed of or otherwise managed. The risk assessment that was conducted confirms this finding, as do the many damage cases that have been documented and presented in today's co-proposal, including documents contained in the docket to today's proposed rule.

3. Migration, Persistence, Degradation, and Bioaccumulation—Factors (iii), (iv), (v), and (vi)

The potential of the hazardous constituents and any degradation products to migrate, persist, degrade and/or bioaccumulate in the environment are all factors that EPA considered and evaluated in the design of the fate and transport models that were used in assessing the concentrations of the toxic constituents to which humans and ecological receptors may be exposed. However, before discussing the hazardous constituents in the fate and transport models, the Agency would note that the toxic constituents for CCRs are all toxic metals—antimony, arsenic, barium, beryllium, cadmium, chromium, lead, mercury, nickel, selenium, silver and thallium, which do not decompose or degrade with the passage of time. Thus, these toxic metals will persist in the environment for very long periods of time, and if they escape from the disposal site, will continue to provide a potential source of long-term contamination.

The purpose of the risk assessment was to use the fate and transport models to assess likely migration of the CCR toxic constituents from different waste types through different exposure pathways, to receptors and to predict whether CCRs under different management scenarios may produce risks to human health and the environment. To estimate the risks posed by the management of CCRs in landfills and surface impoundments, the risk assessment estimated the release of the CCR toxic constituents from landfills and surface impoundments, the concentrations of these constituents in environmental media surrounding coal-fired utility power plants, and the risks that these concentrations pose to human and ecological receptors. The risk estimates were based on a groundwater fate and transport model in which constituents leached to groundwater consumed as drinking water, migrated to surface water and bioaccumulated in recreationally caught and consumed fish, and on direct ecological exposure. The specific 50th and 90th percentile risk assessment results for relevant Appendix VIII constituents are discussed below. While these results are based on a subset of CCR disposal units, they are likely representative of the risks posed by other similar disposal units. As discussed previously, the risk

[92] *Ibid.*

[93] *Ibid.*

[94] *Ibid.*

[95] *Ibid.*

[96] *Ibid.*

[97] *Ibid.*

[98] *Ibid.*

[99] *Ibid.*

[100] Additional data on the waste characteristics of fly ash and FGD are presented in section I.F.2.

assessment demonstrates that if CCRs are improperly managed, they have the potential to present a hazard to human health and the environment above a 1×10^{-4} to 1×10^{-6} cancer range or an HQ of 1. A detailed discussion of the modeling and risks from this pathway can be found in U.S. EPA 2009a (available in the docket for this proposal). This report presents the methodology, results, and uncertainties of EPA's assessment of human health risks resulting from groundwater contamination from coal-fired electric utilities.

Ingestion of Groundwater: The risk assessment predicted that CCRs pose an estimated trivalent arsenic cancer risk of 4 in 10,000 for unlined landfills and 2 in 10,000 for clay-lined landfills at the 90th percentile. No cancer risks above 1 in 100,000 were found at the 50th percentile. The 90th percentile results also estimated that thallium is ingested at three times the reference dose and antimony at twice the reference dose for unlined landfills. For clay-lined landfills, only thallium is estimated to exceed the reference dose, with a 90th percentile ingestion of twice the reference dose.

CCRs co-managed with coal refuse in landfills are estimated to pose arsenic cancer risks of 5 in 10,000 for an unlined landfill and 2 in 10,000 for a clay-lined landfill at the 90th percentile. EPA estimates that arsenic poses a 2 in 100,000 risk of cancer at the 50th percentile for unlined landfills, but poses cancer risks of less than 1 in 100,000 for clay or composite-lined landfills. For CCRs co-managed with coal refule, thallium is estimated at two times the reference dose in unlined landfills at the 90th percentile, but did not exceed the reference dose at the 0th percentile for any liner type.

For unlined landfills managing FBC waste, arsenic is estimated to have a cancer risk of three in one hundred thousand at the 90th percentile. For clay-lined landfills managing FBC waste, arsenic is estimated to have a cancer risk of six in one hundred thousand at the 90th percentile, while thallium is estimated to have an HQ of 4, and antimony is estimated to have an HQ of 3.

The Appendix VIII constituents in CCRs managed in landfills are not all estimated to arrive at the drinking water well at the same time. For unlined landfills, the median number of years until peak well water concentrations are estimated to occur is approximately 2,800 to 9,700 years for arsenic, 2,600 to 10,000 years for selenium, and 2,300 years for thallium. For clay-lined landfills, the median estimated time until peak well concentrations is approximately 4,000 to 10,000 years for arsenic, 5,100 to more than 10,000 years for selenium, and 4,300 years for thallium. Of the contaminated groundwater plumes that are estimated to reach the receptor wells from composite-lined units, the median time to peak well concentration as not estimated to sour in the 10,000 year time period that was modeled.[101]

For surface impoundments, the risk estimates differ. CCRs managed alone, that is, without coal refuse in the same impoundment, are found to pose an arsenic cancer risk of 2 in 1,000 for unlined surface impoundments and 9 in 10,000 for clay-lined surface impoundments at the 90th percentile. For unlined surface impoundments at the 90th percentile, selenium's HQ is two and lead's is three. At the 50th percentile, none of the constituents assessed for non-cancer effects exceed their reference dose in any scenario, but arsenic did pose estimated cancer risks of 1 in 10,000 and 6 in 100,000 for unlined and clay-lined units, respectively. For the surface impoundments with composite liners, arsenic did not exceed cancer risks of 1 in 100,000, nor did selenium exceed its reference dose.

Co-disposed CCRs and coal refuse managed in surface impoundments resulted in the highest risks. For the 90th percentile, arsenic's estimated cancer risk is 2 in 100 and 7 in 1,000 for unlined and clay-lined surface impoundments, respectively.[102] At the 50th percentile, these units still resulted in estimated arsenic cancer risks of 6 in 10,000 for the unlined surface impoundment and 2 in 10,000 for the clay-lined surface impoundment. Cadmium and lead both are estimated to exceed the reference dose by nine times at the 90th percentile for unlined surface impoundments. In clay-lined surface impoundments, cadmium has an estimated cadmium HQ of 3. When managed in surface impoundments with composite liners, these constituents' estimated cancer risks did not exceed 1 in 100,000, nor are they estimated to exceed their reference doses.

As with landfills, the modeling shows differing arrival times of various constituents at the modeled well locations. Due to differences in behaviors when interacting in soil, some chemical constituents move more quickly than others through the subsurface environment. For unlined surface impoundments, the median number of years until peak well water concentrations would occur is estimated to be 74 years for hexavalent selenium and 78 years for arsenic. For clay-lined surface impoundments, the median number of years was estimated to be 90 years for hexavalent selenium and 110 years for trivalent arsenic. Of the plumes that did reach the receptor wells from composite-lined units,[103] the median number of years was estimated to be 4,600 years for hexavalent selenium and 8,600 years for trivalent arsenic.

While hexavalent chromium, and nickel were not modeled using the fate and transport models, they did show the potential for excess risk at the screening stage.[104] Risk attenuation factors were developed for each of these constituents at the 50th and 10th percentiles. Here, attenuation refers to the dilution of the concentration of a constituent. Thus, the 10th percentile (not the 90th percentile) was developed to represent the high-end risks. These risk attenuation factors were calculated by dividing the screening risk results by the full-scale risk results, across all unit types combined, for the constituents modeled in the full-scale assessment. Using the risk attenuation factors, none of the constituents were estimated to exceed an HQ of 1 at either the 50th or 10th percentile for landfills. For surface impoundments, hexavalent chromium was estimated to exceed an HQ of 1 at the 50th percentile, while hexavalent chromium was estimated to exceed an HQ of 1 at the 10th percentile. The HQ for nickel under the surface

[101] The risk model used by EPA evaluates conditions over a 10,000 year period, and considers constituent concentrations during that period. In some cases, peak concentrations do not occur during the 10,000 year period.

[102] Including data with very high leach levels in surface impoundments where pyritic wastes were managed. As mentioned earlier, management of CCRs with coal refuse may have changed, and some pore water data from the coal refuse may not represent the management of these materials today. EPA has solicited comments on these issues.

[103] In other words, based on the results from this subset of the total number of Monte Carlo realizations.

[104] Previous risk assessment results for CCR (U.S. EPA, 1998) indicated concern for the groundwater pathway and limited concern for aboveground pathways for human and ecological receptors. The primary purpose of subsequent risk analyses was to update those results by incorporating new waste characterization data received since 1998 and by applying current data and methodologies to the risk analyses. The initial step in this process is screening and constituent selection for a more detailed analysis. The goal of screening is to identify CCR constituents, waste types, receptors, and exposure pathways with risks below the level of concern and eliminate those combinations from further analysis. The screening analysis (U.S. EPA, 2002) compared the 90th percentile leachate values directly to the human health benchmarks identified above. In other words, it was assumed that a human receptor was drinking leachate directly from a CCR landfill or surface impoundment with no attenuation or variation in exposure.

impoundment scenario was less than 1 using the 50th and 10th percentile values. However, the use of risk attenuation factors in place of probabilistic fate and transport modeling increases the uncertainty associated with these results. This analysis was conducted only for the drinking water exposure pathway.

Consumption of Recreationally Caught Fish: For the unlined, clay-lined, or composite-lined landfills, none of the modeled Appendix VIII hazardous constituents posed a cancer risk greater than 1 in 100,000, nor did they exceed their reference doses. However, for surface impoundments co-disposing of CCRs with coal refuse, trivalent arsenic's 90th percentile estimates are 3 in 100,000 and 2 in 100,000 excess cancer risk for unlined and clay-lined units, respectively. Pentavalent arsenic's 90th percentile estimate is 2 in 100,000 excess cancer risk for unlined impoundments. For all other liner and management unit scenarios at the 90th percentile, and all scenarios at the 50th percentile, there were no arsenic cancer risks above 1 in 100,000. Hexavalent selenium is estimated to result in exposures at three times the reference dose and twice the reference dose in the unlined and clay-lined surface impoundment scenarios, respectively, at the 90th percentile. However, selenium is not estimated to exceed the reference dose in the composite lined scenario at the 90th percentile, or any scenario at the 50th percentile.

Particulate Matter Inhalation: Air emissions from CCR disposal and storage sites can originate from waste unloading operations, spreading and compacting operations, the re-suspension of particulates from vehicular traffic, and from wind erosion. Air inhalation exposures may cause adverse human health effects, either due to inhalation of small-diameter (less than 10 microns) "respirable" particulate matter that causes adverse effects (PM_{10} and smaller particles which penetrate to and potentially deposit in the thoracic regions of the respiratory tract), which particles are associated with a host of cardio and pulmonary mortality and morbidity effects. *See e.g.* 71 FR at 61151–62 and 61178–85 (Oct. 6, 2006); *see* also 40 CFR 50.6 and 50.13 (National Ambient Air Quality Standards for thoracic coarse particles and fine particles).

To evaluate the potential exposure of residents to particulate matter that live near landfills that have disposed of CCRs, EPA has performed a screening-level analysis using the SCREEN3 model. This analysis, in *Inhalation of Fugitive Dust: A Screening Assessment of the Risks Posed by Coal Combustion Waste Landfills—DRAFT* (U.S. EPA 2010b, copy of which is in the docket for this proposed rule), indicates that, without fugitive dust controls, there could be exceedances of the National Ambient Air Quality Standards (NAAQS) for fine particulate matter in the air at residences near CCR landfills. EPA requests comment and data on the screening analysis, on the results of any ambient air monitoring for particulate matter that has been conducted, where air monitoring stations are located near CCR landfills, along with information on any techniques, such as wetting, compaction, or daily cover that may be employed to reduce such exposures.

A description of the modeling and risks from this pathway for disposal of CCRs in landfills and surface impoundments can be found in the Draft Final Report: Non-ground Water Pathways, Human Health and Ecological Risk Analysis for Fossil Fuel Combustion Phase 2 (FFC2); June 5, 1998.[105] This analysis did not address the issue of enrichment of toxic constituents present in the finer, inhalable fraction of the overall particulate matter size distribution,[106] but used the total constituent concentrations to represent the concentrations of constituents present on the inhaled particulate matter. Based on the analysis, at landfills, the highest estimated risk value was an individual excess lifetime risk of 4 in one million for the farmer, due to inhalation of chromium (all chromium present in the particulate matter was assumed to be in the more toxic, hexavalent form). For surface impoundments, the highest risk value was 2 in one million for the farmer (again assuming all chromium present was hexavalent). The Agency requests comment on the analysis, as presented in the draft final report, as well as any data, including air monitoring data that may be available regarding the potential for residents to be exposed to toxic constituents by this exposure pathway.

Ecological Exposure: Where species were directly exposed to surface impoundments, the risk assessment found ecological risks due to selenium, silver, nickel, chromium, arsenic, cadmium, barium, lead, and mercury. For scenarios where species were exposed to constituents that had migrated from the groundwater to surface water and sediment, ecological risk exceedances were found for lead, selenium, arsenic, barium, antimony, and cadmium at the 90th percentile, but not at the 50th percentile. EPA's risk assessment, confirmed by the existing damage cases and field studies published in the peer-reviewed scientific literature, show elevated selenium levels in migratory birds, and elevated contaminant levels in mammals as a result of environmental uptake, fish deformities, and inhibited fish reproductive capacity. Because of the large size of these management units, many being 100's of acres to one that is about 2,600 acres, receptors can often inhabit these waste management units. There are a number of recent references in the peer-reviewed scientific literature specific to CCRs managed in surface impoundments that confirm the 1998 risk assessment results and provide additional pertinent information of potential ecological damage. Hopkins, et al. (2006) [107] observed deformities and reproductive effects in amphibians living on or near CCR disposal sites in Georgia. Rowe, et al. (2002) [108] provided a thorough review of laboratory and field studies that relate to the impact of CCR surface impoundment management practices' on aquatic organisms and communities. Examples of studies cited in Rowe, et al. (2002) that illustrates the impact of CCRs on aquatic organisms in direct contact with surface impoundment waters and/or sediments include Benson and Birge (1985),[109] Coutant, et al. (1978) [110] and Rowe, et al. (2001),[111] while examples of studies cited in Rowe, et al. 2002 that illustrates the impact of CCRs on aquatic organisms in water bodies near CCR surface

[105] *http://www.epa.gov/epawaste/nonhaz/industrial/special/fossil/ngwrsk1.pdf.*

[106] *See,* for example, Vouk, V. and Piver, W. "Metallic Elements in Fossil Fuel Combustion Products: Amounts and Form of Emissions and Evaluation of Carcinogenicity and Mutagenicity." Env Health Perspec 1983:47(201–225).

[107] Hopkins, W.A., S.E. DuRant, B.P. Staub, C.L. Rowe, and B.P. Jackson. 2006. Reproduction, embryonic development, and maternal transfer of contaminants in the amphibian Gastrophryne carolinensis. *Environmental Health Perspectives.* 114(5):661–666.

[108] Rowe, C., Hopkins, W., Congdon, G. "Ecotoxicological Implications of Aquatic Disposal of Coal Combustion Residuals in the United States: A Review." Env Monit Assess 2002: 80(270–276).

[109] Benson, W. and Birge, W. "Heavy metal tolerance and metallothionein induction in fathead minnows: results from field and laboratory investigations." Environ Toxicol Chem 1985:4(209–217).

[110] Coutant, C., Wasserman, C., Chung, M., Rubin, D., Manning, M. "Chemistry and biological hazard of a coal-ash seepage stream." J. Water Poll. Control Fed. 1978:50(757–743).

[111] Rowe C., Hopkins, W., and Coffman, V. "Failed recruitment of southern toads (Bufo terrestris) in a trace-element contaminated breeding habitat: direct and indirect effects that may lead to a local population sink." Arch. Environ. Contam. Toxicol. 2001:40(399–405).

impoundments include Lemly (1993),[112] Sorensen, et al. (1982)[113] and (1988).[114] This latter category may reflect CCR impacts attributable to three constituent migration mechanisms: (1) NPDES-permitted discharges from impoundments; (2) overtopping of impoundments; and (3) groundwater-to-surface-water discharges (modeled in US EPA 2010a), as well as other, non-CCR-related, sources of pollutants.

Although chromium, beryllium, and silver were not modeled, they were analyzed using dilution attenuation factors developed for the 50th and 10th percentiles in the same manner as described above. The only exceedance of the HQ of 1 was for silver at the 10th percentile under the landfill scenario. The only exceedances of the ecological criteria for surface impoundments of the 40 CFR part 261 Appendix VIII constituents was for chromium at the 10th percentile. Since full-scale modeling was not conducted, the results for these constituents are uncertain.

4. Plausible Types of Mismanagement, Quantities of the Waste Generated, Nature and Severity of Effects From Mismanagement—Factors (vii), (viii) and (ix)

As discussed earlier, approximately 46 million tons of CCRs were managed in calendar year 2008 in landfills (34%) and nearly 29.4 million tons were managed in surface impoundments (22%).[115] EPA has estimated that in 2004, 69% of the CCR landfills and 38% of the CCR surface impoundments had liners. As shown in the risk assessment and damage cases, the disposal of CCRs into unlined landfills and surface impoundments is likely to pose significant risks to human health and the environment. Additionally, documented damage cases have helped to confirm the actuality and magnitude of risks posed by these unlined disposal units.

The CCR waste stream is generated in very large volumes and is increasing. The ACAA estimates that the production of CCRs has increased steadily from approximately 30 million tons in the 1960s to over 120 million tons in the 2000s.[116] A recent ACAA survey estimates a total CCR production of just over 136 million tons in 2008.[117] This is a substantially large waste stream when compared to the 6.9 million tons of non-wastewater hazardous wastes disposed by all other sectors in 2007, and the 2 million tons of hazardous waste being reported as disposed of in landfills and surface impoundments in 2005.[118]

EPA currently has documented evidence of proven damages to groundwater and surface water from 27 disposal sites and potential damages at 40 sites which are discussed in detail above and in the Appendix to this proposal. The damage cases resulting from CCR constituents migrating into groundwater were generally the same with those predicted in the risk assessment with respect to constituents which migrated, the concentrations reaching receptors, and the consequent magnitude of risk to those receptors. Of the constituents in Appendix VIII of Part 261, four were found at levels of concern in both the risk assessment and the damage cases (arsenic, cadmium, lead, and selenium). Two additional Appendix VIII (Part 261) constituents (chromium and nickel) were found in damage cases, and showed the potential for risk in the risk assessment, but were not modeled through fate and transport modeling. Finally, there were two Appendix VIII (Part 261) constituents (antimony and thallium) that were projected to be capable of migrating and reaching receptors at levels of concern in the risk assessment, but have yet to be identified in any of our groundwater damage cases.[119]

The damages to surface water from Appendix VIII (Part 261) constituents do not reflect a ground water to surface water pathway, but rather reflect surface water discharges. Five damage cases resulted in selenium fish consumption advisories consistent with the risk assessment's prediction that selenium consumption from fish in water bodies affected by CCR disposal units would result in excess ecologic and human health risk. We are aware that at least three of the fish advisories were subsequently rescinded when the criteria was reassessed and revised. The risk assessment also predicts that arsenic would pose such risks. However, while no arsenic fish advisories have been linked to CCR disposal at this time, the risk assessment predicts that selenium will migrate faster than arsenic.

In addition to the impacts on human health from groundwater and surface water contaminated by CCR released from disposal units, the damage cases have also shown the following adverse effects to plants and wildlife: Elevated selenium levels in migratory birds, wetland vegetative damage, fish kills, amphibian deformities, snake metabolic effects, plant toxicity, mammal uptake, fish deformities, and inhibited fish reproductive capacity. Although these effects cannot easily be linked to the results of the risk assessment as was done for groundwater and surface water above, the risk assessment generally agreed with the damage cases because it sometimes showed very high risks to ecological receptors. For additional information on ecological damages, *see* the document titled "What Are the Environmental and Health Effects Associated with Disposing of CCRs in Landfills and Surface Impoundments?" in the docket to this proposal.

Furthermore, four of the 27 proven damage case disposal sites have been listed on the EPA's National Priorities List (NPL). The NPL is the list of national priority sites with known releases or threatened releases of hazardous substances, pollutants, or contaminants throughout the United States and its territories. The Hazard Ranking System (HRS), the scoring system EPA uses to assess the relative threat associated with a release from a site, is the primary method used to determine whether a site should be placed on the NPL.[120] The HRS takes into account the three elements of environmental and human health risk: (1) Probability of release; (2) exposure; and (3) toxicity. EPA generally will list sites with scores of 28.5 or above. The HRS is a proven tool for evaluating and prioritizing the releases that may pose threats to human health and the environment throughout the nation.

[112] Lemly A., "Guidelines for evaluating selenium data from aquatic monitoring and assessment studies." Environ. Monit. Assess. 1993:28(83–100).

[113] Sorensen, E., Bauer, T., Bell, J., Harlan, C. "Selenium accumulation and cytotoxicity in teleosts following chronic, environmental exposure." Bull. Environ. Contam. Toxicol. 1982:29(688–696).

[114] Sorenson, E. "Selenium accumulation, reproductive status, and histopathological changes in environmentally exposed redear sunfish." Arch Toxicol 1988:61(324–329).

[115] Estimated from the 2009 ACAA survey and Energy Information Administration 2005 F767 Power Plant database.

[116] ACAA (American Coal Ash Association). 2008. Production & Use Chart (1966–2007). *http://www.acaa-usa.org/associations/8003/files/Revised_1966_2007_CCP_Prod_v_Use_Chart.pdf.*

[117] ACAA (American Coal Ash Association). 2009. *2008 Coal Combustion Product (CCP) Production & Use Survey Results. http://www.acaa-usa.org/associations/8003/files/2007_ACAA_CCP_Survey_Report_Form%2809-15-08%29.pdf.*

[118] The National Biennial RCRA Hazardous Waste Report (2007) available at *http://www.epa.gov/epawaste/inforesources/data/br07/national07.pdf.*

[119] While this could indicate a potential conservatism in the model with respect to these two constituents, it is more likely to result from a failure to sample for these constituents as frequently. This is consistent with the data reported in Table 4–29 of the revised risk assessment (only 11 samples taken for antimony and thallium in surface impoundments versus hundreds for various other constituents).

[120] U.S. EPA 2007. "Introduction to the Hazard Ranking System (HRS)." Accessed at: *http://www.epa.gov/superfund/programs/npl_hrs/hrsint.htm.*

Whereas each of those 4 NPL sites also contains waste other than CCRs, CCRs are one of the prevalent waste types in each case.[121]

In addition, the Kingston, Tennessee damage case (*see* the Appendix) helps to illustrate the additional threats to human health and the environment that can be caused by the failure of a CCR waste management unit. At TVA's Kingston facility, there were four failure conditions: The presence of an unusually weak fly ash ("Slimes") foundation; the fill geometry and setbacks; increased loads due to higher fill; and hydraulically placed loose wet ash. If owners or operators do not maintain due diligence regarding the structural integrity of surface impoundments, significant damage to human health and the environment could be a likely outcome. In summary, while the preponderance of documented damage cases were the result of releases from unlined landfills and surface impoundments, EPA believes that the above data identify situations (*e.g.,* adverse impacts on migratory birds) illustrative of potential problems occurring from the management of CCRs in any type of surface impoundment.

5. Action Taken by Other Governmental Agencies or Regulatory Programs Based on the Health or Environmental Hazard Posed by the Waste or Waste Constituent—Factor (x)

As a result of the mismanagement of CCRs, EPA and states have taken steps to compel cleanup in several situations. Specifically, in addition to EPA placing sites on the NPL due to the disposal or indiscriminant placement of CCRs, at least 12 states have issued administrative orders for corrective actions at CCR disposal sites. Corrective action measures at these CCR management units vary depending on the site specific circumstances and include formal closure of the unit, capping, re-grading of ash and the installation of liners over the ash, ground water treatment, groundwater monitoring, and combinations of these measures.

6. Other Factors—Factor (xi)

The damage cases and the risk assessment also found excess risks for human and ecological receptors that resulted from non-Appendix VIII (Part 261) constituents.[122] While not currently identified under RCRA as hazardous or toxic constituents, several of these constituents have the same toxic endpoints as the Appendix VIII (Part 261) constituents found in CCRs, while nitrate is associated with pregnancy complications and methemoglobinemia (blue baby syndrome).[123] Although these non-Appendix VIII (Part 261) constituents do not provide an independent basis for listing CCRs, EPA finds their presence in the damage cases and risk assessment results to be relevant to the listing decision because of the potential to cause additive or synergistic effects to the Appendix VIII constituents. For instance, exposure to high levels of cobalt (cobalt has an HQ of 500 when rounded to 1 significant digit) can result in lung and heart effects, the same endpoints as exposure to high levels of antimony. Thus, these two constituents could act additively or synergistically on both the heart and lungs. The risk assessment showed 90th percentile cobalt drinking water ingestion to be 500 times the reference dose. Thus, cobalt could exacerbate the heart and lung effects due to CCR antimony exposures.

Therefore, based on our examination of CCRs against the criteria for listing, a listing determination for CCRs destined for disposal can be based on such factors as (1) The continued evidence that CCRs in landfills and surface impoundments may not be properly managed—*e.g.,* the lack of groundwater monitoring for many existing units; (2) the continued gaps in some state regulations; (3) the damage cases we have documented to date, including the damage done by the recent catastrophic release of CCRs from the impoundment failure in Kingston, Tennessee; and (4) the results of the risk assessment, which indicates high-end risks associated with disposal of CCRs in unlined and clay-lined CCR landfills and surface impoundments far exceeding acceptable levels (*e.g.,* exceeding a cancer risk threshold of 1×10^{-5}) [124] and the non-cancer risk threshold (HQ greater than 1).

VI. Summary of the Co-Proposed Subtitle C Regulations

Under the subtitle C alternative, EPA would list CCRs from electric utilities and independent power producers intended for disposal in landfills and surface impoundments as a special waste, which would make them subject to the existing subtitle C regulations at 40 CFR parts 260 through 268, as well as the permitting requirements in 40 CFR part 270, and the state authorization process in 40 CFR parts 271–272.[125] These regulations establish, among other things, location restrictions; standards for liners, leachate collection and removal systems, and groundwater monitoring for land disposal units; fugitive dust control; closure and post-closure care requirements; storage requirements; corrective action; financial assurance; waste characterization; and permitting requirements. These regulations also impose requirements on generators and transporters of CCRs destined for disposal, including manifesting (if the CCRs destined for disposal are sent off site). As discussed in detail in section IV. E of today's preamble, EPA is proposing to leave the Bevill determination in place for CCRs used beneficially. Thus, CCRs beneficially used would not be subject to regulation from the point of generation or from the point they are recovered from landfills or surface impoundments, to the point where they are used beneficially. In addition, when beneficially used (*e.g.,* in wallboard and concrete), the CCRs become part of a new product; these products do not carry the special waste listing. When these products reach the end of their useful life and are to be disposed of, this represents a new point of generation. This new waste would be subject to RCRA subtitle C if the waste exhibits a characteristic of hazardous waste (*i.e.,* ignitability, corrosivity, reactivity, or toxicity).

In the majority of cases, EPA is proposing that CCRs be subject to the existing subtitle C requirements without modification. Accordingly, for those regulatory requirements that we propose not to modify or for which EPA does not specifically solicit comment, EPA is not proposing to reopen any aspect of those requirements, and will not respond to any unsolicited comments submitted during this rulemaking. However, where EPA has determined that special

[121] For specifics, please *see http://www.regulations.gov/fdmspublic/component/main?main=DocumentDetail&d=EPA-HQ-RCRA-2006-0796-0015.*

[122] Aluminum, boron, chloride, cobalt, copper, fluoride, iron, lithium, manganese, molybdenum, nitrate/nitrite, strontium, sulfate, vanadium, and zinc.

[123] ATSDR CSEM. Available at: *http://www.atsdr.cdc.gov/csem/nitrate/no3physiologic_effects.html.*

[124] This risk level is consistent with those discussed in EPA's hazardous waste listing determination policy (see the discussion in a proposed listing for wastes from the dye and pigment industries, December 22, 1994; 59 FR 66072).

[125] As discussed in section VI. D of the preamble, as part of the proposal to list CCRs as a special waste, as is done routinely with listed wastes, EPA is also proposing to subject CCRs that are disposed of to the notification requirements under CERCLA at 40 CFR part 302.

characteristics of these wastes warrant changes; *e.g.,* where implementation of existing requirements would present practical difficulties, or where additional requirements are necessary due to the special characteristics of these wastes, EPA is proposing to revise the requirements to account for these considerations. For example, EPA is proposing tailored design criteria for new CCR disposal units, pursuant to its authority under section 3004(x) of RCRA.[126] Similarly, under the authority of section 3004(x) of RCRA, EPA is proposing to modify the CCR landfill and surface impoundment liner and leak detection system requirements and the effective dates for the land disposal restrictions, and the surface impoundment retrofit requirements. EPA is also proposing to establish new land disposal prohibitions and treatment standards for both wastewater and non-wastewater CCRs. In addition, to address dam safety and stability issues, EPA is proposing design and inspection requirements for surface impoundments, similar to those of the Mine Safety and Health Administration (MSHA) design requirements for slurry impoundments at 30 CFR part 77.216 for surface impoundments. Further, EPA is proposing that all existing surface impoundments that have not closed in accordance with the rule's requirements by the effective date of this rule would be subject to all of the requirements of this rule, including the need to obtain a permit, irrespective of whether the unit continues to receive CCRs or the facility otherwise engages in the active management of those units.

Finally, we would note that if the Agency concludes to reverse the Bevill determinations and list CCRs as a special waste, EPA would make in any final rule conforming changes to 40 CFR parts 260 through 268 and 270 through 272 so that it is clear that these requirements apply to all facilities regulated under the authority of RCRA subtitle C that generate, transport, treat, store, or dispose of special wastes as well as to those facilities that generate, treat, store, or dispose of special wastes.

The following paragraphs set out the details of this subtitle C proposal, with the modified or new requirement discussed in Section B. and the existing subtitle C requirements discussed in Section C.

A. Special Waste Listing

Under this regulatory option, EPA is proposing to list CCRs generated by electric utilities and independent power producers destined for disposal as a special waste subject to the requirements of RCRA subtitle C by amending 40 CFR part 261 and to add Subpart F—Special Wastes Subject to Subtitle C Regulations. The Agency believes this would be the appropriate manner for listing these wastes, and, as discussed in detail later in this section, the Agency believes that listing CCRs destined for disposal as a special waste, rather than a hazardous waste could, in large measure, address potential issues of stigma.

B. Proposed Special Requirements for CCRs

The following paragraphs discuss the special requirements the Agency is proposing for CCRs. These requirements modify or are in addition to the general subtitle C requirements found at 40 CFR parts 264–268 and 270–272.

1. Modification of Technical Standards Under 3004(x)

Section 3004(x) of RCRA authorizes the Administrator to modify the statutory requirements of sections 3004(c), (d), (e), (f), (g), (o), (u), and 3005(j) of RCRA in the case of landfills or surface impoundments receiving Bevill wastes, including CCRs that EPA determines to regulate under subtitle C, to take into account the special characteristics of the wastes, the practical difficulties associated with implementation of such requirements, and site-specific characteristics, including, but not limited to the climate, geology, hydrology and soil chemistry at the site, so long as such modified requirements assure protection of human health and the environment. The Agency is proposing to modify, through its authority under RCRA 3004(x), the CCR landfill and surface impoundment liner and leak detection system requirements, the effective dates for the land disposal restrictions, and the surface impoundment retrofit requirements.

i. Modification of CCR Landfills and Surface Impoundments From the Section 3004(o) Liner and Leak Detection Requirements

The minimum technological requirements set out in RCRA Section 3004(o)(1)(A)(i) requires that new hazardous waste landfills and surface impoundments, replacements of existing landfills and impoundments, and lateral expansions of existing landfills and impoundments,[127] to install two or more liners and a leachate collection and removal system above (in the case of a landfill) and between such liners. Section 3004(o)(4)(A) also requires these units to install a leak detection system. Landfills and surface impoundments covered under the regulations at 40 CFR part 264 are required to have a double liner system, and a leachate collection and removal system that can also serve as a leak detection system as described in 40 CFR sections 264.221 and 264.301. Under section 3005 (j)(1) (and, as explained below, effectively under section 3005 (j)(11) as well), existing surface impoundments are required to meet all of these requirements as well.

EPA is proposing to modify the double liner and leachate collection and removal system requirement by substituting a requirement to install a composite liner and leachate collection and removal system. As modeled in EPA's risk assessment, composite liners effectively reduce risks from all constituents to below the risk criteria for both landfills and surface impoundments. Therefore, the Agency believes a composite liner system would be adequately protective of human health and the environment and a double liner system would be unnecessarily burdensome. The modified standards specify a composite liner system that consists of two components: the upper component must consist of a minimum 30-mil flexible membrane liner (FML), and the lower component must consist of at least a two-foot layer of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} cm/sec. FML components consisting of high density polyethylene (HDPE) shall be at least 60-mil thick. The FML component must be installed in direct and uniform contact with the compacted soil component. The leachate collection system must be designed and constructed to maintain less than a 30-cm depth of leachate over the liner.

[126] Section 3004(x) of RCRA provides EPA the authority to modify certain statutory provision (i.e., 3004(c), (d), (e), (f), (g), (o), and (u) and 3005(j) taking into account the special characteristics of such wastes, the practical difficulties associated with implementation of such requirements, and site-specific characteristics, including, but not limited to, climate, geology, hydrology, and soil chemistry at the site, so long as such modified requirements are protective of human health and the environment.

[127] Replacement unit means a landfill, surface impoundment, or waste pile unit (1) from which all or substantially all of the waste is removed, and (2) that is subsequently reused to treat, store, or dispose of such waste. "Replacement unit" does not apply to a unit from which waste is removed during closure, if the subsequent reuse solely involves the disposal of waste from that unit and other closing units or corrective action areas at the facility, in accordance with an approved closure plan or EPA or State approved corrective action. Lateral expansion means a horizontal expansion of the waste boundaries of an existing landfill or surface impoundment.

EPA has concluded that these liner and leachate collection requirements will be protective of human health and the environment from the release of contaminants to groundwater from CCRs in landfills and surface impoundments. Specifically, the risk assessment indicates that risks from disposal units with composite liners will be less than the 1×10^{-5} for carcinogens and less than an HQ of one for other hazardous constituents—levels that EPA has considered protective for the management of hazardous wastes. (The results of EPA's risk analyses are discussed in section II.B, and in the full risk assessment document, which is in the docket for today's proposed rulemaking.) Further support is provided by the damage cases, as none of the proven damage cases involved lined landfills or surface impoundments (with the possible exception of one unit, which in any case did not have a composite liner). In addition, the proposed modified requirements are the design standards for composite liners specified for municipal solid waste landfills at 40 CFR part 258; based on EPA's experience, such liner design would be expected to be effective in mitigating the risks of leaching to groundwater for a waste, such as CCRs. For example, CCRs do not contain volatile organics, such as ethylbenzene, which has recently been shown to be problematic for synthetic liners.

Although EPA has not confirmed damage cases involving the failure of clay liners, it is not proposing to allow new disposal units to be built solely with clay liners. EPA's modeling in its risk assessment indicated that clay liners could be of concern; EPA also believes that composite liners reflect today's best practices for new units, and, as such, can therefore be feasibly implemented.[128] Nevertheless, EPA solicits comments on whether clay liners should also be allowed under EPA's regulations. To assist EPA in its review, we request that commenters provide data on the hydraulic conductivity of clay liners associated with coal ash disposal units, and information on the protectiveness of clay liner designs based on site-specific analyses.

Thus, we are proposing to amend the current requirements of 40 CFR 264.220, and 264.300 to require that CCR surface impoundments and landfills install a composite liner and leachate collection and removal system. EPA would codify these requirements, as well as other special requirements for CCR wastes in a new subpart FF of 40 CFR part 264.

EPA also notes that section 3004(o)(2) allows the Agency to approve alternate liner designs, based on site-specific demonstrations that the alternate design and operating practices, together with location characteristics, will prevent the migration of any hazardous constituents into ground or surface water at least as effectively as the double-liner system (42 U.S.C. 6924(o)(2)). EPA solicits comment on whether, in addition to the flexibility provided by section 3004(o)(2), EPA's regulations should also provide for alternative liner designs based on, for example, a specific performance standard, such as the subtitle D performance standard in 40 CFR 258.40(a)(1), or a site specific risk assessment, or a standard that the alternative liner, such as a clay liner, was at least as effective as the composite liner. Such an approach might be appropriate, for example, in situations where groundwater is particularly deep and/or infiltration rates are low, or where alternative liner systems provide an equivalent level of protection.

Subtitle C of RCRA requires only new hazardous waste landfills (or new portions of existing landfills) to meet the minimum technology requirements for liners and leachate collection and removal systems. RCRA section 3004 (o)(1)(A). The statute thus does not require existing landfills that are brought into the subtitle C system because they are receiving newly listed hazardous wastes, or the new category of listed special wastes proposed in this notice, to be retrofitted with a new minimum-technology liner/leachate collection and removal system (or to close). They can continue to receive hazardous or special waste, and continue to operate as compliant hazardous or special waste landfills. Following from these provisions, EPA has not typically required existing landfills to be retrofitted to meet the new requirements. Congress specifically established this approach under subtitle C, and EPA sees no reason or special argument to adopt more stringent requirements for CCR landfills, particularly given the volume of the material and the disruption that would be involved with any other approach. However, under the proposal, existing units would have to meet the groundwater monitoring, corrective action, and other requirements of the subtitle C regulations to assure that any groundwater releases from the unit were identified and promptly remediated. This is consistent with the manner in which EPA has historically implemented the hazardous waste requirements. EPA believes that maintaining this approach in this context will be protective, in part, because, unless facilities ship all of their wastes off-site (which EPA believes is highly unlikely), they will need a permit for on-site management of CCRs, which will provide regulatory oversight that could, as necessary, address the risks from the existing (unpermitted) landfills.

By contrast, Congress was significantly more concerned about the risks associated with unlined surface impoundments managing newly listed hazardous wastes (*see* 42 U.S.C. Section 6924, October 21, 1976). This is addressed in more detail in section (iv) below titled "Wet-Handling of CCRs, Closure, and Interim Status for Surface Impoundments."

ii. Fugitive Dust Controls

The proposed subtitle C approach would require that surface impoundments and landfills be managed in a manner that controls fugitive dust consistent with any applicable requirements developed under a State Implementation Plan (SIP) or issued by EPA under section 110 of the Clean Air Act (CAA). Specifically, EPA is proposing to adopt as a standard the 35 $\mu g/m^3$ level established as the level of the 24-hour NAAQS for fine particulate matter (PM–2.5). In addition, CCR facilities would be required to control fugitive dust by either covering or otherwise managing CCRs to control wind dispersal of dust, emplacement as wet conditioned CCRs to control wind dispersal, when stored in piles, or storage in tanks or buildings. For purposes of the proposal, wet conditioning means wetting CCRs with water to a moisture content that prevents wind dispersal, facilitates compaction, but does not result in free liquids. Trucks or other vehicles transporting CCRs are to be covered or otherwise managed to control wind dispersal of dust. EPA is proposing this requirement based on the results of a screening level analysis of the risks posed by fugitive dusts from CCR landfills, which showed that, without fugitive dust controls, levels at nearby locations could exceed the 35 $\mu g/m^3$ level established as the level of the 24-hour PM 2.5 NAAQS for fine particulate.

iii. Special Requirements for Stability of CCR Surface Impoundments

To detect and prevent potential catastrophic releases, EPA is proposing requirements for periodic inspections of surface impoundments. The Agency

[128] EPA notes that the state of Maryland, in developing new standards for CCR disposal units under its subtitle D authorities, prescribes composite liners.

believes that such a requirement is critical to ensure that the owner and operator of the surface impoundment becomes aware of any problems that may arise with the structural stability of the unit before they occur and, thus, prevent the past types of catastrophic releases, such as at Martins Creek, Pennsylvania and TVA's Kingston, Tennessee facility. Therefore, EPA is proposing that inspections be conducted every seven days by a person qualified to recognize specific signs of structural instability and other hazardous conditions by visual observation and, if applicable, to monitor instrumentation. If a potentially hazardous condition develops, the owner or operator shall immediately take action to eliminate the potentially hazardous condition; notify the Regional Administrator or the authorized State Director; and notify and prepare to evacuate, if necessary, all personnel from the property which may be affected by the potentially hazardous condition(s). Additionally, the owner or operator must notify state and local emergency response personnel if conditions warrant so that people living in the area down gradient from the surface impoundment can be evacuated. Reports of inspections are to be maintained in the facility operating record.

To address surface impoundment (or impoundment) integrity (dam safety), EPA considered two options. One option, which is the option proposed in this notice, is to establish standards under RCRA for CCR surface impoundments similar to those promulgated for coal slurry impoundments regulated by the Mine Safety and Health Administration (MSHA) at 30 CFR 77.216. Facilities relying on CCR impoundments would need to (1) submit to EPA or the authorized state plans for the design, construction, and maintenance of existing impoundments, (2) submit to EPA or the authorized state plans for closure, (3) conduct periodic inspections by trained personnel who are knowledgeable in impoundment design and safety, and (4) provide an annual certification by an independent registered professional engineer that all construction, operation, and maintenance of impoundments is in accordance with the approved plan. When problematic stability and safety issues are identified, owners and operators would be required to address these issues in a timely manner.

In developing these proposed regulations for structural integrity of CCR impoundments, EPA sought advice from the federal agencies charged with managing the safety of dams in the United States. Many agencies in the federal government are charged with dam safety, including the U.S. Department of Agriculture (USDA), the Department of Defense (DOD), the Department of Energy (DOE), the Nuclear Regulatory Commission (NRC), the Department of Interior (DOI), and the Department of Labor (DOL), MSHA. EPA looked particularly to MSHA, whose charge and jurisdiction appeared to EPA to be the most similar to our task. MSHA's jurisdiction extends to all dams used as part of an active mining operation and their regulations cover "water, sediment or slurry impoundments" so they include dams for waste disposal, freshwater supply, water treatment, and sediment control. In fact, MSHA's current impoundment regulations were created as a result of the dam failure at Buffalo Creek, West Virginia on February 26, 1972. (This failure released 138 million gallons of stormwater run-off and fine coal refuse, and resulted in 125 persons being killed, another 1,000 were injured, over 500 homes were completely demolished, and nearly 1,000 others were damaged.)

MSHA has nearly 40 years of experience writing regulations and inspecting dams associated with coal mining, which is directly relevant to the issues presented by CCRs in this rule. In our review of the MSHA regulations, we found them to be comprehensive and directly applicable to the dams used in surface impoundments at coal-fired utilities to manage CCRs. We also believe that, based on the record compiled by MSHA for its rulemaking, and on MSHA's 40 years of experience implementing these regulations, these requirements will prevent the catastrophic release of CCRs from surface impoundments, as occurred at TVA's facility in Kingston, Tennessee, and will generally meet RCRA's mandate to ensure the protection of humans and the environment. Thus, we have modeled our proposal on the MSHA regulations in 30 CFR Part 77 and we have placed the text of the salient portions of the MSHA regulations in the docket for this rulemaking. The Agency requests comment on EPA's proposal to adopt the MSHA standards (with limited modifications to deal with issues specific to CCR impoundments) to address surface impoundment integrity under RCRA.

MSHA's regulations cover impoundments which can present a hazard and which impound water, sediment or slurry to an elevation of more than five (5) feet and have a storage volume of 20 acre-feet or more and those that impound water, sediment, or slurry to an elevation of 20 feet or more. EPA seeks comment on whether to cover all CCR impoundments for stability, regardless of height and storage volume, whether to use the cut-offs in the MSHA regulations, or whether other regulations, approaches, or size cut-offs should be used. If commenters believe that other regulations or size cut-offs should be adopted (and not the size-cut offs established in the MSHA regulations), we request that commenters provide the basis and technical support for their position.

The second option that EPA considered, but is not being proposed today, is to establish impoundment integrity requirements under the Clean Water Act's NPDES permit system. Existing regulations at 40 CFR 122.41(e) require that permittees properly operate and maintain all facilities of treatment and control used to achieve compliance with their permits. In addition, regulations at 40 CFR 122.44(k) allow the use of best management practices for the control and abatement of the discharge of toxic pollutants. Guidance could be developed to use best management practices to address impoundment construction, operation, and maintenance, consistent with the requirements of 40 CFR 122.41(e) and 122.44(k). Associated permit conditions could require that surface impoundments be designed and constructed in accordance with relevant state and federal regulations. The Agency requests comments regarding the alternate use of NPDES permits rather than the development of RCRA regulations to address dam safety and structural integrity.

iv. Wet-Handling of CCRs, Closure, and Interim Status for Surface Impoundments

Where a nonhazardous waste surface impoundment is storing a waste that becomes newly subject to the RCRA hazardous waste requirements, RCRA subtitle C and the implementing regulations require these surface impoundments either to be closed or upgraded to meet the minimum technology requirements within four years. RCRA section 3005 (j)(6), is implemented by 40 CFR 268.14.[129] In order to be eligible for this four year grace period, the impoundment must be in compliance with the applicable

[129] 40 CFR 268.14 allows owners and operators of newly regulated surface impoundments to continue managing hazardous waste without complying with the minimum technology requirements for a period up to four years before upgrading or closing the unit.