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Part II

Environmental Protection Agency

40 CFR Parts 257 and 261
Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities; Final Rule

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ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 257 and 261

[EPA–HQ–RCRA–2009–0640; FRL–9919–44–OSWER]

RIN–2050–AE81

Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: The Environmental Protection Agency (EPA or the Agency) is publishing a final rule to regulate the disposal of coal combustion residuals (CCR) as solid waste under subtitle D of the Resource Conservation and Recovery Act (RCRA). The available information demonstrates that the risks posed to human health and the environment by certain CCR management units warrant regulatory controls. EPA is finalizing national minimum criteria for existing and new CCR landfills and existing and new CCR surface impoundments and all lateral expansions consisting of location restrictions, design and operating criteria, groundwater monitoring and corrective action, closure requirements and post closure care, and recordkeeping, notification, and internet posting requirements. The rule requires any existing unlined CCR surface impoundment that is contaminating groundwater above a regulated constituent's groundwater protection standard to stop receiving CCR and either retrofit or close, except in limited circumstances. It also requires the closure of any CCR landfill or CCR surface impoundment that cannot meet the applicable performance criteria for location restrictions or structural integrity. Finally, those CCR surface impoundments that do not receive CCR after the effective date of the rule, but still contain water and CCR will be subject to all applicable regulatory requirements, unless the owner or operator of the facility dewaters and installs a final cover system on these inactive units no later than three years from publication of the rule. EPA is deferring its final decision on the Bevill Regulatory Determination because of regulatory and technical uncertainties that cannot be resolved at this time.

DATES: This final rule is effective on October 14, 2015.

ADDRESSES: EPA has established three dockets for this regulatory action under Docket ID No. EPA–HQ–RCRA–2009–0640, Docket ID No. EPA–HQ–RCRA–2011–0392, and Docket ID No. EPA–HQ–RCRA–2012–0028. All documents in these dockets are available at *http://www.regulations.gov*. Although listed in the index, some information is not publicly available, *e.g.*, Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, is not placed on the Internet and will be publicly available only in hard copy form. Publicly available docket materials are available either electronically in *http://www.regulations.gov* or in hard copy at the OSWER Docket, EPA/DC, WJC West Building, Room 3334, 1301 Constitution Ave. NW., Washington, DC 20460. 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, and the telephone number for the OSWER Docket is 202–566–0276.

FOR FURTHER INFORMATION CONTACT: For questions on technical issues: Alexander Livnat, Office of Resource Conservation and Recovery, Environmental Protection Agency, 5304P; telephone number: (703) 308–7251; fax number: (703) 605–0595; email 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; email address: *souders.steve@epa.gov*. For questions on the regulatory impact analysis: Richard Benware, Office of Resource Conservation and Recovery, Environmental Protection Agency, 5305P; telephone number: (703) 308–0436; fax number: (703) 308–7904; email address: *benware.richard@epa.gov*. For questions on the risk assessment: Jason Mills, Office of Resource Conservation and Recovery, Environmental Protection Agency, 5305P; telephone number: (703) 305–9091; fax number: (703) 308–7904; email address: *mills.jason@epa.gov*.

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?

This rule applies to all coal combustion residuals (CCR) generated by electric utilities and independent power producers that fall within the North American Industry Classification System (NAICS) code 221112 and may affect the following entities: Electric utility facilities and independent power producers that fall under the NAICS code 221112. 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 discussed in Unit VI.A. of this document 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 actions are not addressed in this rule?

This rule does not address the placement of CCR in coal mines. The U.S. Department of Interior (DOI) and, as necessary, EPA will address the management of CCR in minefills in 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. See Unit VI of this document for further details. This rule does not regulate practices that meet the definition of a beneficial use of CCR. Beneficial uses that occur after the effective date of the rule need to determine if they comply with the criteria contained in the definition of ''beneficial use of CCRs.'' This rule does not affect past beneficial uses (*i.e.*, uses completed before the effective date of the rule.) See Unit VI of this document for further details on proposed clarifications of beneficial use. Furthermore, CCR from non-utility boilers burning coal are also not addressed in this final rule. EPA will decide on an appropriate action for these wastes through a separate rulemaking effort. See Unit IV of this document for further details. Finally, this rule does not apply to municipal solid waste landfills (MSWLFs) that receive CCR for disposal or use as daily cover.

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

I. Executive Summary

This rule establishes nationally applicable minimum criteria for the safe disposal of coal combustion residuals in landfills and surface impoundments. This section summarizes these criteria. Detailed discussions of the criteria and the Agency's rationale for finalizing these requirements are provided in Unit VI of this document.

A. What are coal combustion residuals?

Coal combustion residuals (CCR) are generated from the combustion of coal, including solid fuels classified as anthracite, bituminous, subbituminous, and lignite, for the purpose of generating steam for the purpose of powering a generator to produce electricity or electricity and other thermal energy by electric utilities and independent power producers. CCR includes fly ash, bottom ash, boiler slag, and flue gas desulfurization materials. A description of the types of CCR can be found in the proposed rule (see 75 FR 35137).

CCR is one of the largest industrial waste streams generated in the U.S. In 2012, over 470 coal-fired electric utilities burned over 800 million tons of coal, generating approximately 110 million tons of CCR in 47 states and Puerto Rico. CCR may be generated wet or dry; however, this composition may change after generation. Some CCR is dewatered while other CCR is mixed with water to facilitate transport (*i.e.*, sluiced). CCR can be sent off-site for disposal or beneficial use or disposed in on-site landfills or surface impoundments. In 2012, approximately 40 percent of the CCR generated was beneficially used, with the remaining 60 percent disposed in surface impoundments and landfills. Of that 60 percent, approximately 80 percent was disposed in on-site disposal units. CCR disposal currently occurs at over 310 active on-site landfills, averaging over 120 acres in size with an average depth of over 40 feet, and at over 735 active on-site surface impoundments, averaging over 50 acres in size with an average depth of 20 feet.

B. Background

The Agency first solicited comments on the regulation of CCR in a proposed rule published in the **Federal Register** on June 21, 2010. This proposal, under the Resource Conservation and Recovery Act (RCRA), addressed the risks from disposal of CCR generated from the combustion of coal at electric utilities and from independent power producers. Two regulatory options were proposed. Under the first option, EPA proposed to list CCR as special waste subject to regulation under subtitle C of RCRA, when destined for disposal in landfills or surface impoundments. Under this option, CCR would require ''cradle-to-grave'' management and would be subject to requirements for, among other things, composite liners, groundwater monitoring, structural stability requirements, corrective action, closure/post closure care and financial assurance. States would be required to adopt the rule before it went into effect and a permitting program would be established with direct federal oversight. The subtitle C option, as proposed, would also effectively result in the closure of all CCR surface impoundments.

Under the second option, EPA proposed to regulate the disposal of CCR under subtitle D of RCRA by issuing minimum national criteria. Similar to the subtitle C option, this option would require composite liners, groundwater monitoring, structural stability requirements, corrective action, and closure/post closure care. However, consistent with the available statutory authority under subtitle D, EPA proposed this option to be a self-implementing rule with no direct federal oversight, with an effective date six months after publication in the **Federal Register**. This option required all unlined surface impoundments to either retrofit to a composite liner or close within five years.

After reviewing all the comments and additional data received, EPA is promulgating this final rule to regulate the disposal of CCR as solid waste under subtitle D of RCRA. This rule addresses the risks from structural failures of CCR surface impoundments, groundwater contamination from the improper management of CCR in landfills and surface impoundments and fugitive dust emissions. The rule has also been designed to provide electric utilities and independent power producers generating CCR with a practical approach for implementation of the requirements and has established implementation timelines that take into account, among other things, other upcoming regulatory actions affecting electric utilities and site specific practical realities. In order to ease implementation of the regulatory requirements for CCR units with state programs, EPA is also providing the opportunity for states to secure approval of its CCR program through the State Solid Waste Management Plan (''SWMP''). EPA strongly recommends that states take advantage of this process by revising their SWMPs to address the issuance of the revised federal requirements in this final rule, and to submit revisions of these plans to EPA for review. EPA would then review and approve the revised SWMPs provided they demonstrate that the minimum federal requirements in this final rule will be met. In this way, EPA's approval of a revised SWMP signals EPA's opinion that the state SWMP meets the minimum federal criteria.

C. What types of CCR units are covered by this rule?

The final rule applies to owners and operators of new and existing landfills and new and existing surface impoundments, including all lateral expansions of landfills and surface impoundments that dispose or otherwise engage in solid waste management of CCR generated from the combustion of coal at electric utilities and independent power producers. The requirements of the rule also apply to CCR units located off-site of the electric utilities' or independent power producers' facilities that receive CCR for disposal. In addition, the rule applies to certain inactive CCR surface impoundments (*i.e.*, units not receiving CCR after the effective date of the rule) at active electric utilities' or independent power producers' facilities, regardless of the fuel currently used at the facility to produce electricity (*e.g.* coal, natural gas, oil), if the CCR unit still contains CCR and liquids.

The requirements do not apply to: (1) CCR landfills that ceased receiving CCR prior to the effective date of the rule; (2) CCR units at facilities that have ceased producing electricity (or electricity and other thermal energy) prior to the effective date of the rule; (3) CCR generated at facilities that are not part of an electric utility or independent power producer, such as manufacturing facilities, universities, and hospitals; (4) fly ash, bottom ash, boiler slag, and flue gas desulfurization materials, generated primarily from the combustion of fuels (including other fossil fuels) other than coal, for the purpose of generating electricity unless the fuel burned

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consists of more than fifty percent coal on a total heat input or mass input basis, whichever results in the greater mass feed rate of coal; (5) CCR that is beneficially used; (6) CCR placement at active or abandoned underground or surface coal mines; or (7) municipal solid waste landfills (MSWLF) that receive CCR.

D. What minimum national criteria are being established for CCR landfills and CCR surface impoundments?

This final rule establishes minimum national criteria for CCR landfills, CCR surface impoundments, and all lateral expansions of CCR units including location restrictions, liner design criteria, structural integrity requirements, operating criteria, groundwater monitoring and corrective action requirements, closure and post-closure care requirements, and recordkeeping, notification, and internet posting requirements.

1. Location Restrictions. To ensure there will be no reasonable probability of adverse effects on health or the environment from the disposal of CCR in CCR landfills, CCR surface impoundments, and all lateral expansions of CCR landfills and CCR surface impoundments (together ''CCR units''), this final rule establishes five location restrictions. The location criteria include restrictions relating to placement of CCR above the uppermost aquifer, in wetlands, within fault areas, in seismic impact zones, and in unstable areas. All of these location restrictions require the owner or operator of a CCR unit to demonstrate that they meet the specific criteria. As discussed elsewhere in this preamble, the five location restrictions apply to all new CCR landfills, all new and existing CCR surface impoundments, and all lateral expansions of CCR units; however, existing CCR landfills are only subject to the location restriction for unstable areas. Units that do not meet these restrictions can retrofit or make appropriate engineering demonstrations to meet this criteria. This final rule requires owner or operators of existing CCR units that cannot make the required demonstrations to close, while owners or operators of new CCR units and all lateral expansions who fail to make the required demonstrations are prohibited from placing CCR in the CCR unit.

2. Liner Design Criteria. The final rule also establishes liner design criteria to help prevent contaminants in CCR from leaching from the CCR unit and contaminating groundwater. All new CCR landfills, new CCR surface impoundments, and lateral expansions of CCR units must be lined with composite liner, which is a liner system consisting of two components—a geomembrane and a two-foot layer of compacted soil—installed in direct and uniform contact with one another. The final rule allows an owner or operator to construct a new CCR unit with an alternative composite liner, provided the alternative composite liner performs no less effectively than the composite liner. In addition, new landfills are required to operate with a leachate collection and removal system which is designed to remove excess leachate that may accumulate on top of the composite (or alternative composite) liner. Existing CCR landfills are not required to close or retrofit with a composite (or alternative composite) liner and a leachate collection and removal system. These existing CCR units can continue to receive CCR after this rule is in effect; however, the CCR units must meet all applicable groundwater monitoring and corrective action criteria to address any groundwater releases promptly. Existing CCR surface impoundments can also continue to operate as designed. However, if the existing CCR surface impoundment was not constructed with a composite (or alternative composite) liner or with at least two feet of compacted soil with a specified hydraulic conductivity, the rule would require the unit to retrofit or close if the CCR surface impoundment detects concentrations of one or more constituents listed in appendix IV at statistically significant levels above the groundwater protection standard established by the rule.

3. Structural Integrity Requirements. To help prevent the damages associated with structural failures of CCR surface impoundments, the final rule establishes structural integrity criteria for new and existing surface impoundments (and all lateral expansions) as part of the design criteria. While the applicability of the structural integrity requirements to individual CCR surface impoundments vary depending on factors such as dike heights and the potential for loss of life, environmental damage and economic loss if there is a dike failure, the final rule establishes requirements for owner or operators to conduct a number of structural integrity-related assessments regularly. These include: (1) Conducting periodic hazard potential classification assessments to assess the potential adverse incremental consequences that would occur if there was a failure of the CCR surface impoundment; (2) conducting periodic structural stability assessments by a qualified professional engineer to document whether the design, construction, operation and maintenance is consistent with recognized and generally accepted good engineering practices; and (3) conducting periodic safety factor assessments to document whether the CCR unit achieves minimum factors of safety for slope stability. If a CCR unit required to conduct a safety factor assessment fails to demonstrate that the unit achieves the specified factors of safety, the owner or operator must close the unit. In addition, certain CCR surface impoundments are required to develop an emergency action plan which defines the events and circumstances involving the CCR unit that represent an emergency and identifies the actions that will be taken in the event of a safety emergency.

4. Operating Criteria. The operating criteria include air criteria for all CCR units, run-on and run-off controls for CCR landfills, hydrologic and hydraulic capacity requirements for CCR surface impoundments, and periodic inspection requirements for all CCR units. These criteria address the day-to-day operations of CCR units and are established to prevent health and environmental impacts from CCR units. The air criteria address the pollution caused by windblown dust from CCR units, and require owners and operators to minimize CCR from becoming airborne at the facility. The run-on controls for CCR landfills minimize the amount of surface water entering the unit that will help prevent erosion, surface discharges of CCR in solution or suspension, and will mitigate the generation of landfill leachate, while run-off controls help prevent erosion, protect downstream surface water from releases from the unit, and minimize storm water run-off volume and velocity. CCR surface impoundments are subject to hydrologic and hydraulic capacity requirements to ensure the unit can safely handle flood flows, which will help prevent uncontrolled overtopping of the unit or erosion of the materials used to construct the surface impoundment. The final rule also requires periodic inspections of CCR units to identify any appearance of structural weakness or other conditions that are not consistent with recognized and generally accepted good engineering standards.

5. Groundwater Monitoring and Corrective Action. The groundwater monitoring and corrective action criteria require an owner or operator of a CCR unit to install a system of monitoring wells and specify procedures for sampling these wells, in addition to methods for analyzing the groundwater data collected, to detect the presence of hazardous constituents (*e.g.,* toxic metals) and other monitoring parameters (*e.g.,* pH, total dissolved solids) released from the units. The final rule establishes a groundwater monitoring program consisting of detection monitoring, assessment monitoring and corrective action. Once a groundwater monitoring system and groundwater monitoring program has been established for a CCR unit, the owner or operator must conduct groundwater monitoring and, if the monitoring demonstrates an exceedance of a groundwater protection standard for any of the identified constituents in CCR, must initiate corrective action.

6. Closure and Post-Closure Requirements. The closure and post-closure care criteria require all CCR units to close in accordance with specified standards and to monitor and maintain the units for a period of time after closure, including the groundwater monitoring and corrective action programs. These criteria are essential to ensuring the long-term safety of closed CCR units. Closure of a CCR unit must be completed either by leaving the CCR in place and installing a final cover system or through removal of the CCR and decontamination of the CCR unit. The final rule establishes timeframes to initiate and complete closure activities, and authorize owners or operators to obtain time extensions due to circumstances beyond the facility's control. As discussed elsewhere in this preamble, the rule also establishes alternative closure procedures in situations where an owner or operator is closing a CCR unit, but has no alternative CCR disposal capacity or is permanently closing the coal-fired boiler unit in the foreseeable future. Finally, owners and operators are required to prepare closure and post-closure care plans describing these activities.

7. Record Keeping, Notification, and Internet Posting Requirements. The final rule requires owners or operators of CCR units to record certain information in the facility's operating record. In addition, owners and operators are required to provide notification to States and/or appropriate Tribal authorities when the owner or operator places information in the operating record, as well as to maintain a publicly accessible internet site for this information.

8. Severability. EPA intends that the provisions of this rule be severable. In the event that any individual provision or part of this rule is invalidated, EPA intends that this would not render the entire rule invalid, and that any individual provisions that can continue to operate will be left in place. The following tables provide a summary of the specific technical requirements applicable to existing and new CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units.

CCR Landfill Requirements

Requirement	Existing CCR Landfills		New CCR Landfills and Lateral Expansions	
	Required? [1]	Rule Section	Required? [1]	Rule Section
Location Restrictions:	√	§257.64	√	§257.60 - §257.64
Placement Above the Uppermost Aquifer			√	§257.60
Wetlands			√	§257.61
Fault Areas			√	§257.62
Seismic Impact Zones			√	§257.63
Unstable Areas	√	§257.64	√	§257.64
Floodplains[2]	√	§257.3-1	√	§257.3-1
Endangered Species[2]	√	§257.3-2	√	§257.3-2
Design Requirements:			√	§257.70
Composite Liner			√	§257.70 (b & c)
Leachate Collection and Removal System			√	§257.70 (d)
Groundwater Monitoring and Corrective Action	√	§257.90 - §257.98	√	§257.90 - §257.98
Weekly Inspections	√	§257.84 (a)	√	§257.84 (a)
Annual Inspections	√	§257.84 (b)	√	§257.84 (b)
Fugitive Dust Controls	√	§257.80	√	§257.80
Run-on, Run-off Controls	√	§257.81	√	§257.81
Surface Water Protection[2]	√	§257.3-3	√	§257.3-3
Closure Requirements	√	§257.100 - §257.103	√	§257.100 - §257.103
Post-Closure Care	√	§257.104	√	§257.104
Recordkeeping Requirements	√	§257.105	√	§257.105
Notification Requirements	√	§257.106	√	§257.106
Publicly Accessible Internet Site Requirements	√	§257.107	√	§257.107

[1] √ = required, [shaded] = not required.
[2] In existing regulations at 40 CFR part 257, subpart A.

CCR Surface Impoundment Requirements

Requirement	Existing Surface Impoundments				New Surface Impoundments and Lateral Expansions			
	Five feet high AND 20 acre-feet, or 20 feet high				Five feet high AND 20 acre-feet, or 20 feet high			
	Yes		No		Yes		No	
	Required? [1]	Rule Section	Required? [1]	Rule Section	Required? [1]	Rule Section	Required? [1]	Rule Section
Location Restrictions:	√	§257.60 - §257.64	√	§257.60 - §257.64	√	§257.60 - §257.64	√	§257.60 - §257.64
Placement Above the Uppermost Aquifer	√	§257.60	√	§257.60	√	§257.60	√	§257.60
Wetlands	√	§257.61	√	§257.61	√	§257.61	√	§257.61
Fault Areas	√	§257.62	√	§257.62	√	§257.62	√	§257.62
Seismic Impact Zones	√	§257.63	√	§257.63	√	§257.63	√	§257.63
Unstable Areas	√	§257.64	√	§257.64	√	§257.64	√	§257.64
Floodplains[4]	√	§257.3-1	√	§257.3-1	√	§257.3-1	√	§257.3-1
Endangered Species[4]	√	§257.3-2	√	§257.3-2	√	§257.3-2	√	§257.3-2
Design Requirements:	√	§257.71	√	§257.71	√	§257.72	√	§257.72
Composite Liner	[2]	§257.71	[2]	§257.71	√	§257.72	√	§257.72
Leachate Collection and Removal System								
Groundwater Monitoring and Corrective Action	√	§257.90 - §257.98	√	§257.90 - §257.98	√	§257.90 - §257.98	√	§257.90 - §257.98
Structural Integrity Criteria:	√	§257.73 & §257.83	√	§257.73 & §257.83	√	§257.74 & §257.83	√	§257.74 & §257.83
History of Construction	√	§257.73 (c)						
Construction Plan					√	§257.74 (c)		
Marker [3]	√	§257.73 (a)(1)	√	§257.73 (a)(1)	√	§257.74 (a)(1)	√	§257.74 (a)(1)
Hazard Potential Classification Assessments [3]	√	§257.73 (a)(2)	√	§257.73 (a)(2)	√	§257.74 (a)(2)	√	§257.74 (a)(2)
Structural Stability Assessments	√	§257.73 (d)			√	§257.74 (d)		
Safety Factor Assessments	√	§257.73 (e)			√	§257.74 (e)		
Emergency Action Plan [3]	√	§257.73 (a)(3)	√	§257.73 (a)(3)	√	§257.74 (a)(3)	√	§257.74 (a)(3)
Weekly Inspections	√	§257.83 (a)	√	§257.83 (a)	√	§257.83 (a)	√	§257.83 (a)
Annual Inspections	√	§257.83 (b)			√	§257.83 (b)		
Fugitive Dust Controls	√	§257.80	√	§257.80	√	§257.80	√	§257.80

CCR Surface Impoundment Requirements

Requirement	Existing Surface Impoundments				New Surface Impoundments and Lateral Expansions			
	Five feet high AND 20 acre-feet, or 20 feet high				Five feet high AND 20 acre-feet, or 20 feet high			
	Yes		No		Yes		No	
	Required? [1]	Rule Section	Required? [1]	Rule Section	Required? [1]	Rule Section	Required? [1]	Rule Section
Hydrologic & Hydraulic Capacity Requirements	√	§257.82	√	§257.82	√	§257.82	√	§257.82
Surface Water Protection[4]	√	§257.3-3	√	§257.3-3	√	§257.3-3	√	§257.3-3
Closure Requirements	√	§257.100 - §257.103	√	§257.100 - §257.103	√	§257.100 - §257.103	√	§257.100 - §257.103
Post-Closure Care	√	§257.104	√	§257.104	√	§257.104	√	§257.104
Recordkeeping Requirements	√	§257.105	√	§257.105	√	§257.105	√	§257.105
Notification Requirements	√	§257.106	√	§257.106	√	§257.106	√	§257.106
Publicly Accessible Internet Site Requirements	√	§257.107	√	§257.107	√	§257.107	√	§257.107

[1] √ = required, = not required.

[2] Existing CCR surface impoundments are required to be constructed with two feet of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} cm/sec, a composite liner that meets the requirements of §257.70(b), or an alternative liner that meets the requirements of §257.70(c).

[3] This requirement does not apply to an incised CCR surface impoundment.

[4] In existing regulations at 40 CFR part 257, subpart A.

E. When must owners or operators of CCR landfills and CCR surface impoundments meet the minimum national criteria?

The rule becomes effective six months after the publication date of this rule. The final rule establishes timeframes for certain technical criteria based on the amount of time determined to be necessary to implement the requirements (*e.g.*, installing the groundwater monitoring wells and establishing the groundwater monitoring program). In establishing these timeframes, EPA accounted for other Agency rulemakings that are anticipated to also affect the owners or operators of CCR units, namely the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category (78 FR 34432; proposed rule issued June 7, 2013) and the Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units (79 FR 34830; proposed rule issued June 18, 2014). Specifically, EPA developed implementation timeframes that would ensure that owner or operators of CCR units would not be required to make decisions about those CCR units without first understanding the implications that such decisions would have for meeting the requirements of all applicable EPA rules.

F. Deferral of Final Bevill Determination

This rule defers a final Bevill Regulatory Determination with respect to CCR that is disposed in CCR landfills and CCR surface impoundments until additional information is available on a number of key technical and policy questions. This includes information needed to quantify the risks of CCR disposal, and the potential impacts of recent Agency regulations on the chemical composition of CCR. The Agency also needs further information on adequacy of the state programs.

G. Beneficial Use

The final rule retains the Bevill exclusion for CCR that is beneficially used, and provides a definition of beneficial use to distinguish between beneficial use and disposal.

H. Implementation

Because the regulations have been promulgated under sections 1008(a), 4004(a), and 4005(a) of RCRA, the rule does not require permits, does not require states to adopt or implement these requirements, and EPA cannot enforce these requirements. Instead, states or citizens can enforce the requirements of this rule under RCRA's citizen suit authority; the states can also continue to enforce any state regulation under their independent state enforcement authority. (For a more detailed discussion of EPA authorities under RCRA and its relationship to this rule, see 75 FR 35128, June 21, 2010). EPA recognizes the significant role states play in implementing these requirements and EPA strongly encourages states to revise their SWMPs to show how these new criteria will be implemented. EPA would then review and approve the revised plan provided it demonstrates that the minimum federal requirements in this final rule will be met. In this way, EPA's approval of a revised plan signals EPA's opinion that the State's SWMP meets the minimum federal criteria. For a more detailed discussion on the role of the states in implementing this rule, please refer to Unit IX of this document.

I. Characterization of Baseline Affected Entities and CCR Management Practices

This action will affect CCR generated by coal-fired electric utility plants in the NAICS industry code 221112 (*i.e.*, the ''Fossil Fuel Electric Power Generation'' industry within the NAICS 22 ''Utilities'' sector code). Based on 2012 electricity generation data published by the Energy Information Administration (EIA), the Regulatory Impact Analysis (RIA) for this action estimated that a total of 478 operational coal-fired electric utility plants in this NAICS code could be affected by this action. These plants are owned by 242 entities consisting of 166 companies, 17 cooperative organizations, 58 state or local governments, and one federal agency. A sub-total of 81 of the 242 owner entities (*i.e.*, 33 percent may be classified as small businesses, small organizations, or small governments). The 478 coal-fired electric utility plants operate a total of 1,045 CCR management units (735 surface impoundments and 310 landfills). These 478 plants generate 110 million tons of CCR, consisting of 201 plants (42 percent) disposing in on-site landfills, 169 (35 percent) disposing in on-site ponds, and 197 (41 percent) disposing in off-site landfills. Because some plants use more than one CCR management method, these plant counts exceed 478 total plants. In addition, 293 of the 478 plants supply CCR for beneficial uses in at least 14 industries. Nineteen of the 293 plants solely supply CCR for beneficial uses. As of 2012, CCR beneficial uses (*i.e.*, industrial applications) involved about 52 million tons annually.

J. Summary of Estimated Regulatory Costs and Benefits

The EPA estimated future regulatory compliance costs and expected future human health and environmental protection benefits can be found in the RIA document which is available from the docket for this action. The estimated costs and benefits for the CCR rule are incremental to the baseline (current) practices by the electric utility industry to manage CCR in accordance with (a) existing state government environmental regulations and (b) utility company CCR management methods.

The RIA estimates the cost of the rule over a 100 year period because of: (1) CCR unit lifespans (40 years to 80 years of age); (2) groundwater migration (estimated time to peak potential exposures of CCR through groundwater migration to drinking water wells is 75 years); and (3) latency periods for onset of illness after exposure to CCR, which can average 20 years.

The table below summarizes the estimated incremental costs and benefits of the rule. The RIA estimates costs to comply with the 12 pollution control requirements associated with the rule, as well as estimated monetized values for 11 expected benefits, and discusses 11 other non-monetized benefits.

EPA ESTIMATED INCREMENTAL COSTS & BENEFITS OF THE CCR RULE

[millions 2013$ over 100-year period of analysis 2015–2114]

	3% Discount rate	7% Discount rate
A. Annualized Values		
A1. Total Costs	$735	$509
A2. Total monetized benefits	$294	$236
A3. Net Benefits (A2–A1)	($441)	($441)
A4. Benefit to Cost Ratio (A3/A1)	0.40	0.46

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EPA ESTIMATED INCREMENTAL COSTS & BENEFITS OF THE CCR RULE—Continued

[millions 2013$ over 100-year period of analysis 2015–2114]

	3% Discount rate	7% Discount rate
B. Present Value		
B1. Total Costs	$23,200	$7,260
B2. Total monetized benefits	$8,710	$3,360
B3. Net Benefits (B2–B1)	($14,490)	($3,900)
B4. Benefit to Cost Ratio (B2/B1)	0.38	0.46

II. Statutory Authority

These regulations are established under the authority of sections 1006(b), 1008(a), 2002(a), 3001, 4004, and 4005(a) 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. 6906(b), 6907(a), 6912(a), 6944 and 6945(a).

RCRA section 1006(b) directs EPA to integrate the provisions of RCRA for purposes of administration and enforcement and to avoid duplication, to the maximum extent practicable, with the appropriate provisions of other EPA statutes. Section 1006(b) conditions EPA's authority to reduce or eliminate RCRA requirements on the Agency's ability to demonstrate that the integration meets RCRA's protectiveness mandate (42 U.S.C. 6005(b)(1)). *See Chemical Waste Management* v. *EPA*, 976 F.2d 2, 23, 25 (D.C. Cir. 1992).

RCRA section 1008(a) authorizes EPA to publish ''suggested guidelines for solid waste management.'' 42 U.S.C. 6907(a). RCRA defines solid waste management as ''the systematic administration of activities which provide for the collection, source separation, storage, transportation, transfer, processing, treatment, and disposal of solid waste.'' 42 U.S.C. 6903(28).

Pursuant to section 1008(a)(3), the guidelines are to include the minimum criteria to be used by the states to define the solid waste management practices that constitute the open dumping of solid waste or hazardous waste and are prohibited as ''open dumping''under section 4005. Only those requirements promulgated under the authority of section 1008(a)(3) are enforceable under section 7002 of RCRA.

RCRA section 4004 generally requires EPA to promulgate regulations containing criteria for determining which facilities shall be classified as sanitary landfills (and therefore not ''open dumps''). The statute directs that, ''at a minimum, the criteria are to ensure that units are classified as sanitary landfills only if there is no reasonable probability of adverse effects on health or the environment from disposal of solid wastes at such facility.'' 42 U.S.C. 6944(a).

RCRA section 4005(a), entitled ''Closing or upgrading of existing open dumps'' generally establishes the key implementation and enforcement provisions applicable to EPA regulations issued under sections 1008(a) and 4004(a). Specifically, this section prohibits any solid waste management practices or disposal of solid waste that does not comply with EPA regulations issued under RCRA section 1008(a) and 4004(a). 42 U.S.C. 6944(a). See also 42 U.S.C. 6903(14) (definition of ''open dump''). This prohibition takes effect ''upon promulgation'' of any rules issued under section 1008(a)(3) and is enforceable through a citizen suit brought pursuant to section 7002. As a general matter, this means that facilities must be in compliance with any EPA rules issued under this section no later than the effective date of such rules, or be subject to a citizen suit for ''open dumping'' 42 U.S.C. 6945. RCRA section 4005 also directs that open dumps, *i.e.*, facilities out of compliance with EPA's criteria, must be ''closed or upgraded.''

Section 7004 lays out specific requirements relating to public participation in regulatory actions under RCRA. Subsection (b) provides that ''[p]ublic participation in the . . . implementation, and enforcement of any regulation under this chapter shall be provided for, encouraged, and assisted by the Administrator.'' 42 U.S.C. 6974(b).

A. Regulation of Solid Wastes Under RCRA Subtitle D

Solid wastes that are neither a listed nor 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 non-hazardous solid waste. The federal role is to establish the overall regulatory direction, by providing minimum nationwide standards that will protect human health and the environment, and to provide technical assistance to states for planning and developing their own environmentally sound waste management practices. The actual planning and any direct implementation of solid waste programs under RCRA subtitle D, however, remains a state and local function, and the Act envisions that states will devise programs to deal with state-specific conditions and needs. EPA has no role in the planning and direct implementation of the minimum national criteria or solid waste programs under RCRA subtitle D, and has no authority to enforce the criteria. However, states are not required to adopt solid waste management programs, and thus, Congress developed a statutory structure that creates incentives for states to implement and enforce the federal criteria, but that does not necessarily rely on or require a regulatory entity to oversee or implement them. While Congress developed the statutory structure to create incentives for states to implement and enforce the federal criteria, it does not require them to do so. As a result, subtitle D is also structured to be self-implementing.

RCRA sections 1008(a)(3) and 4004(a) delegate broad authority to EPA to establish regulations governing the management of solid waste. Under section 4004(a) EPA is charged with establishing requirements to ensure that facilities will be classified as sanitary landfills ''only if there is no reasonable probability of adverse effects on health or the environment from the disposal of solid waste'' at the facility. Or in other words, under section 4004(a) EPA is charged with issuing regulations to address all ''reasonable probabilities of adverse effects'' (*i.e.*, all reasonably anticipated risks) to health and the environment from the disposal of solid waste. Section 1008(a)(3) expands EPA's authority to address the risks from any of the listed activities. Specifically, EPA is authorized to establish requirements applicable to ''storage, transportation, transfer, processing, treatment, and disposal of solid waste.'' (42 U.S.C. 6907(a), 6903(28)).

EPA interprets the standard in section 4004(a) to apply equally to criteria issued under sections 1008(a)(3) and 4004(a); namely that the criteria must ensure that a facility is to be classified as a sanitary landfill, and thus allowed to continue to operate, ''only if there is no reasonable probability of adverse effects on health or the environment'' from either the disposal or other solid waste management practices at the facility. Thus, under the combined authority conferred by sections 1008(a)(3) and 4004(a), a facility is an ''open dump'' if it engages in any activity involving the management of solid waste that does not meet the standard in section 4004(a); or in other words, any activity involved with the management of solid waste that presents a reasonable probability of causing adverse effects on health or the environment. EPA also interprets these provisions to authorize the establishment of criteria that define the manner in which facilities upgrade or close, consistent with the standard in section 4004(a), to ensure there will be no reasonable probability of adverse effects on health or the environment.

As discussed previously, Congress created a regulatory structure that limited EPA's role to the creation of national criteria that would operate even in the absence of a regulatory entity to oversee or implement the criteria. Under RCRA section 4005(a), upon promulgation of criteria under section 1008(a)(3), any solid waste management practice or disposal of solid waste that constitutes the ''open dumping'' of solid waste is prohibited. The federal standards apply directly to the facility (are self-implementing) and facilities are directly responsible for ensuring that their operations comply with these requirements. States are not required to incorporate or implement these requirements under any state permitting program or other state law requirement, and EPA is not authorized to impose such requirements, directly or indirectly on the states. States and citizens may enforce this prohibition (and therefore, the federal criteria) using the authority under RCRA section 7002.[1]

The statute also creates incentives to states to implement the criteria. Chief among the incentives is a greater role in implementation and enforcement of the solid waste program, including to a limited extent the ability to give facilities that are operating within their state additional time to come into compliance with newly promulgated EPA criteria. Specifically, if the facility is located in a state with a plan that was approved under section 4003(b), the state may grant the facility an extension of up to five years from the date the final rule was published in the **Federal Register** to come into compliance with EPA regulations, provided: (a) The facility is listed in a state inventory of open dumps; and (b) the facility has demonstrated that it has considered other public or private alternatives for solid waste management to comply with the prohibition on open dumping and is unable to utilize such alternative. For facilities that meet these requirements, the state may establish a ''schedule for compliance'' which specifies a schedule of remedial measures, including an enforceable sequence of actions or operations, leading to compliance with the requirements ''within a reasonable time (not to exceed five years from the date of publication of criteria under section [1008] (a)(3) of this title).'' 42 U.S.C. 6945(a).

As a consequence of this statutory structure—the requirement to establish national criteria and the absence of any requirement for direct regulatory oversight—to establish the criteria EPA must demonstrate, through factual evidence available in the rulemaking record, that the final rule will achieve the statutory standard (''no reasonable probability of adverse effects on health or the environment'') at all sites subject to the standards based exclusively on the final rule provisions. This means that the standards must account for and be protective of all sites, including those that are highly vulnerable.

III. Background

A. EPA's Proposed Rule

On June 21, 2010 (75 FR 35128), EPA proposed to regulate CCR under RCRA to address the risks from the disposal of CCR generated from the combustion of coal at electric utilities and independent power producers. As described in the proposal, CCR are residuals generated from the combustion of coal and include fly ash, bottom ash, boiler slag (all composed predominantly of silica and aluminosilicates), and flue gas desulfurization (FGD) materials (predominantly $Ca\text{-}SO_X$ compounds) and can be managed in either wet (surface impoundments) or dry (landfills) disposal systems. EPA noted in the proposed rule that the constituents of most environmental concern in CCR are metals, such as antimony, arsenic, barium, beryllium, cadmium, chromium, lead, mercury, nickel, selenium, silver and thallium. EPA also presented data showing numerous instances where these constituents (especially arsenic) have leached at levels of concern from unlined and inadequately clay-lined landfills and surface impoundments.

In the proposal, EPA revisited its August 1993 and May 2000 Bevill Regulatory Determinations regarding CCR generated at electric utilities and independent power producers. The results from this effort led the Agency to consider two primary options for the management of CCR and thus, propose two alternative regulatory strategies. Under the first option, EPA proposed to reverse its August 1993 and May 2000 Bevill Regulatory Determinations (58 FR 42466 and 65 FR 32214 respectively) regarding CCR and to 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 this proposed option, CCR would be regulated from the point of generation to the point of final disposition and would generally be 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. Among other things, the regulatory requirements included waste characterization, location restrictions, liner and, if applicable, leachate collection requirements for land disposal units, fugitive dust controls, groundwater monitoring and corrective action requirements, closure and post-closure care requirements, financial assurance, permitting requirements, and recordkeeping and reporting requirements. This option also imposed requirements on generators and transporters of CCR destined for disposal, including manifesting (if the CCR destined for disposal is sent off-site). However, in light of practical difficulties in implementing certain subtitle C regulatory requirements, EPA also proposed to revise selected requirements under the subtitle C option. Consequently, EPA proposed, pursuant to its authority under section 3004(x) of RCRA, modifications to 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. EPA also proposed to establish new land disposal prohibitions and treatment standards for both wastewater and non-wastewater forms of CCR. In part, the proposed

[1] EPA also may act if the handling, storage, treatment, transportation, or disposal of such wastes may present an imminent and substantial endangerment to health or the environment, pursuant to RCRA section 7003.

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modifications to the treatment standards would result in the closure of existing surface impoundments and the prohibition of all new surface impoundments. (See 75 FR 35128 for a complete discussion of this proposed option).

Under the second option, EPA proposed to retain the August 1993 and May 2000 Bevill Regulatory Determinations and to regulate CCR disposal under subtitle D of RCRA by issuing national minimum criteria to ensure the safe disposal of CCR in surface impoundments and landfills. Under this option, CCR would remain classified as a non-hazardous RCRA solid waste. EPA proposed to establish technical requirements, many of which were nearly identical to the technical standards proposed under the subtitle C option. The technical standards included, among other things, locations standards, liner and leachate collection requirements, groundwater monitoring and corrective action standards for releases from the units, operating criteria, such as fugitive dust control, closure and post-closure care requirements, and recordkeeping and reporting requirements. Under this option, EPA did not propose to establish regulatory requirements that would restrict the generation, transportation, storage, or treatment of CCR prior to disposal, nor did EPA propose to establish financial assurance requirements under RCRA.[2] Also, because of subtitle D's limitations, the proposed rule did not require permits; nor could EPA enforce the national minimum criteria. Rather, states or citizens could enforce the national minimum criteria under RCRA's citizen suit authority, and states could continue to enforce any state regulation that applies to CCR under their independent state enforcement authority.

The subtitle D proposed option was designed to be self-implementing, meaning that the requirements were such that facilities could comply with the regulatory requirements without the need to interact with a regulatory authority. EPA sought to enhance the protectiveness of the proposed option by requiring certified demonstrations by an independent registered professional engineer to provide verification that the regulatory requirements were being adhered to. In addition, the option provided for state and public notification of the certifications, as well as required posting of certain information on a Web site maintained by the facility and in the operating record. (See 75 FR 35128 for a complete discussion of this proposed option).[3]

The Agency also described other alternatives considered. For example, one subtitle D option, called ''D-prime'' was structured so that all existing CCR surface impoundments could continue to receive CCR after the effective date of the rule for the remainder of the unit's useful life, irrespective of their liner type, provided the other provisions of the subtitle D option were met (*e.g.,* groundwater monitoring). (See 75 FR 35128 for a complete discussion of this and other possible regulatory alternatives on which the Agency solicited comment.)

Under both the subtitle C and subtitle D alternatives, EPA proposed establishing dam safety requirements to address the structural integrity of surface impoundments. EPA also proposed not to change the May 2000 Regulatory Determination for beneficially used CCR, which are currently exempt from the hazardous waste regulations under section 3001(b)(3)(A) of RCRA. EPA also did not propose to address the placement of CCR in mines, or non-minefill uses of CCR at coal mine sites.

In addition to proposing these two regulatory options for the management of CCR, EPA identified many issues on which it solicited comment, information, and data. Certain solicitations were very general, such as comments on alternative options for regulating CCR, while other requests for comment were very specific in nature, for example, whether clay liners designed to meet a specified hydraulic conductivity might perform differently in practices than modeled in the risk assessment. (The Agency requested comment on issues throughout the preamble; however specific issues for which EPA solicited comment can be found at 75 FR 35221–34224.)

B. Comments Received on the Proposed Rule

The Agency received over 450,000 comments on the proposed rule. The majority of the commenters focused on which regulatory path the Agency should pursue for regulating CCR, *i.e.,* RCRA's subtitle C or subtitle D. A number of commenters, however, argued that no additional regulation was necessary and that the states were adequately regulating the management of CCR. Generally, environmental groups and individual citizens favored a subtitle C rule arguing that state programs have failed and damage cases are growing in number. State organizations, individual states, and industry groups (electric utilities, recycling firms, trade associations), largely favored a subtitle D rule with a permitting program.

One area that received extensive comment was the re-evaluation of the eight Bevill study factors.[4] Numerous commenters provided detailed analysis related to the study factors and provided their own interpretations of the data (*e.g.,* state programs and damage cases). Other areas that received significant comment included beneficial use and the risk assessment.

Discussion of the specific comments germane to this rulemaking are provided in the relevant sections of this document.

C. Other Actions During Which Comment Was Taken

1. Public Hearings

EPA conducted eight public hearings during the months of August, September, and October in 2010. There were over 1300 individual speakers at the eight public hearings that commented on the proposed rule. Testimony at the public hearings focused generally on whether EPA

[2] In the proposal, the Agency stated that the RCRA subtitle D alternative did not include proposed financial responsibility requirements and that any such requirements would be proposed separately. The Agency solicited comment on whether financial responsibility requirements under CERCLA section 108(b) should be a key Agency focus under a RCRA subtitle D approach. While the Agency received numerous comments urging the Agency to establish financial responsibility as part of the subtitle D option, the CERCLA 108(b) option did not receive significant support. As discussed in the proposal and reiterated here, EPA will not be requiring financial assurance requirements as part of this rule. The Agency however will continue to investigate the use of other statutory authorities (*e.g.,* CERCLA) to establish financial responsibility requirements for owners or operators of CCR landfills, CCR surface impoundments and any lateral expansion.

[3] While EPA cannot enforce the subtitle D proposed rules, EPA can take action under section 7003 of RCRA to abate conditions that ''may present an imminent and substantial endangerment to health or the environment.'' EPA can also use the imminent and substantial endangerment authorities under the CERCLA, or under other federal authorities to address those circumstances where a unit(s) may pose a threat.

[4] In considering whether to retain or to reverse the August 1993 and May 2000 Regulatory Determinations regarding the Bevill exemption of CCR destined for disposal, the Agency re-examined the RCRA section 8002(n) study factors. These eight study factors are: (1) Source and volumes of CCR generated per year; (2) present disposal and utilization practices (which includes evaluation of existing state regulatory oversight and beneficial use); (3) potential danger, if any, to human health and the environment from the disposal and reuse of CCR; (4) documented cases in which danger to human health or the environment from surface runoff or leachate has been proved; (5) alternatives to current disposal methods; (6) the cost of such alternative disposal methods; (7) the impact of the alternative disposal methods on the use of coal and other natural resources; and (8) the current and potential utilization of CCR (see 75 FR 35128).

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should adopt a subtitle C or subtitle D approach for regulating CCR. Many commenters were also concerned with fugitive dust emissions and the affect these emissions had on their health and overall well-being. Other commenters were concerned that adopting a subtitle C rule for CCR would negatively affect the beneficial use of the material. In addition to their testimonies that were entered into the rulemaking record, over 1200 additional documents were submitted in hard copy and entered into the docket (see EPA–HQ–RCRA–2009–0640).

2. Notices of Data Availability

Subsequent to the proposed rule, the Agency published several Notices of Data Availability (NODAs), the first on October 21, 2010, (75 FR 64974); the second on October 12, 2011 (76 FR 63252) and the third on August 2, 2013 (78 FR 46940). Specifically:

- The first NODA invited comment on the responses EPA received on Information Collection Requests that were sent to electric utilities on their CCR surface impoundments, as well as reports and materials related to the site assessments EPA had conducted on a subset of these impoundments.
- The second NODA invited comment on a number of topics, including (1) chemical constituent data from coal combustion residuals; (2) facility and waste management unit data; (3) information on additional alleged damage cases; (4) the adequacy of state programs; and (5) beneficial use.
- The third NODA invited comment on (1) supplemental data for the risk assessment; (2) supplemental data for the RIA; (3) information regarding large-scale fill; and (4) data on the CCR Assessment Program. EPA also sought comment on two technical issues associated with the requirements for CCR management units: closure requirements and regulation of overfills (*i.e.,* CCR management units built directly over pre-existing CCR landfills or CCR surface impoundments).

Specific comments received on each of the three NODAs are discussed in the relevant sections of this rule.

3. Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category Proposed Rule

On June 7, 2013 (78 FR 34432), EPA proposed a regulation that would strengthen the controls on discharges from certain steam electric power plants by revising the technology-based effluent limitation guidelines (ELG) and standards for the steam electric power generating point source category. As part of this proposal, EPA discussed its current thinking on how a final RCRA CCR rule might be aligned and structured to account for any final requirements adopted under the ELG for the Steam Electric Power Generating point source category. Two primary means of integrating the two rules were discussed: (1) Coordinating the design of any final substantive CCR regulatory requirements and (2) coordinating the timing and implementation of the rules to allow facilities to coordinate their compliance planning and implementation and to protect electricity reliability for consumers. EPA stated that consistent with RCRA section 1006(b), effective coordination of any final RCRA requirements with the ELG requirements would be sought in order to minimize the overall complexity of the two regulatory structures, and facilitate implementation of engineering, financial, and permitting activities. EPA solicited comments on how any final CCR final rule might be aligned and structured to account for any final requirements adopted under the ELG for the Steam Electric Power Generation point source category.

D. EPA's CCR Assessment Program

In March 2009, the Agency's CCR Assessment Program (herein referred to as the Assessment Program) was initiated. This effort was in response to the December 22, 2008 dike failure of a coal ash impoundment at the Tennessee Valley Authority (TVA) Kingston Fossil Plant in Harriman, Tennessee where over one billion gallons of coal ash slurry were released, affecting more than 300 acres, including residences and infrastructure. The TVA Kingston impoundment failure ignited a nation-wide concern over the safety of coal ash impoundments; and EPA was tasked with determining whether the potential existed for similar impoundment failures at other coal-fired power plants. In response, EPA developed the Assessment Program to evaluate the structural stability and safety of all coal ash impoundments throughout the country.[5] As of September 2014, 559 impoundments had been assessed at over 230 coal-fired power plants.

The Assessment Program began as a separate effort from the development of this final rule.[6] However, the information and experience developed in carrying out the site assessments during the Assessment Program is directly relevant to many of the issues addressed in this rulemaking, and provide further technical support for many of the technical criteria. Consequently, many of the final technical criteria were developed in direct response to findings from the site assessments. For example, several of the technical criteria contained in the proposed rule were modified to account for the widely accepted engineering methodologies and practices used in conducting the site assessments, as well as current facility practices documented during the assessments. In a few instances, the criteria were supplemented to better align the technical requirements with the Assessment Program. Included among the final criteria that directly rely on the Assessment Program are the provisions relating to structural integrity assessments to address factors of safety, periodic reassessments, hazard potential classifications, and the hydrologic and hydraulic capacity of CCR surface impoundments. These requirements are further discussed in Unit VI of this preamble.

The Assessment Program focused on impoundments meeting four general criteria that were designed to identify the units most likely to present the same risks as the collapsed TVA impoundment: (1) Above ground or diked; (2) of sufficient height to be susceptible to structural failure (*i.e.,* six feet); (3) receiving CCR; and (4) located at operating coal-fired power plants selling power to the electric grid. Also included in the assessments were a number of inactive impoundments, *i.e.,* impoundments not receiving CCR but still containing CCR and/or liquid. The Agency included these inactive units in the assessment reasoning that these units would be as susceptible to structural failure as units currently receiving CCR, given that they still contained CCR and maintained an ability to impound liquid (*i.e.,* the unit had not been breached). The Assessment Program did not evaluate, however, incised (not having above ground berms or dikes) impoundments or landfills (not containing liquid slurried CCR wastes). EPA chose not to assess these units because they did not share the characteristics of

[5] The focus of the Assessment Program was to assess the structural integrity of CCR impoundments meeting specified criteria. The Agency did not include, as part of its evaluation, the assessment of other conditions/characteristics of the impoundment that may present potential risks to human health or the environment, *i.e.,* groundwater contamination due to an insufficient liner design.

[6] EPA issued two Notices of Data Availability (75 FR 35128 (October 21, 2010) and 78 FR 46940 (August 2, 2013)) specifically soliciting comment on the information generated by the Assessment Program and the materials posted on our Web site.

impoundments likely to raise concern for catastrophic releases, and because no known catastrophic structural failures were associated with these types of units.

Prior to initiating the assessments, EPA consulted with two key dam safety organizations, the Association of State Dam Safety Officials (ASDSO) and the Mine Safety and Health Administration (MSHA) to better understand how these federal and state dam inspection programs operated, including how earthen dams and impoundments were assessed.[7] These groups provided the Agency with critical insight and information for inspecting and evaluating CCR impoundments. The Agency also reviewed various technical documents relating to dam safety and conducting impoundment inspections, many of which were recommended by these organizations. They were: (1) U.S. Army Corp of Engineers (USACE) 2008 National Inventory of Dams (NIDS); (2) Federal Emergency Management Agency's (FEMA) Federal Guidelines for Dam Safety—Hazard Potential Classification System for Dams (April 2004); (3) FEMA's Risk Prioritization Tool for Dams User Manual (March 2008); (4) MSHA's Handbook (PH07–01); (5) MSHA's Coal Mine Impoundment Inspection and Plan Review Handbook (October 2007); and (6) MSHA's Engineering and Design Manual: Coal Refuse Disposal Facility (May 2009); (7) ASDSO's ''Summary of State Dam Safety Laws and Regulations,'' (2000); (8) ASDSO's ''Owner Responsible Periodic Inspection Guidance,'' (2005); (9) ''Guidelines for Inspections of Existing Dams.'' New Jersey Department of Environmental Protection—Dam Safety (January 2008).

In developing the criteria that were used to conduct the assessments, a standard rating system was developed to classify the units' suitability for continued safe and reliable operation. EPA modeled its impoundment condition rating criteria on those developed by the State of New Jersey (see reference above).

1. Conducting the Site Assessments

In order to prioritize the assessments, a preliminary hazard potential classification ranking was identified for each impoundment, based on criteria developed by the FEMA and found generally in USACE's NID. EPA elected to evaluate first those impoundments with a high hazard potential classification, which signifies that a failure or mis-operation of the unit would probably result in the loss of human life.

Upon initiation of the Assessment Program, every owner or operator of a CCR impoundment was contacted by the Agency and supplied with information on the objectives of the assessment and how the assessments were to be conducted. Assessments were conducted in rounds, consisting of groups of 12–26 facilities per round.[8] Prior to each site assessment, to ensure uniformity throughout the study, a statement of work and an impoundment field checklist was developed and adhered to during the assessment.

To ensure objectivity, EPA contracted with professional engineers (PEs) in the state where the impoundment was located who were experts in the area of dam safety to perform the site assessments. Each individual assessment was performed by PEs qualified in the areas of geotechnical engineering, hydrology and hydraulics, and overall dam safety. Upon evaluation of a robust set of technical documents addressing dam safety and inspections as well as comprehensive discussions with key dam safety organizations, the Assessment Program developed a comprehensive set of factors that were to be used to evaluate the overall safety of CCR surface impoundments, which concluded that, among other important factors, the static and seismic factors of safety, hydrologic and hydraulic capacity, liquefaction potential analysis and a post-liquefaction stability analysis if the soils of the embankment were identified to be susceptible to liquefaction, and operation and maintenance protocols, *e.g.* instrumentation monitoring, inspection program, emergency response protocols were critical parameters for assessing the overall safety of CCR surface impoundments.

The individual evaluations or assessments were conducted at each impoundment at each facility using standard, accepted engineering practices, including a visual assessment of the CCR surface impoundment, interviews with site personnel, a review of the history of the CCR surface impoundment, and a review of engineering documentation related to the design, construction, operation, and maintenance of the impoundments, including available technical analyses. At each site visit, additional documentation was collected and reviewed as available, including descriptions, along with supporting information, of: (1) The impoundment, including location, size, age, design and/or alterations to the design, and the amount of residuals currently in the unit; (2) known, measured settlement of the impoundment embankment; (3) known, measured movement of the impoundment embankment; (4) observed erosion of the impoundment embankment; (5) seepage; (6) leakage; (7); observed cracking of the impoundment embankment; (8) deterioration, such as scarps, boils, or sloughs, of the — embankment; (9); seismicity; (10) internal stresses; (11) functioning of foundation drains and relief wells; (12) stability of critical slopes adjacent to the units; and (13) regional and site geological conditions. If available, state and federal inspections reports were also reviewed.[9]

In addition, for each assessment, the following factors were identified, to the extent feasible, for evaluation: (1) The presence and adequacy of spillways; (2) hydrologic and hydraulic capacity of the unit; (3) overall structural adequacy and stability of structures under all credible loading conditions through a review of static, seismic, and liquefaction analyses with determined factors of safety; (4) soil, groundwater, surface water, geology, and geohydrology characteristics associated with the unit, including hydrological data accumulated since the impoundment was constructed or last inspected; (5) a history of the performance of the management unit through analysis of data from monitoring instruments, interviews with facility personnel, and review of available operating records; (6) quality and adequacy of maintenance, surveillance, and methods of unit operations for the protection of public safety; (7) location of schools, hospitals, or other critical infrastructures within five miles down gradient of the impoundment; and (8) whether the impoundment is located within federally designated flood plains. Finally, each impoundment and any associated spillways were evaluated to determine whether the impoundment and the spillways could withstand the loading or overtopping from appropriate inflow design flood events.

Each CCR surface impoundment was classified with a hazard potential classification following the New Jersey Department of Environmental Protection

[7] ASDSO identified for EPA key documents to review including Federal Energy Regulatory Commission (FERC) and MSHA guidance.

[8] The results of this effort are either presented on a facility by facility basis or are summarized by round. All of these data have been posted on the Agency Web site.

[9] It is important to note that during the assessment, no physical drilling, coring or sampling was conducted, while on site; however, studies were reviewed that often included such information.

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Bureau of Dam Safety and Flood Control's hazard potential ranking. Each impoundment was classified with a hazard potential classification of either; ''high,'' ''significant,'' ''low,'' or ''less-than-low.'' The hazard potential classification was a qualitative assessment of the potential adverse incremental consequences of a dam failure.

At the conclusion of each assessment, a report was generated and the impoundment was given a condition rating of either; satisfactory, fair, poor, or unsatisfactory. The condition ratings were based on the availability of information on the unit and evaluation of the previously mentioned factors, including the static, seismic, and liquefaction factors of safety. No impoundments received an ''unsatisfactory'' rating. Numerous impoundments were, however, rated as ''poor,'' often for lack of appropriate technical documentation in the aforementioned areas. ''Poor'' or ''fair'' ratings were also an indication that additional measures were needed to improve the stability of the unit. Of 559 impoundments assessed, 241 received a condition rating of ''satisfactory,'' 166 received a condition rating of ''fair,'' and 152 received a ''poor'' condition rating.

It is important to note that the condition rating did not necessarily imply that the unit had inadequate structural integrity. On the contrary, in many instances a structurally sound impoundment may have been given a condition rating or ''fair'' or ''poor'' based on other factors such as a lack of documented information on the unit or insufficient operations and maintenance protocols. For example, an impoundment could be rated as ''poor'' if it lacked the appropriate technical documentation and analyses regarding structural or hydrologic and hydraulic analyses. EPA rated numerous units as ''poor'' based primarily on unavailable technical analyses.

Once the assessment was performed, a draft report was prepared. Draft reports were reviewed by the appropriate state agency, the utility, and by EPA.[10] Once comments were received and incorporated, a final report was issued along with recommendations for additional actions to be taken by the facility (if needed). Facilities then developed action plans and schedules to implement the recommendations. EPA also informed facility owners and operators that in addition to implementing their action plans, they need to adopt an ongoing, routine program to assess each surface impoundment and to take necessary corrective measures to ensure the units' continued structural integrity.

2. Assessment Program Findings

Upon completion of the Assessment Program, a review was undertaken to ascertain the key findings or lessons learned from the effort. These key findings included: (1) The majority of CCR surface impoundments are currently inspected on a periodic basis; (2) most utilities were readily able to supplement outdated or missing information with new or updated evaluations of their impoundments after the on-site portion of EPA's assessment was conducted; (3) in response to the assessment report recommendations, facilities typically willingly conducted remedial actions; (4) interaction with the states and the utilities assured accuracy in the final assessment reports; (5) placing site assessment materials on an internet site assured that the public, states, and utilities had full access to information about the design and operation of CCR impoundments and did not present either homeland security or other confidentiality concerns; (6) static, seismic, and liquefaction analyses did not pose a significant technical or cost burden on facilities since many already routinely conducted these types of evaluations; (7) state regulatory bodies viewed the assessments as a means to further support existing assessment programs; and (8) the use of PEs to certify all final reports ensured that the assessments reflected the PE's best judgments.

3. Assessment Program's Support for the Structural Integrity Requirements of the Rule

As noted, the findings from EPA's Assessment Program provide technical and factual support for many of the final requirements for structural stability in this rule. A more detailed discussion of several of the most significant of these is presented below. Additional discussion of the relevance of these findings is included throughout Unit VI of this document.

a. Periodic Inspections/Assessments

Consistent with the findings from the assessments and with EPA's recommendations to facilities as part of the Assessment Program, this rule requires that all CCR surface impoundments be inspected at intervals not exceeding seven days for any appearances of actual or potential structural weakness and other conditions that are disrupting or have the potential to disrupt the operation or safety of the CCR surface impoundment. Monitoring of instrumentation is also required to be conducted at intervals not exceeding 30 days. The Assessment Program found that virtually all utility companies conduct some sort of periodic inspection or monitoring at CCR surface impoundments, although practices varied among facilities and between states. The Assessment Program also found that while many facilities were conducting regularly scheduled inspections, some did not adequately document the results of these inspections.

In the final rule, CCR surface impoundments exceeding a specified size threshold, *i.e.,* height of five feet or more and capacity of 20 acre-feet or more or a height of 20 feet or more, are required to perform annual inspections as well as two assessments of structural stability quinquennially, (*i.e.,* every five years) that include a structural stability assessment of specified parameters and a factor of safety assessment. Annual inspections are broader in scope than weekly inspections and are conducted to ensure that the design, construction, operation and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering standards. Annual inspections must include a review of available information regarding the status and condition of the unit and a visual inspection to identify signs of distress or malfunction of the unit and appurtenant structures. The annual inspections must be conducted by a qualified professional engineer.

The Assessment Program also reviewed how detailed structural stability reviews and inspections were recommended to be conducted by FEMA, MSHA, and the USACE guidelines and found that such inspections were recommended to take place every three to five years. Review of state dam safety programs demonstrated that similar detailed inspections were also conducted on a three-to-five year cycle. Therefore, in the final rule, EPA is requiring that structural integrity assessments, including the calculation of factors of safety under various loading conditions, be conducted within 18 months of publication of the rule, and be repeated every five years. The five year review timeframe is based on documentation showing that the factual bases for such reviews are only sound for that time

[10] As noted many times in this document, states play a critical role in implementing and overseeing these units. To assist states in this effort, EPA has, in the majority of cases directly provided the states with all of the information from our assessments. The Assessment Program reports may be accessed at: *http://www.epa.gov/wastes/nonhaz/industrial/special/fossil/surveys2/index.htm.*

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period, and is consistent with federal dam safety guidance, specifically FEMA. FEMA recommends in *Federal Guidelines for Dam Safety* that dams be formally assessed at a frequency not to exceed five years by a qualified professional engineer. EPA has adopted this timeframe to maintain consistency with FEMA guidance. The inspection and assessment requirements in this rule will ensure that there are consistent and uniform inspection and assessment practices across states and facilities and will ensure that problems related to their stability will be promptly identified and remediated as necessary.

b. Static, Seismic, and Liquefaction Factors of Safety

(1) Static Factors of Safety.

Factor of safety (FOS) means the ratio of the forces tending to resist the failure of a structure, as compared to the forces tending to cause such failure as determined by accepted engineering practice. This analysis is used to determine whether a CCR surface impoundment's dikes are engineered to withstand the specific loading conditions that can be reasonably anticipated to occur during the lifetime of the unit without failure of the dike, if accepted good engineering practices are employed. Static factors of safety refer to the factors of safety (FOS) under static loading conditions that can reasonably be anticipated to occur during the lifetime of the unit. Static loading conditions are unique from other loading conditions (*e.g.,* seismic, liquefaction) in that static loading conditions are those which are in equilibrium, meaning the load is at rest or is applied with constant velocity.

EPA reviewed a series of USACE guidance documents addressing how to determine static FOS. These documents included, but were not limited to, Engineer Manual EM 1110–2–1902 ''Slope Stability'' (October 2003), and EM 1110–2–1902 ''Stability of Earth and Rock-Fill Dams.'' The Agency also assessed the recommendations on how to conduct static analysis contained in the Engineering and Design Manual for Coal Refuse Disposal Facilities, originally published by the Mining Enforcement and Safety Administration (MESA) in 1975 and updated for MSHA in May 2009, and in particular Chapter 6, ''Geotechnical Exploration, Material Testing, Engineering Analysis and Design.'' Based on recommendations from ASDSO, among others, the Agency adopted the USACE guidance to determine static FOS, both in the Assessment Program and in this rulemaking, as these manuals are recognized throughout industry as the standard routinely used in field assessment of structural integrity.

In EPA's Assessment Program all CCR units were assessed to determine their static FOS. Each assessment classified a CCR unit as having sufficient structural stability under static loading conditions if analysis of critical sections of embankments demonstrated FOS that met or exceeded the values defined by USACE for static specific loading conditions. EPA found that most CCR surface impoundments exhibited sufficient calculated factors of safety under static loading conditions. EPA also found that in those CCR units which insufficient factors of safety against failure due to static loading were calculated, the owner or operator was able to implement actions which increased the factors of safety under static loading conditions to acceptable levels. Oftentimes, these implemented actions were of a simple nature, such as installing riprap (rock armoring the slopes) or buttressing the slopes.

Similarly, this rule adopts the static FOS from USACE Engineer Manual EM 1110–2–1902 ''Slope Stability,'' with the exception of the rapid drawdown loading condition,[11] which was determined not to be relevant to CCR surface impoundments. EPA found the factors of safety identified by EM 1110–2–1902, specifically the Maximum Storage pool, Maximum Surcharge pool, and End-Of-Construction loading conditions, provided consistent, achievable levels of safety in CCR surface impoundment dikes, comprehensively assessed static stability, and provided sufficient consideration of compounding stresses on dikes (*e.g.,* factors of safety values greater than 1.00 to account for unanticipated loadings acting in conjunction or misidentified strength of materials).

(2) Seismic Factor of Safety.

Seismic FOS means the FOS determined using analysis under earthquake conditions for a seismic loading event, based on the U.S. Geological Survey (USGS) seismic hazard maps for seismic events with a specified return period for the location where the CCR surface impoundment is located. The seismic FOS analysis is used to determine whether a dam would remain stable during an earthquake or other seismic event. The Agency relied on guidance from USACE and MSHA to evaluate the appropriate methods to determine if a dam would remain stable during a seismic event. This includes the USACE guidance Engineer Circular 1110–2–6061: Safety of Dams—Policy and Procedures 2204, Engineer Circular 1110–2–6000: Selection of Design Earthquakes and Associated Ground Motions 2008, and Engineer Circular 1110–2–6001: Dynamic Stability of Embankment Dams 2004). EPA also reviewed MSHA's 2009 Engineering and Design Manual for Coal Refuse Disposal Facilities, in particular Chapter 7, ''Seismic Design: Stability and Deformation Analyses.'' These documents are viewed by ASDSO, FEMA and MSHA as generally accepted guidance on how to conduct seismic stability analyses.

As noted earlier, in performing the assessments, EPA directed its engineering contractors to assess seismic stability of CCR impoundments during and following a seismic event with a 2% probability of exceedance in 50 years (*i.e.* probable earthquake within approximately 2,500 years) and a horizontal spectral response acceleration for 1.0-second period (5% of Critical Damping). EPA selected this return period for determining the maximum design earthquake (MDE) by first considering the operating life anticipated for CCR surface impoundments. EPA has identified the operating life of CCR surface impoundments to range between 40–80 years. EPA then consulted the United States Geological Survey (USGS) and ASDSO to determine a conservative probability that should be used in the assessments.[12] To reduce the likelihood of a CCR unit failing during a seismic

[11] Rapid (or sudden) drawdown is a condition in earthen dikes that may develop when the embankment becomes saturated through seepage during a high pool elevation in the reservoir. Rapid drawdown becomes a threat to the dike when the reservoir pool is drawn down or lowered at a rate significantly higher than the excess poor water pressure within the dike can dissipate. Typically, rapid drawdown scenarios are considered for dikes with reservoirs used for water supply and management or agricultural supply. In these scenarios, a high pool elevation is maintained in the reservoir in storage months. Subsequently, the water supply is drawn on in months where there is a demand for the reservoirs contents. This drawing down of the pool can present issues for the structural integrity of the unit. However, the management of CCR surface impoundments differs from that of conventional water supply reservoirs. CCR surface impoundments are never used for water supply, and the only instance in which EPA determined through its Assessment Program that rapid drawdown loading conditions would be relevant to CCR surface impoundments was in the event that the CCR surface impoundment had already released the contents of the impoundment through a breach of the dike or emergency discharge. Since the threat of release of CCR and the reservoir has already been realized, any failure due to rapid drawdown of the embankment is no longer critical to the overall containment of the now-released contents of the CCR unit.

[12] Wieland, M., ''Seismic Design and Performance Criteria for Large Storage Dams'', Proc. 15th World Conf. on Earthquake Engineering, Lisbon, Portugal, Sep. 24–28, 2012.

event, the Agency assessed various return periods and chose a conservative 2500 year return period. The use of this ''return'' period was chosen because it is conservative, reflects the fact that many CCR impoundments are located in active seismic zones, and the use of a conservative ''return'' period ensures that if a unit meets the seismic FOS it is unlikely to fail under most seismic events. By evaluating seismic stability under a conservative return period and requiring the unit to maintain structural stability under that design seismic event, the likelihood of a seismic event occurring at the location of the CCR surface impoundment in which the strength of the unit is exceeded and the unit fails is considerably reduced. Additionally, the unit can reasonably be anticipated to withstand seismic events of a more frequent return period (*i.e.,* smaller magnitude).

The Agency assessed CCR impoundments and classified them as having seismic stability if modeling results of critical failure surfaces were calculated to have a FOS greater than 1.0 under the specified seismic loading condition. The Assessment Program found that most CCR impoundments did meet the required seismic FOS. This rule also adopts this seismic stability FOS under the 2% probability of exceedance in 50 years event.

The Assessment Program found that many CCR impoundments had not undergone static or seismic analyses in sufficient detail that an independent professional engineer could assert that they were stable. The assessments gave impoundments a condition rating of ''poor'' if the utility was unable to provide static and seismic studies of their units conducted in a fashion which represented acceptable professional engineering practice. As the Assessment Program advanced, many utilities independently conducted new or updated static and seismic analyses of CCR surface impoundments in anticipation of their facilities being assessed. By the end of the program, virtually all facilities had conducted or were in the process of conducting static and seismic analyses. While some utilities noted concern over the costs of conducting additional static or seismic stability studies, none found that completing these studies presented any significant engineering challenges.

(3) Liquefaction Factors of Safety

Liquefaction FOS means the factor of safety determined using analysis under liquefaction conditions. Liquefaction is a phenomenon which typically occurs in loose, saturated or partially-saturated soils in which the effective stress of the soils reduces to zero, corresponding to a total loss of shear strength of the soil. The most common occurrence of liquefaction is in loose soils, typically sands. The liquefaction FOS determination in the final rule is used to determine if a CCR unit would remain stable if the soils of the embankment of the CCR unit were to experience liquefaction. EPA relied primarily on one source to evaluate the appropriate methods to determine if a dam would remain stable under liquefaction conditions. This source was ''Soil Liquefaction during Earthquakes,'' Idriss and Boulanger, Earthquake Engineering Research Institute, 2008.[13] EPA also reviewed several technical resources regarding soil liquefaction, including ''Ground Motions and Soil Liquefaction During Earthquakes,'' Seed and Idriss, 1982,[14] ''Liquefaction Resistance of Soils: Summary report from the 1996 and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils,'' Youd and Idriss, 2001,[15] and *Seismic Design Guidance for Municipal Solid Waste Landfill Facilities,* US EPA, Office of Research and Development, 1995.[16] These documents are viewed as generally accepted guidance on how to conduct liquefaction potential analyses and residual strength analyses under post-liquefaction conditions.

As noted earlier, in performing the assessments, EPA assessed the liquefaction potential of soils that compose the embankments of the CCR unit to determine if the soils present in the embankment were of the soil classification and configuration that was susceptible to liquefaction. This determination was based on evidence available through interviews with facility personnel, construction documentation, or representative soil sampling, such as information provided by corings and borings. Identical to the requirements for seismic factor of safety calculation, EPA selected a return period for a seismic event for analysis of liquefaction potential, under a seismic loading which may induce liquefaction in embankments, of a 2% probability of exceedance in 50 years. The discussion of the selection of this return period can be found in the ''Seismic Factor of Safety'' section above.

The Agency assessed CCR impoundments and classified them as having stability under liquefaction conditions if representative soil sampling, anecdotal evidence from interviews with facility personnel, or construction documentation indicated that there was no susceptibility to liquefaction of the embankment soils or if modeling or analysis in critical failure planes in the embankment expected to be susceptible to liquefaction were calculated to have a FOS greater than 1.00 under post-liquefaction conditions. The Assessment Program found that most CCR surface impoundments did not contain soils in detrimental volumes or configurations in the embankment that would indicate susceptibility to liquefaction. However, the assessment effort found that in embankments with a presence of soils susceptible to liquefaction, most CCR surface impoundments did not meet the required liquefaction FOS.

The Assessment Program found that many CCR surface impoundments had not undergone liquefaction potential analyses or post-liquefaction residual strength analyses in those instances in which liquefaction potential was identified (*i.e.,* soils subject to liquefaction were present). The assessments gave impoundments a condition rating of ''poor'' if there was no information available to characterize the soils of the embankment, and a condition rating of ''poor'' or ''fair'' if post-liquefaction residual strength analysis of soils previously identified as being susceptible to liquefaction had not been available, with the rating dependent on the determined severity of the liquefaction potential in the embankment. Impoundments with calculated liquefaction factors of safety which did not meet or exceed 1.00 were given a condition rating of ''poor.''

As the Assessment Program advanced, many utilities independently conducted new or updated liquefaction potential analyses or residual strength analyses of CCR surface impoundments in anticipation of their facilities being assessed. By the end of the program, virtually all facilities had conducted or were in the process of conducting liquefaction potential analyses or residual strength analyses. While some utilities noted concern over the costs of

[13] *https://www.eeri.org/products-page/monographs/soil-liquefaction-during-earthquakes-3/.*

[14] Seed, H. B., and Idriss, I. M., 1982, ''Ground Motions and Soil Liquefaction During Earthquakes,'' Monograph No. 5, Earthquake Engineering Research Institute, Berkeley, California, pp. 134.

[15] Youd, T. L., Idriss, I. M., 2001, ''Liquefaction Resistance of Soils: Summary report from the 1996 and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils.'' Journal of Geotechnical and Geoenvironmental Engineering, ASCE.

[16] United States EPA, Office of Research and Development, 1995, EPA/600/R–95/051, RCRA Subtitle D (258) Seismic Design Guidance for Municipal Solid Waste Landfill Facilities. Available as of the Writing of this policy at *www.epa.gov/clhtml/pubtitle.html* on the U.S. EPA Web site.

conducting additional liquefaction potential or residual strength studies, none found that completing these studies presented any significant engineering challenges.

Based on its experience in the Assessment Program and subsequent review of numerous technical resources, EPA determined that a post-liquefaction residual strength factor of safety in the embankment of 1.00 is not sufficient. Liquefaction potential analysis and post-liquefaction residual strength analysis involves a larger degree of uncertainties, *e.g.,* liquefiable stratum configuration, in assumptions and analysis which must be accounted for with a factor of safety above 1.00. The final rule therefore requires CCR surface impoundments which are constructed of soils determined to be susceptible to liquefaction to meet or exceed a liquefaction factor of safety of 1.20. EPA has determined that 1.20 is an appropriate liquefaction factor of safety based on several technical guidances and memos, including *Federal Guidelines for Dam Safety: Earthquake Analyses and Design of Dams,* Document 65, FEMA May 2005, which states that ''post-liquefaction factors of safety are generally required to be a minimum of 1.2 to 1.3.'' [17] [18] [19] [20] [21]

c. Impoundment Height and Relationship to Regulatory Requirements

During the Assessment Program, the Agency reviewed the stability issues related to various heights of impoundments. The Assessment Program concluded that impoundments with heights less than five feet or those retaining less than 20 acre feet were unlikely to cause significant environmental or economic loss should they undergo a catastrophic failure. The Agency's review of MSHA and FEMA guidance also noted that ''small'' units were unlikely to cause significant losses should they fail. Based on the Agency's experience and FEMA and MSHA's guidance, the Agency has concluded that there is a substantial benefit in having impoundments which exceed a specified size threshold, *i.e.,* height of five feet or more and capacity of 20 acre-feet or more or a height of 20 feet or more determine their static, seismic, and liquefaction FOS on a regular basis. The analyses and experience gained in conducting the Assessment Program indicates that a catastrophic failure of a CCR surface impoundment is unlikely to occur so long as the factors of safety are maintained or exceeded throughout the unit's operating life. This conclusion is also consistent with relevant guidance and regulations which do not require such evaluations for units below a certain size threshold.

d. Hazard Potential Ratings

Each impoundment assessed in the Assessment Program was given a Hazard Potential Classification rating of either *Less-than-Low, Low, Significant, and High.* Previous classifications were reviewed and amended as necessary to reflect guidance developed for the Assessment Program. The hazard potential ratings refer to the potential for loss of life or damage if there is a dam failure. The ratings do not refer to the condition or structural stability of the dam. Four hazard potential classifications were used in assessing the impoundments in the Assessment Program:

High Hazard Potential—Dams assigned the high hazard potential classification are those where failure or mis-operation will probably cause loss of human life.

Significant Hazard Potential—Dams assigned the significant hazard potential classification are those dams 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. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas, but could be located in areas with population and significant infrastructure.

Low Hazard Potential—Dams assigned the low hazard potential classification are those 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 owner's property.

Less Than Low Hazard Potential—Dams which do not pose high, significant, or low hazard potential.

There is a substantial benefit in having owners or operators of all CCR impoundments determine the hazard potential classification of their units. The Assessment Program found that many CCR surface impoundments had not been given a hazard potential classification and consequently, their potential threat to human health and the environment if a failure were to occur was not clearly identified, nor had response plans been developed to respond to any catastrophic failure. Moreover, these classifications should be updated over time, particularly to account for changes such as population growth, construction of key infrastructure, or changes to the impoundment's size or operation. The Assessment Program also found that some states do not classify CCR impoundments as ''dams'' and therefore those units may not be required to determine their hazard potential classification or otherwise evaluate the potential effects of a catastrophic failure. Consistent with the guidance from ASDSO, FEMA, and the state of New Jersey, this rule requires that all diked CCR impoundments determine their hazard potential classification according to the definitions set out in this regulation. For those units with a hazard potential classification of significant or high, the owner or operator of such impoundments is also required to develop an Emergency Action Plan to address the higher potential impacts of a potential failure.

e. Condition Ratings

While the rule does require facilities to evaluate the same engineering factors that went into developing these ratings, the rule does not require that each impoundment be given a condition rating. After evaluation of the use of these ratings, the Agency determined that the rating may have relied too heavily on subjective factors. For that reason, this rule requires that the qualified professional engineer certify, based on quantitative determinations, that an impoundment meets the requirements for FOS and hydraulic and hydrologic capacity. This approach is less subjective and allows the professional engineer to make quantifiable certifications.

IV. Bevill Regulatory Determination Relating to CCR From Electric Utilities and Independent Power Producers

As discussed in the preceding sections, in the proposed rule EPA reopened its August 1993 and May 2000 Regulatory Determinations regarding CCR generated at electric utilities and independent power producers, to re-evaluate whether regulation of CCR under RCRA subtitle C is necessary in light of subsequent information. EPA explained that this was based on several

[17] US Bureau of Reclamation (USBR), ''Water Operation and Maintenance Bulletin No. 222,'' Denver, Colorado, December 2007.

[18] *http://www.oregon.gov/odot/hwy/bridge/docs/bddm/pdfs/psha.pdf.*

[19] Canadian Dam Association. Canadian Dam Safety Guidelines, 2007, 88 pp.

[20] Sonmez, H., 2003. Modification of the liquefaction potential index and liquefaction susceptibility mapping for a liquefaction-prone area (Inegol, Turkey), Env. Geology, (44): 862–871.

[21] Seed, R.B., Cetin, O.K., Moss, R.E.S., Kammerer, A.M., Wu, J., Pestana, J.M., Riemer, M.F., Sancio, R.B., Bray, J.D., Kayen, R.E., Faris, A., 2003. Recent advances in soil liquefaction engineering: a unified and consistent framework, 26th annual ASCE L.A. Geot. Spring Sem., Long Beach, California, April 30, 71 pp.

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relatively recent developments, such as a newly completed quantitative risk assessment that concluded that the disposal of CCR in unlined waste management units posed substantial risks, with upper end risk estimates ranging from 10^{-2}–10^{-4}. Citing to the recent structural failures of surface impoundments, the proposed rule also noted that these wastes have caused greater damage to human health and the environment than EPA originally estimated. Finally, EPA explained that recently collected information regarding the existing state regulatory programs had called into question whether those programs, in the absence of national minimum standards specific to these wastes, had sufficiently improved to address the gaps originally identified in the May 2000 Regulatory Determination. EPA ultimately concluded that federal regulation of this material was necessary, but did not reach any conclusion as to whether regulation under subtitle D would be sufficient or whether regulation under subtitle C would be necessary to adequately address the risks.

Of the over 450,000 comments received on the proposed rule, the vast majority focused on whether the Bevill exemption should be retained, and the corresponding question of whether CCR regulations should be established under RCRA subtitle C or subtitle D. In terms of the sheer numbers, the majority of commenters supported a decision to revoke the Bevill exemption and to regulate CCR under a subtitle C rule. These commenters, largely individual members of the public and environmental groups, generally argued that the Bevill exemption should be revoked because state programs have failed to adequately regulate the disposal of CCR and because the risks associated with the management of these wastes are significant. In support of both points, these commenters pointed to the fact that the number of damage cases that have been discovered has increased substantially since the original 2000 Regulatory Determination, and have continued to grow since publication of the proposed rule in 2010.

By contrast, state organizations, individual states, and industry groups (electric utilities, recycling firms, trade associations), largely favored a subtitle D rule. Overall, these commenters raised concern about the costs of the subtitle C regime, arguing that the subtitle C requirements were more stringent than necessary to address the risks from CCR disposal. Commenters also raised concern that regulation of these wastes under subtitle C would negatively affect the beneficial use of these materials, arguing that the stigma associated with regulating the disposal of CCR as a hazardous waste would ''cripple'' the current beneficial reuse market. Many of these commenters also argued that EPA lacks the legal authority to regulate these wastes under subtitle C on a variety of grounds, including claims that EPA entirely lacks the authority to revisit its Bevill Regulatory Determination, and that EPA had failed to comply with statutory procedures in doing so.

A. Deferral of a Final Decision on the Bevill Regulatory Determination for CCR Destined for Disposal

In determining whether the Bevill exemption should be retained for CCR, EPA must evaluate and weigh eight factors that were enumerated in section 8002(n) of RCRA. 42 U.S.C. 6921(b)(3)(C). The eight factors are: (1) The source and volumes of CCR generated per year; (2) present disposal and utilization practices; (3) potential danger, if any, to human health or the environment from the disposal and reuse of CCR; (4) documented cases in which danger to human health or the environment from surface run-off or leachate has been proved; (5) alternatives to current disposal methods; (6) the cost of such alternative disposal methods; (7) the impact of those alternatives on the use of coal and other natural resources; and (8) the current and potential utilization of CCR. 42 U.S.C. 6982(n).

EPA addressed each of these study factors in the 1988 and 1999 Reports to Congress, and in reaching our decisions in the August 1993 and the May 2000 Regulatory Determinations to maintain the Bevill exemption for CCR. 58 FR 42466 (August 9, 1993); 65 FR 32214 (May 22, 2000). Consequently, in considering whether to reverse these Regulatory Determinations for CCR destined for disposal, EPA reexamined the RCRA section 8002(n) study factors against all of the available data, which included both the data that formed the basis for the May 2000 Regulatory Determination and the most recent data available. (See 75 FR 35150–35156.)

As discussed at length in the proposed rule, three of these factors weighed the most heavily in the Agency's decision to reconsider its previous Regulatory Determinations. (See 75 FR 35133 and 35156–35158.) The first of these related to the extent of the risks posed by the current management of these wastes. Since the 2000 Regulatory Determination, EPA had completed a quantitative risk assessment that estimated significant risks to human health and the environment. EPA's 2010 CCR risk assessment estimated the cancer risk from arsenic that leaches into groundwater from CCR 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 CCR is co-disposed with coal refuse), groundwater interception and arsenic speciation, the 90th percentile risks from unlined surface impoundments ranged from 2×10^{-3} to 1×10^{-4}. The risks from clay lined surface impoundments ranged from 7×10^{-2} to 4×10^{-5}. Similarly, estimated risks from unlined landfills ranged from 5×10^{-4} to 3×10^{-6}, and from 2×10^{-4} to 5×10^{-9} for clay-lined landfills. EPA's risk assessment also estimated Hazard Quotients (HQs) [22] above 1 for other metals, including selenium and lead in unlined and clay-lined units. However, a number of technical questions were raised regarding this quantitative risk assessment that called into question the accuracy of these risk estimates.

A second and equally significant consideration related to how effectively state regulatory programs address the risks associated with the improper management of these wastes. The existing reports on state regulatory programs had called into question whether the trend in improving state regulatory regimes that EPA identified in May 2000 had materialized to the degree anticipated in the Regulatory Determination. EPA noted concern about the lack of substantial details regarding the full extent of state regulatory authority over the disposal of these materials, and the manner in which states have, in practice, implemented this oversight.

The final consideration, which is tightly related to the first two, was the recent information documenting continued instances involving the contamination of ground or surface water from the management of these wastes. Since the 2000 Regulatory Determination EPA had gathered or received information on 67 ''proven or potential'' cases involving damage to (*i.e.,* contamination of) ground and surface water, and to human health and the environment from improper management of CCR in landfills and surface impoundments. These also included cases involving the structural failure of surface impoundments and the catastrophic release of CCR.

[22] For more information on HQs please see Unit X. Risk Assessment of this preamble.

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For each of these key areas, EPA identified a number of issues on which the absence of critical information prevented the Agency from reaching an initial decision on whether to revise the Bevill Determination. Some of these issues or uncertainties have been resolved during the development of the final rule, either as a result of information received from commenters or through additional information and analyses EPA obtained or developed, which were held out for comment in subsequent NODAs. See 75 FR 35128 (October 21, 2010) and 78 FR 46940 (August 2, 2013). However, as discussed in more detail below, critical information necessary to make a final Regulatory Determination is still lacking in two of these three areas. This information bears directly on the extent and magnitude of the risks over the course of the next several years, and the degree to which those risks can be managed sufficiently under each of the two regulatory structures available to the Agency. In the absence of this information, EPA is unable to reach a conclusion on the issue that is central to a Bevill Determination: Whether the risks presented by management of CCR waste streams can only be adequately mitigated through regulation under RCRA subtitle C. As a consequence, EPA is deferring a final Regulatory Determination for these wastes.[23]

Nevertheless, the record is clear that current management of these wastes can present, and in many cases has presented, significant risks to human health and the environment. Although EPA cannot reach conclusions as to the full extent or magnitude of those risks over the long term, the current level of risk clearly warrants the issuance of federal standards to ensure consistent management practices and a national minimum level of safety.

In the following sections, EPA describes the information that was obtained over the course of the rulemaking relating to each area of concern, and the extent to which the new information addressed the issue.

1. Risks Posed by Current Management of CCR and Potential Danger to Human Health From the Disposal of CCR

In the proposed rule, EPA specifically noted that several uncertainties remained in the Agency's quantitative risk analysis of the current management of CCR. Chief among these uncertainties was the evolving character and composition of CCR due to electric utility upgrades and retrofits of multi-pollutant controls needed to comply with the emerging Clean Air Act (CAA) requirements, which could present new or otherwise unforeseen contaminant issues (*e.g.,* addition of calcium bromide to coal prior to combustion increasing mercury capture; use of selective catalytic reduction for post-NO_X controls forming hexavalent chromium). As EPA explained, changes to fly ash and other types of CCR is 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 (ACI) 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 these more advanced air pollution control technologies 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. Previous EPA studies of whether increased pollutant content would increase the risks correspondingly were inconclusive. For example, EPA evaluated the environmental fate of metals that are captured in CCR through use of enhanced air pollution controls, by characterizing the leaching behavior of 73 air pollution control residues, using the Leaching Environmental Assessment Framework (LEAF) methodology. Materials were tested over the pH conditions and liquid/solid ratios expected during management via land disposal or beneficial use. Leachate concentrations for most metals were highly variable over a range of coal type, facility configurations, and air pollution control residues. In addition, the data showed significantly different leaching behavior for similar residue types and facility configurations. Overall, the variability in leaching of the metals in the CCR was greater than the variability in totals concentrations by several orders of magnitude, suggesting that total pollutant content may not be predictive of leaching behavior, and consequently the risks.[24]

The Agency received no data from commenters that would aid in resolving this uncertainty. To try to establish some parameters around the uncertainty, EPA attempted to develop estimates of the extent to which this issue could meaningfully affect the risks.

As an initial step, EPA focused on mercury pollution controls, as mercury levels in these wastes was an issue of particular concern in the public comments. It has been established that mercury pollution controls can affect both the mercury content and the general leaching behavior of ash (US EPA 2006, 2008, 2009). Using the limited data available, EPA attempted to evaluate the extent to which mercury controlled wastes could ultimately affect the overall risk associated with disposal of CCR.

EPA conducted a sensitivity analysis that filtered the full 2014 risk assessment results for the subset of fly ash samples generated by facilities that have currently installed ACI systems. The samples were collected from five different facilities that were either installing or evaluating an ACI system for increasing mercury capture. At each facility, samples were collected both before and after the installation of an ACI system. Ultimately the results were inconclusive, likely because of the small sample size, and EPA can draw no conclusions about the exact effects of ACI systems on the risks from CCR disposal. Nevertheless, the analysis provided some useful information. Capturing and transferring pollutants from air emission to the fly ash and other air pollution control residues would normally be expected to increase the risks associated with disposal of these wastes. EPA's analyses, however, showed only a marginal difference in risks for ash generated with or without the use of an ACI system, and in some instances the risks decreased slightly with the addition of activated carbon. The significance of these results should not be overstated—the observed decreases were not consistent and were thought to be an artifact of the relatively small number of model iterations. It is also important to remember that these results provide no information about the potential effects from the installation of

[23] Because EPA is deferring its final Bevill Determination, EPA has not responded to comments that pertain exclusively to that issue. However EPA has responded to significant comments that relate to topics that are otherwise relevant to the final subtitle D regulation. For example, because EPA is relying on the damage cases to support certain aspects of the technical requirements, EPA has responded to comments relating to the accuracy of the facts involved in the damage cases. EPA has not, however, responded to many comments on state programs because the Agency has made no final conclusions on the adequacy of those programs and is not relying on state programs to support any of the final rule's provisions.

[24] Thorneloe, S, Kosson, D., Sanchez, F., Garrabrants, A.C., and Helms, G., Evaluating the Fate of Metals in Air Pollution Control Residues from Coal-Fired Power Plants, Environ. Sci. Technol. 2010, 44, 7351–7356.

FGD systems for SO_2 control, or SCR systems for NO_X control, any of which could also significantly affect the characteristics of the wastes. But these results also suggest that EPA should be cautious about assuming that the risks will necessarily increase as a result of the imposition of additional air pollution controls.

Other uncertainties in the risk assessment developed for the proposal related to the extent to which some sampled data with high concentrations of constituents used in the risk assessment accurately reflect coal ash leaching from landfills or surface impoundments. For example, as explained in the proposed rule, 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. EPA also noted that much of the pore water samples and leachate data were several years old, and questions had been raised whether these data accurately reflected current management practices. Finally, EPA noted that recent research indicated that traditional leach procedures (*e.g.,* Toxicity Characteristic Leaching Procedure (TCLP) and Synthetic Precipitation Leaching Procedure (SPLP)) may underestimate the actual leach rates of toxic constituents from CCR under different field conditions.

First, regarding the question of appropriate pH conditions in CCR units, and the resulting leachate concentrations in impoundments where coal refuse was placed, EPA obtained data during the development of this rule directly relevant to this issue. A survey conducted by the Electric Power Research Institute (EPRI) in 1995 had shown that 34 percent of unlined landfills and 68 percent of unlined surface impoundments actively managed CCR with coal refuse. However, more recent data collected by EPA as part of the Clean Water Act ELG rulemaking in 2009–2010 indicates that this management practice has declined significantly to approximately five percent of current units.

EPA also obtained sufficient data to resolve concerns about the accuracy of the concentrations in pore water and leachate used in the risk assessment. EPA received a substantial amount of data on CCR chemical constituents from commenters, which included total concentrations, pore water, and leaching test results for various types of CCR, *i.e.,* bottom ash, FGD gypsum, FGD sludge, fly ash cenospheres, boiler slag, and combined waste streams. This included data from several EPRI reports, which provided field leachate results for bottom ash, fly ash, and FGD solids from a number of landfills and surface impoundments. EPA also received leachate data from the Alaska Department of Environmental Conservation, the Michigan Department of Natural Resources and Environment (MI DNRE), and from the Maryland Department of the Environment on total metals, TCLP, and SPLP results for bottom ash and fly ash. Included among these data were TCLP results for 102 CCR samples and 12 FGD gypsum samples, and two landfill leachate samples, as well as several laboratory reports on CCR leachate from 2008 through 2010. EPA also received several reports from the University of North Dakota Energy & Environmental Research Center, with leaching test results for 58 fly ash, five FGD, and four FGD gypsum samples using various leaching methods other than TCLP, and TCLP mercury results for 15 fly ash samples, as well as leaching test results for five fly ash and two bottom ash samples using 18-hr, 30-day, and 60-day leach methods, plus bulk and trace element data for five fly ash samples, two bottom ash samples, and one slag sample. (See 76 FR 63252, October 12, 2011.)

In addition to the data submitted by commenters, EPA's Office of Research and Development (ORD), in collaboration with Vanderbilt University (VU), developed additional CCR leaching data using a revised methodology, the Leaching Environmental Assessment Framework, or LEAF, consisting of four methods that evaluate leaching potential for various waste forms at different plausible pH values and liquid-solid ratios, in order to more accurately simulate leaching potential over a variety of field conditions. The LEAF methods went through validation working with 20 different laboratories, different waste matrices, and documented in two EPA reports finding good agreement between the labs for the four methods.[25] In addition, EPA compiled decades of data for ten different case studies to compare field and laboratory leach data.[26] These data also showed LEAF methods to be a good predictor of field leachate behavior using geochemical speciation modeling for factors such as oxidation that are difficult to account for in the lab. When considered along with the methods validation, the field-to-lab leachate data comparison provides additional confidence that LEAF methods can more accurately predict environmental release over a range of materials, waste form, pH, liquid-solid ratio, and other parameters influencing leaching behavior such as calcium depletion for a material.

In updating the risk assessment for the final rule, EPA relied on surface impoundment pore water data and impoundment wastewater data, including the data submitted by commenters. For landfills, EPA only used LEAF data to characterize the leachate for the range of materials resulting from various air pollution control technologies. The CCR data documented in three EPA reports [27] and summarized in Thorneloe et al, 2010 [28]

[25] Garrabrants A.C., D.S. Kosson, H.A. van der Sloot, F. Sanchez and O. Hjelmar (2010) Background information for the Leaching Environmental Assessment Framework (LEAF) Test Methods, EPA–600/R–10/170, U.S. Environmental Protection Agency, Air Pollution Prevention and Control Division, December 2010.

Garrabrants A.C., D.S. Kosson, L. Stefanski, R. DeLapp, P.F.A.B. Seignette, H.A. van der Sloot, P. Kariher and M. Baldwin (2012a) Interlaboratory Validation of the Leaching Environmental Assessment Framework (LEAF) Method 1313 and Method 1316, EPA/600/R–12/623, U.S. Environmental Protection Agency, Air Pollution Prevention and Control Division, September 2012.

Garrabrants A.C., D.S. Kosson, R. DeLapp, P. Kariher, P.F.A.B. Seignette, H.A. van der Sloot, L. Stefanski and M. Baldwin (2012b) Interlaboratory Validation of the Leaching Environmental Assessment Framework (LEAF) Method 1314 and Method 1315, EPA–600/R–12/624, U.S. Environmental Protection Agency, Air Pollution Prevention and Control Division, September 2012.

[26] Kosson D.S., van der Sloot, H.A., Seignette, P.F.A.B. 2014. Leaching Test Relationships, Laboratory-to-Field Comparisons and Recommendations for Leaching Evaluation using the Leaching Environmental Assessment Framework (LEAF), EPA–600/R–14/061. EPA Office of Research and Development, National Risk Management Research Laboratory, Research Triangle Park, NC, 27711. December.

[27] Sanchez F., R. Keeney, D.S. Kosson and R. DeLapp (2006) Characterization of Mercury-Enriched Coal Combustion Residues from Electric Utilities using Enhanced Sorbents for Mercury Control, EPA–600/R–06/008, U.S. Environmental Protection Agency, Air Pollution Prevention and Control Division, February 2006.

Sanchez F., D.S. Kosson, R. Keeney, R. DeLapp, L. Turner and P. Kariher (2008) Characterization of Coal Combustion Residues from Electric Utilities using Wet Scrubbers for Multi-pollutant Control, EPA–600/R–08/077, U.S. Environmental Protection Agency, Air Pollution Prevention and Control Division, July 2008.

Kosson D.S., F. Sanchez, P. Kariher, L.H. Turner, R. DeLapp, and P. Seignette (2009) Characterization of Coal Combustion Residues from Electric Utilities—Leaching and Characterization Data, EPA–600/R–09/151, U.S. Environmental Protection Agency, Air Pollution Prevention and Control Division, December 2009.

[28] Thorneloe S.A., D.S. Kosson, F. Sanchez, A.C. Garrabrants and G. Helms (2010) ''Evaluating the fate of metals in air pollution control residues from coal-fired power plants,'' *Environmental Science and Technology,* 44, 7351–7356.

provides a robust characterization of air pollution control residues from coal-fired power plants and indicates that leaching rates can vary by several orders of magnitude, depending on pH levels and the amount of liquid that comes into contact with the CCR solids (*i.e.,* the liquid to solid ratio).

The 2014 risk assessment incorporates these new data, and accounts for both the pH of the waste in field conditions, as well as the liquid-to-solid ratio of the leachate and CCR, which effectively addresses the concerns raised in the proposed rule that TCLP and SPLP methods could underestimate leachate concentrations.

A further area of uncertainty related to one of the primary inputs into the risk assessment. As noted in the proposed rule, the Agency's risk estimates were based on the existing cancer slope factor of 1.5 $mg/kg/d^{-1}$ for arsenic in EPA's Integrated Risk Information System (IRIS). However, EPA noted that was in the process of revaluating the arsenic cancer slope factor in light of recent recommendations from the National Research Council (NRC) of the National Academy of Sciences (NAS) in ''Critical Aspects Arsenic in Drinking Water, 2001 Update.'' In the proposal, EPA estimated that using this NRC data analysis would increase the individual risk estimates by approximately 17 times.

EPA is currently evaluating the arsenic cancer slope factor in light of more recent NRC recommendations, regarding the approach and the science for estimating cancer and non-cancer risk in ''Critical Aspects of EPA's IRIS Assessment of Inorganic Arsenic, (NRC 2013).'' EPA is in the process of implementing these recommendations, but to date has been unable to finalize its IRIS reassessment. Nor did EPA receive any other information during the development of this final rule that would help to resolve this uncertainty.

A final source of uncertainty in the risk assessment developed for the proposed rule related to the potential impact from the interception of contaminated groundwater plumes by surface water bodies that exist between a waste management unit and a down-gradient drinking water well. It is common for coal-fired utilities to be located near water bodies, which are used as a source of cooling water and waste conveyancing. Releases from surface impoundments located in close proximity to water bodies can be intercepted, which can significantly affect the contaminants that reach 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.

Over the course of the rulemaking, EPA was able to obtain sufficient data to model the impact from interception of contamination by surface water bodies. The risk assessment developed for the final rule accounts for the interception of the groundwater contamination plume by surface water bodies, and the resulting decrease in constituent mass to downstream drinking water sources. As a consequence of this modeling, the median risks for surface impoundments and landfills were substantially lower than both the high-end and median risks modeled in the 2010 risk assessment, *i.e.,* by approximately an order of magnitude.

2. Adequacy of Existing State Regulatory Oversight

The assessment of state regulatory programs in the proposed rule was based largely on two reports: A joint U.S. Department of Energy (DOE) and EPA study completed in 2006, ''Coal Combustion Waste Management at Landfills and Surface Impoundments, 1994–2004,'' and a 2009 survey conducted by the Association of State and Territorial Solid Waste Management Officials (ASTSWMO). EPA's preliminary conclusion was that while states seem to be regulating landfills to a greater extent than in 2000, significant gaps in state programs appeared to remain, particularly with respect to the oversight of surface impoundments.

In reaching this conclusion EPA noted the following findings from the DOE/EPA study: only 19 percent (three out of 19) of the surveyed surface impoundment permits included requirements addressing groundwater protection standards (*i.e.,* contaminant concentrations that cannot be exceeded) or closure/post-closure care, and only 12 percent (two 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 CCR generated was potentially exempt from all state solid waste permitting requirements (EPA/DOE Report at pp 45–46). For example, at the time of the report, Alabama did not regulate CCR disposal under any state waste authority and nor had a dam safety program. Texas (the largest coal ash producer) did not require permits for waste managed on-site, which is defined as waste managed at any site owned by the generator, up to 50 miles away from the generating facility. Finally, the report found that a number of states only regulated surface impoundments under CWA authorities, and consequently primarily addressed the risks from effluent discharges to navigable waters, but did not require liners or groundwater monitoring.

The more recent 2009 ASTSWMO survey reached similar conclusions. With respect to liner requirements, 36 percent of surveyed states did not have minimum liner requirements for CCR landfills, while 67 percent did not have CCR liner requirements for surface impoundments. Similarly, 19 percent of states surveyed did not have minimum groundwater monitoring requirements for landfills and 61percent did not have groundwater monitoring requirements for surface impoundments. The 2009 ASTSWMO survey also indicated that only 36 percent of states regulated the structural stability of surface impoundments.

In the proposal, EPA identified several issues that complicated its preliminary assessment and prevented the Agency from reaching overall conclusions as to the adequacy of state regulatory programs. First, EPA raised concern about the absence of any real details in the two reports regarding how states, in practice, oversee the disposal or other solid waste management of CCR. For example, even though the disposal units might not be regulated under the state solid waste provisions, some states may use performance based standards or implement requirements to control CCR landfills and surface impoundments under other state programs. Second, EPA noted that most of the more recent data primarily focused on the requirements applicable to new management units, which only represented approximately 10 percent of currently operating units. EPA had little, if any, information that described the extent to which states and utilities had implemented requirements, such as groundwater monitoring, on the many existing landfills and surface impoundments that receive CCR. Moreover, the information in the record for the proposal with respect to these older units was fifteen years old. EPA assumed it to be unlikely that states would have required existing units to install liners, but suggested states may have been more likely to have imposed groundwater monitoring for such units over the last 15 years.

EPA also identified several issues that would be relevant to the Agency's evaluation of the overall adequacy of state regulatory programs. Specifically, EPA explained that it would 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 CCR; (6) whether financial responsibility requirements are in place for the management of CCR; (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.

EPA received a substantial amount of information on state programs from commenters. Extensive comments were submitted by a coalition of environmental groups, outlining the alleged gaps in state regulatory programs applicable to the management of CCR. These comments contained a comprehensive analysis of 37 state programs based on the findings of the DOE/EPA 2006 report as well as on an independent compilation of state program requirements. According to these commenters' analysis, only four states (representing approximately four percent of the CCR generated in the U.S. in 2005) required groundwater monitoring in all new and existing landfills, and only six states (representing approximately 19 percent of the CCR generated in 2005) required groundwater monitoring in all new and existing surface impoundments; only five states (representing approximately seven percent of the CCR generated in 2005) required composite liners for all new landfills; and only four states (representing approximately 19 percent of the CCR generated) required composite liners for all new surface impoundments. The commenters' analysis discounted any state law that included any provision that granted permit writers discretion to modify the requirement on a case-by-case basis, and/or to grant waivers and exemptions based on the waste's toxicity, onsite location, and management practice.

EPA also received comments from ASTSWMO, the Environmental Council of the States (ECOS), and 36 individual states. In its comments, ASTSWMO submitted a report with revisions of the aggregated statistics in its 2009 report, which they claim demonstrated that state CCR programs were more robust than described in the proposed rule. These commenters generally agreed with EPA's conclusion that state requirements for key CCR requirements are typically more robust for landfills than for surface impoundments. ASTSWMO's comments included the following examples: 71 percent of the surveyed states required a liner for landfills, compared to 65 percent that required that surface impoundments be lined; 87 percent of surveyed states required groundwater monitoring at landfills, compared to 67 percent of states that required groundwater monitoring at surface impoundments; and while 83 percent of surveyed states required structural stability monitoring at landfills, only 64 percent of surveyed states required it at surface impoundments. The sole exception related to permit requirements, where the report claimed that 91 percent of the surveyed states required a permit of some type for surface impoundments, as compared to 86 percent of states that required a permit for landfills. In addition, ASTSWMO claimed that all 42 surveyed states had the authority to require remediation. The report also alleged that in 43 of 44 states, states had the authority to require surface impoundments to implement repair and maintenance efforts during operation. ASTSWMO also claimed that 43 out of 44 states required that steps be taken to protect human health and the environment, and that 41 of 43 states also had authority to require closure.

According to this revised survey, state requirements also vary with respect to whether they applied to all waste units, or only to new units or lateral expansions. ASTSWMO stated that in 34 percent of the surveyed states, liner requirements applied equally to new and existing landfills, and to both existing and new surface impoundments in 46 percent of the surveyed states. Similarly, ASTSWMO stated that groundwater monitoring was required for both existing and new landfills in 82 percent of the surveyed states, and to both existing and new surface impoundments in 74 percent of the surveyed states.

Nineteen states and state organizations also directly responded to the environmental groups' report by submitting comments on their programs, although only four of these states were among the leading CCR generators: Kentucky, North Dakota, Ohio, and Michigan. These states identified specific instances where the assertions made by the environmental groups were factually incorrect or omitted relevant information. In response to both the proposed rule and the NODA (76 FR 63252, October 12, 2011) most states provided only summaries of their regulatory programs rather than detailed descriptions.

As EPA explained in the proposed rule, there are significant limitations to the kind of aggregated survey statistics presented in ASTSWMO's comments. Such statistics fail to provide the information necessary to meaningfully address the question of how, in practice, state programs regulate the relevant risks presented by the management or disposal of CCR, which was the issue that EPA explained was necessary to resolve. For example, even assuming that 91 percent of the surveyed states actually do require a permit of some type for surface impoundments, this provides no information on the nature or extent of the specific requirements in the permit. As noted in the proposal, most CCR surface impoundments are regulated under a NPDES permit, and while the risks from effluent discharges to navigable waters are addressed, these units are not subject to the provisions designed to protect groundwater, such as liners or groundwater monitoring. Nor does it address the extent of the requirement; for example, although Texas generally requires landfills to be permitted and to monitor groundwater, the majority of CCR units are exempt from these requirements because all industrial wastes managed on-site (*i.e.,* any site owned by the generator, up to 50-miles away from the generator's facility) are exempt. Finally, since the ASTSWMO survey does not identify the individual surveyed states but merely presents aggregated statistics, this information cannot be correlated with the amount of CCR generated, which significantly limits its value; for example, information demonstrating the strength of the regulatory program in a state responsible for two percent of the net CCR generated nationally is less significant than similar information on a state responsible for 25 percent of the net CCR generated.

In addition to the information provided by commenters, EPA independently reviewed state statutes and regulations, with a more detailed focus on the 16 states responsible for approximately 74 percent of the CCR generated in 2009. It is clear from this review, as well as from information submitted by the commenters, that the degree of state regulatory oversight of these wastes and the overall protectiveness of the particular state programs varies widely.

Overall, the information from commenters and from EPA's own review of state programs generally confirms EPA's original conclusion that significant gaps remain in many state programs. Some programs provide minimal or no regulatory oversight of CCR units. For example, Arizona, New Mexico, and Utah have no regulations applicable to CCR units or entirely exempt CCR from state regulations governing solid waste. Similarly, Mississippi, Montana, and Texas (the largest coal-ash producer) exempt the on-site disposal of CCR (as ''non-hazardous industrial solid waste'') from some or all key requirements, such as permits or groundwater monitoring.[29] Such exemptions would cover most of the disposal of CCR within the state, as the majority of utilities dispose of their CCR on-site. Other states, such as Florida, Indiana, Ohio and Pennsylvania, exempt CCR landfills or ''monofills'' from many requirements. For example, Indiana regulations consider surface impoundments that are dredged at least annually to be ''storage units'' that are exempt from solid waste regulations, including from corrective action requirements. Many of these states are among the leading generators of CCR wastes. In total, EPA estimates that approximately 20 percent of the net disposable CCR is entirely exempt from state regulatory oversight.

State programs that entirely exempt CCR management from regulatory oversight, however, are the exception. Most states do regulate the management of CCR to varying degrees, although the particular requirements can vary significantly. Still, some general conclusions can be drawn.

Most CCR surface impoundments are permitted exclusively under NPDES or other surface water pollution prevention programs. In these states, requirements to protect groundwater, such as liners or groundwater monitoring systems, are frequently less robust than the corresponding requirements applicable to CCR landfills.

Many state programs require that new disposal units be lined and groundwater monitoring systems installed, although many exempt existing waste units from the liner and groundwater monitoring requirements. Consequently, for newer units, the facts are less alarming: 89 percent of the 114 CCR surface impoundments constructed between 1994 and 2010 have liners, and 70 percent have composite liners. Similarly, 37 of 45 CCR surface impoundments EPA surveyed had installed groundwater monitoring systems. By contrast, 79 percent of the landfills constructed during this timeframe had installed liners, but only 58 percent were composite-lined. However the majority of the older (pre-1994) waste units still lack liners; 63 percent of older landfills have no liners and 63 percent and 24 percent of older surface impoundments have either no liners or clay liners, respectively.

Information on the extent of groundwater monitoring at older units was either unavailable, or was too unreliable to support any conclusions as to the overall number or percentage of older units with groundwater monitoring systems in most states. ASTSWMO's comments in response to the October 2011 NODA identified eight states[30] that required groundwater monitoring at existing facilities, but only a few of these states addressed this issue in their comments. EPA has some anecdotal evidence on the status of groundwater monitoring in six states, including four states that are among the leading CCR generators. In the wake of the Kingston TVA spill, groundwater monitoring wells were installed at 12 of Illinois's existing surface impoundments, almost doubling the number of monitored surface impoundments in the state. However, 55 additional surface impoundments, both active and inactive, still lack groundwater monitoring systems. In Ohio, 44 CCR units, out of a total of 57 CCR units in the state (42 surface impoundments and 15 landfills) still lack groundwater monitoring, even though all of the surface impoundments were permitted decades ago under Ohio's NPDES program. Ohio acknowledged in their comments that the extent of groundwater risks in the state is poorly documented, as 40 out of 44 unlined CCR units do not have a groundwater monitoring system. In sum, the available information is limited, but at least some of that information indicates that significant gaps remain with respect to the implementation of groundwater monitoring requirements under some state regulatory programs.

Of the states that require groundwater monitoring, most appear to require monitoring wells to be placed around the waste unit boundary, although the distance from the unit boundary varies from 50 feet to 150 meters. However, some state programs also authorize a buffer zone or a ''zone of discharge,'' which allows the facility to defer remediation of groundwater contamination for some period of time, usually until the contaminant plume has migrated to the facility site boundary. Florida, Illinois, North Dakota, and Tennessee are among that states with such a regulatory provision. For example, under Florida regulations, primary and secondary maximum contaminant levels (MCLs) do not apply even beyond the ''zone of discharge,'' absent a specific order by state regulatory authorities.

Most state programs allow the state regulatory authority to grant variances or exemptions for some or all of the requirements based on site-specific factors. For example, all of the following states require groundwater monitoring at CCR surface impoundments, but also authorize the regulatory authority to exempt or waive those requirements: Alabama, Florida, Georgia, Illinois, Indiana, Kentucky, North Carolina, North Dakota, Pennsylvania, and West Virginia. Contrary to the analysis presented by the environmental groups' comments, the mere fact that state law grants a permit authority the discretion to tailor requirements to account for a facility's site specific conditions does not support a conclusion that the regulatory program is necessarily inadequate. In fact, EPA noted in the proposal that one of the strengths of the subtitle C program was that, as a result of the permit process, requirements could be tailored to account for site specific conditions. Nor does the existence of a waiver process provide any evidence of actual practices; in their comments, a few states acknowledged that state law allowed for variances, but asserted that none had been requested.

To complicate matters further, several states explained that while state law does not mandate certain requirements, state regulatory authorities have, in practice, begun to require them in more recent permits. For example, several states, including Ohio, Texas, Michigan, Florida, and Kentucky, noted that recent practice was to require older disposal units to retrofit or close where they failed to meet relevant standards. Similarly, it appears that in the 16 leading CCR-generating states, 94 percent of new landfills have installed liners (either composite or clay), although only 19 percent of these state programs actually mandate CCR landfills to install a liner. And although only six percent of these state programs require installation of a liner in a new surface impoundment, 75 percent of

[29] See 30 TX ADC 335.2(d);

[30] Georgia, Illinois, Indiana, Iowa, Montana, Ohio, Pennsylvania, and South Carolina.

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new CCR surface impoundments in these states are lined.

All of this information suggests that, at least in some cases, the concerns raised in the proposal regarding the protectiveness of state programs remain warranted. But it also is clear it would be impossible to accurately evaluate whether, in practice, state programs are protective without reviewing individual permit decisions and permit requirements. Such an evaluation would necessarily involve not only a review of the specific permit requirements, but also the site conditions and other factual bases supporting the decision to impose the particular requirements. Unfortunately, this information was not provided by commenters or found in any source currently available to the Agency.

3. Documented Cases in Which Danger to Human Health or the Environment From Surface Run-off or Leachate Has Been Proved

In the proposed rule, EPA described the information it had compiled on specific cases where CCR mismanagement had caused harm to human health or the environment since the 2000 Regulatory Determination. Specifically, EPA explained that it had 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 the unit was lined. EPA also identified 40 potential damage cases to groundwater and surface water. The Agency noted that these numbers likely underestimated the number of damage cases and its expectation 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. EPA also noted its concern that several of the new damage cases involved activities that differ from prior damage cases, including the catastrophic release of waste due to the structural failure of CCR surface impoundments, such as the dam failures that occurred in Martins Creek, Pennsylvania and Kingston, Tennessee, as well as the large-scale placement, akin to disposal, of CCR, under the guise of ''beneficial use.''

EPA noted as well that it had received new reports from industry and environmental and citizen groups regarding damage cases. Industry provided information to demonstrate that many of EPA's listed proven damage cases did not meet EPA's criteria for a damage case to be considered ''a proven damage case,'' that had been developed for purposes of the Bevill Regulatory Determinations. Environmental and citizen groups, on the other hand, had submitted reports alleging the existence of more recent damage cases beyond those EPA had previously documented.

EPA raised questions concerning the following areas associated with the damage cases; first, whether the damage cases discovered to date accurately reflected the true number of damage cases associated with the mismanagement of CCR. Second, EPA highlighted concern regarding the accuracy of the available information on damage cases, as in certain instances, much of the information was largely anecdotal. EPA therefore specifically solicited comments from state regulatory authorities and the facilities involved with the incidents, in the hope of obtaining direct evidence of the facts in each case and to obtain a better understanding of the nature of the damage caused by past and current management practices. For the same reason, on October 12, 2011, EPA published a NODA, soliciting comment on the extensive reports received during the original comment period on the proposed rule. (See 76 FR 63252.)

As discussed in more detail in Unit XI of this document, EPA received a significant number of comments on this topic, both during the original comment period on the proposal, and in response to the NODA. EPA received information on additional damage cases from a number of citizen groups, including the report from Environmental Integrity Project and Earthjustice titled, ''Out of Control: Mounting Damages From Coal Ash Waste Sites,'' which presented information on 31 alleged CCR damage cases that were not included or were not recognized as damage cases in EPA's July 2007 report. EPA also received an August 26, 2010 report by the Environmental Integrity Project, Earthjustice, and the Sierra Club titled ''In Harm's Way: Lack of Federal Coal Ash Regulations Endangers Americans and Their Environment,'' which presented an additional 39 alleged CCR damage cases.[31] EPA also received information on ten additional damage cases from state officials in Michigan and Wisconsin.

EPRI submitted two draft reports titled ''Evaluation of Coal Combustion Product Damage Cases: Volume 1: Data Summary and Conclusions'' (finalized in July 2010), and ''Evaluation of Coal Combustion Product Damage Cases: Volume 2: Case Summaries'' (finalized in September 2010). In these reports, EPRI provided information that, they claimed, showed that many of EPA's previously identified ''proven'' damage cases did not meet EPA's criteria for a damage case to be considered ''proven.'' In response to the 2010 NODA, USWAG submitted a report that reviewed the 70 additional damage cases submitted by citizen groups as part of their comments on the proposed rule. These reports focused primarily on the degree to which the contamination had been contained ''on-site'' or had migrated off-site of the facility.

In Unit XI of this document, EPA discusses at length all of the comments received and its subsequent analysis of the information obtained throughout the rulemaking. In sum, after analyzing all of the information submitted in response to this rulemaking, EPA has confirmed a total of 157 cases, both proven and potential, in which CCR mismanagement has caused damage to human health and the environment. Although EPA expects that additional damage cases will be discovered in response to the installation of the groundwater monitoring systems required by the final rule, overall EPA has a significantly better understanding of the extent and nature of the damage caused by CCR mismanagement than when the proposed rule was issued. EPA has sufficient confidence in the veracity of the information collected to rely on it in making decisions in this rule.

4. Conclusions

EPA explained in the proposed rule that the decision on whether to retain the Bevill exemption is inherently discretionary, in that it ultimately requires the Agency to make a policy judgment as to the appropriate balance among the eight statutory factors. Chief among the several principles that EPA stated would guide its decision was that any action must protect human health and the environment. To this end, EPA singled out three key areas of analyses that bear directly on that guiding principle: the extent of the risks posed by mismanagement of CCR; the adequacy of state programs to ensure proper management of CCR; and the extent and nature of damage cases.

The first of these largely related to the 2010 quantitative risk assessment of the potential for contamination to

[31] EPA also received several additional reports that contained allegations of further damage cases. However, because these were submitted after the close of the comment period, EPA did not evaluate these damage cases for this rulemaking or otherwise consider the information in those reports.

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groundwater. During the rulemaking, EPA received information that allowed the Agency to resolve two of the four primary uncertainties identified in the proposal. The risk assessment has been revised with updated pore water concentration data and with LEAF leachate data, and accounts for the potential reduction of contaminants reaching drinking water sources due to interception of contamination by surface water bodies. However, two sources of uncertainty remain: the potential effect of pollution control technologies on the CCR characteristics, and the appropriate IRIS value for arsenic.

EPA's risk assessment evaluated current management practices, and generally did not attempt to account for or evaluate the potential for future changes in the wastes. While EPA has great confidence in the assessment, its ability to definitively resolve this question is therefore limited, given the very real potential for significant changes in CCR characteristics and constituents in the near future, due to the required installation of pollution control technologies. Changes in the CCR characteristics are particularly significant, as the risk assessment concluded that one of the parameters most likely to affect the agency's risk estimates was the characteristic of the wastes.

With respect to the second area, EPA is unable to reach any definitive conclusions as to whether state regulatory programs are so deficient that the level of federal oversight under subtitle C is necessary. Specifically, EPA cannot determine from the available information how states, in practice, have implemented regulatory requirements. At this point, only limited conclusions are possible.

Clear deficiencies exist in some state regulatory programs, and questions remain with respect to others. And many of these concerns exist with respect to programs in states responsible for the majority of CCR generation and disposal. However, most state programs, although they vary considerably, are not clearly deficient on their face. But it is equally clear that exclusive reliance on the regulatory programs as written, without any examination of how states have implemented those requirements in practice, would not support sweeping conclusions about the overall adequacy of state programs. It is critical to ensure that any decision accurately accounts for how the states have exercised their judgment in implementing those requirements, before concluding that state programs cannot adequately oversee the management of CCR without the degree of federal involvement mandated by subtitle C. Notwithstanding EPA's inability to draw conclusions on the overall adequacy of state programs, the high degree of variation across state programs strongly supports the need for federal requirements to establish a consistent national standard of groundwater and human health protection.

In contrast to the other two areas identified in the proposed rule, while some uncertainty remains with respect to the damage cases—namely, whether the 157 identified to date represent the total number of damage cases caused by CCR mismanagement, and whether some of the ''potential'' damage cases should be classified as ''proven'' damage cases—at this point, EPA has concluded that the available information provides a sufficient evidentiary base on which decisions can be made. In the absence of the necessary information on two of the three critical areas, however, EPA cannot reach any final conclusions regarding the appropriate balance among the eight statutory factors. Consequently, EPA is also not reaching any final conclusions as to whether a damage case is best categorized as ''proven'' or ''potential.'' Such a finding is relevant only to the Bevill Regulatory Determination.

However, as discussed in more detail in Unit XI of this document, the damage cases provide extremely valuable evidence that is directly relevant to the question of whether and how to regulate CCR waste. For example, the damage cases provide ''real world'' evidence against which to compare EPA's risk modeling estimates, such as evidence regarding the frequency with which particular constituents leach into groundwater. They also provide direct evidence regarding specific waste management practices at electric utilities, along with the potential consequences of those practices. Finally, both the specifics of the damage cases and the fact that they continue to occur provide strong evidence of the need for this rule under subtitle D while EPA obtains the information that will allow the Agency to make a final Regulatory Determination for these wastes.

Thus, even though EPA is not able to reach a final conclusion on the Regulatory Determination for these wastes, the totality of the information in the rulemaking record clearly demonstrates that the risks associated with the current management and disposal of CCR remain substantial. EPA's risk assessment concluded that the cancer risks from unlined surface impoundments ranged from 3×10^{-4} for trivalent arsenic to 4×10^{-5} for pentavalent arsenic. Non-cancer risks from these same units also significantly exceeded EPA's level of concern, with estimates ranging from an HQ of 2 for thallium, to HQs [32] of 4 for molybdenum and 8 for trivalent arsenic. The risks associated with unlined landfills were also estimated to be significant, with cancer risks of 2×10^{-5} for trivalent arsenic. It is important to note that these risk numbers are based on national disposal practices. Risks at an individual site may be even higher based on individual site conditions, waste characteristics, and management practices. EPA's risk assessment identified the potential for higher risks based on different waste pH values and management practices. Multiple constituents presented higher risks when considered in waste management units that co-dispose both ash and coal refuse at more acidic pHs or FGD wastes at more basic pHs. For example, the modeled cancer risks for the co-disposal of ash and coal refuse (pH 1.7–8.2) ranged between 10^{-3} for trivalent arsenic to 4×10^{-4} for pentavalent arsenic. Non-cancer risks were similarly high, ranging between and an HQ of 13 for cobalt, and HQs of 14 for pentavalent arsenic to 26 for trivalent arsenic, based on the ingestion of contaminated drinking water. Although this management practice is declining, recent information indicates that approximately five percent of facilities continue to co-dispose of ash and coal refuse in surface impoundments.

Moreover, EPA's risk estimates are consistent with the continued damage cases compiled through this rulemaking. As further discussed in Unit XI of this document, EPA has confirmed that 157 cases of proven or potential contamination of groundwater have occurred in states across the nation since the initial Regulatory Determination. These damage cases were primarily associated with unlined units and were most frequently associated with releases of arsenic. While new units are typically constructed with composite liners, which under EPA's current risk assessment adequately mitigate the risks, older units still comprise the overwhelming majority of currently operating units. EPA's data show that approximately 63 percent of currently operating surface impoundments and landfills are unlined, and thus more prone to leach contaminants into groundwater. Analysis of the information from the damage cases also demonstrates that unlined surface

[32] For more information on HQs please see Unit X. Risk Assessment of this preamble.

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impoundments typically operate for 20 years before they begin to leak. Most of the currently operating surface impoundments are between 20 and 40 years old.

The age of the units also has implications for their structural stability and the potential for catastrophic releases. Of the approximately 735 CCR surface impoundments currently operating in the United States, a certain percentage 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 Assessment Program, 318 surface impoundments have either a high or significant hazard potential rating, at least 13 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; based on the subset of units for which age data were available, approximately 195 active surface impoundments exceed 40 years of age; 56 units are older than 50 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 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. Collectively, these facts indicate a high likelihood that in the absence of any regulatory action, such units will leak in the near future, or are currently leaking, undetected, since groundwater monitoring is not installed at many of these older units. Moreover, damage cases continue to occur; 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. And as recently as February 2014, CCR slurry was released into the Dan River from an inactive surface impoundment in North Carolina.

All of which demonstrates a compelling need for a uniform system of requirements to address these risks without waiting for the information and analyses necessary to complete a final Regulatory Determination. EPA will continue to monitor these critical areas, and will provide the public with an additional opportunity to comment on any proposed Regulatory Determination, prior to issuing a final Regulatory Determination.

B. Final Regulatory Determination Regarding Beneficial Use

EPA generally proposed to retain the May 2000 Regulatory Determination that beneficially used CCR did not warrant federal regulation under subtitle C 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.) EPA noted that since the original Regulatory Determination, the Agency had found no data or other information to indicate that existing efforts of states, EPA, and other federal agencies had been inadequate to address the environmental issues associated with the beneficial use of CCR that were originally identified in the Regulatory Determination. EPA explained that it had proposed this approach in recognition that some uses of CCR, 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. Consequently, EPA preliminarily concluded that encapsulated uses of CCR, which are common in many consumer products, did not merit regulation based on the available information.

However, EPA noted that the issues were more difficult with respect to unencapsulated uses of CCR and specifically solicited comment on whether such uses should continue to be included as ''beneficial use'' under the Bevill exemption. EPA explained that unencapsulated uses have raised concerns and therefore merited closer attention. For example, the placement of unencapsulated CCR on the land, such as in road embankments or in agricultural uses, presented a set of issues similar to those that caused the Agency to propose to regulate CCR destined for disposal. But the Agency also acknowledged that the amounts and, in some cases, the manner in which CCR is used—*i.e.,* subject to engineering specifications and material requirements rather than landfilling techniques—are potentially very different from land disposal.

EPA is retaining the original 2000 Regulatory Determination for CCR that is beneficially used. EPA has made this determination based on consideration of the available information and the RCRA section 8002(n) study factors.

1. Source and Volume of CCR Generated Each Year

The American Coal Ash Association (ACAA) conducts a voluntary, annual survey of the coal-fired electric utility industry to track the quantities of CCR generated and beneficially used. According to the latest survey, the electric utility industry generated nearly 110 million tons of CCR in 2012. Approximately 39 million tons of these CCR was identified by ACAA as beneficially used in either encapsulated or unencapsulated products. An additional 12.8 million tons were placed in mine-fill operations, while the remaining 57.8 million tons were disposed of in landfills and surface impoundments (ACAA, 2013).[33]

2. Present Utilization Practices

Based on the beneficial use rates reported by ACAA, approximately 50 percent of the CCR beneficially used on an annual basis falls into two categories: (1) Fly ash used as a direct substitute for Portland cement during the production of concrete (referred to as ''fly ash concrete''); and (2) FGD gypsum used as a replacement for mined gypsum in wallboard (referred to as ''FGD gypsum wallboard''). Specifically, the 2012 ACAA survey indicates that the largest encapsulated beneficial uses of CCR, by more than a factor of two, are fly ash used in ''concrete/concrete products/grout'' (12.6 million tons) and FGD gypsum used in ''gypsum panel products'' (7.6 million tons).

3. Potential Danger, if Any, to Human Health or the Environment From the Reuse of CCR

The risks associated with the disposal of CCR stems from the specific nature of that activity; that is, the disposal of CCR in (often unlined) landfills or surface impoundments, with thousands, if not millions, of tons placed in a single

[33] ACAA (American Coal Ash Association). 2013. 2012 Coal Combustion Product (CCP) Production & Use Survey Report. Farmington Hills, MI 48331. Available online at: *http://www.acaa-usa.org/Portals/9/Files/PDFs/revisedFINAL2012CCPSurveyReport.pdf*

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concentrated location. And in the case of surface impoundments, the CCR is managed with water, under a hydraulic head, which promotes rapid leaching of contaminants into neighboring groundwater. The beneficial uses identified as excluded under the Bevill exemption for the most part present a significantly different risk profile.

a. Encapsulated Beneficial Uses

An encapsulated beneficial use is one that binds the CCR into a solid matrix that minimizes mobilization into the surrounding environment. Examples of encapsulated uses include, but are not limited to: (1) Filler or lightweight aggregate in concrete; (2) a replacement for, or raw material used in production of, cementitious components in concrete or bricks; (3) filler in plastics, rubber, and similar products; and (4) raw material in wallboard production.

Since publication of the proposal, EPA has developed a methodology for evaluating encapsulated beneficial uses. A copy of the methodology can be found at *http://www2.epa.gov/coalash/methodology-evaluating-encapsulated-beneficial-uses-coal-combustion-residuals*. EPA applied this methodology to the two largest CCR uses—the use of fly ash as a replacement for Portland cement in concrete, and the use of FGD gypsum as a replacement for mined gypsum in wallboard. A complete copy of the evaluation can be found at *http://www.epa.gov/wastes/conserve/imr/ccps/pdfs/ccr_bu_eval.pdf*.

The evaluation considered products that meet relevant physical and performance standards, that conform to standard design specifications, and that incorporate fly ash and FGD gypsum from pollution control devices currently used in the United States. Based on the findings of the evaluation, the Agency concluded that environmental releases of constituents of potential concern from CCR fly ash concrete and FGD gypsum wallboard during use by the consumer are comparable to or lower than those from analogous non-CCR products, or are at or below relevant regulatory and health-based benchmarks for human and ecological receptors.

b. Unencapsulated Uses

EPA acknowledged in the proposal that unencapsulated uses generally presented more difficult issues than encapsulated uses. CCR 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. However, EPA cannot extrapolate from the risk assessments conducted to evaluate the management practices associated with CCR landfills and CCR surface impoundments, because the exposure patterns are too dissimilar: The amounts and manner involved with beneficial use are very different than the thousands, if not millions of tons of CCR that are mounded in a single concentrated location in a landfill. And the potential exposures are entirely unlike surface impoundments, where CCR is managed with water under a hydraulic head, which promotes more rapid leaching of contaminants. By contrast ''beneficial uses,'' even unencapsulated uses, are typically subject to engineering specifications, and for certain uses, federal oversight, and material requirements. For example, fly ash used as a stabilized base course in highway construction is subject to both regulatory standards under the U.S. Department of Transportation (DOT) and the Federal Highway Administration (FHWA), and engineering specifications, 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 kPa (400 psi). (See 75 FR 35163–35165 for additional examples.)

In 1999, EPA conducted a risk assessment of certain agricultural uses of CCR, since this practice was considered the most likely to raise human health or environmental concerns.[34] EPA estimated the risks associated with such uses to be within the range of 1×10^{-6}. These results as well as EPA's conclusion that the use of CCR in agricultural settings was the most likely use to raise concerns, caused EPA to conclude that none of the beneficial uses identified in the 2000 Regulatory Determination 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 noted that beneficially using secondary materials conserves natural resources, and can serve as an important alternative to disposal.

[34] For more information on this risk assessment see EPA's Notice of Regulatory Determination on Wastes from the Combustion of Fossil Fuels (65 FR 32214, May 22, 2000).

4. Documented Cases in Which Damage to Human Health or the Environment From Surface Run-off or Leachate Has Been Proved

To date, EPA has seen no evidence of damages from the encapsulated beneficial uses of CCR that EPA identified in the proposal. For example, there is wide acceptance of the use of CCR in encapsulated uses, such as wallboard, concrete, and bricks because the CCR is bound into products. However, as of the date of the proposed rule, seven proven damage cases associated with unencapsulated uses have occurred, in which large quantities of unencapsulated CCR were used indiscriminately to re-grade the landscape or to fill old quarries or gravel pits. The proposed rule discussed two of these cases. (See 75 FR 35147.) The first case was in Gambrills, Maryland and 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 to contour a golf course. Groundwater contamination above MCLs 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 to be a proven damage case. However, due to the onsite groundwater contamination, EPA considers this site to be a potential damage case.

During the development of this final rule, EPA obtained information on a comparable situation in which large quantities of unencapsulated CCR were placed on the land in a manner that presented significant concerns. The AES coal-fired power plant in Puerto Rico lacked capacity to dispose of their CCR on-site, and off-site landfills in Puerto Rico were prohibited from accepting CCR. In lieu of transporting their CCR off of the island for disposal, AES created an aggregate (''AGREMAX'') with the CCR generated at their facility, and used the aggregate as fill in housing developments and in road projects. Over two million tons of this material was used between 2004 and 2012.

Currently, there is insufficient information to determine whether groundwater has been contaminated as a result of this practice, and thus, EPA cannot classify this as either a proven or potential ''damage case.'' Nevertheless, the available facts illustrate several of the significant concerns associated with unencapsulated uses. Specifically, the AGREMAX was applied without appropriate engineering controls and in volumes that far exceeded the amounts necessary for the engineering use of the materials. Inspections of some of the sites where the material had been placed showed use in residential areas, and to environmentally vulnerable areas, including areas close to wetlands and surface waters and over shallow, sole-source drinking water aquifers. In addition, some sites appeared to have been abandoned.

Consistent with the proposed rule, EPA does not consider the practices described in this section to be beneficial use, but rather waste management that would be subject to the requirements of the final rule.

5. Alternatives to Current Disposal Methods, the Costs of Such Alternatives, and the Impact of Such Alternatives on the Use of Coal and Other Natural Resources

The beneficial use of CCR is a primary alternative to current disposal methods. And as EPA has repeatedly concluded, it is a method that, when performed correctly, can offer significant environmental benefits, including greenhouse gas (GHG) reduction, energy conservation, reduction in land disposal (along with the corresponding avoidance of potential CCR disposal impacts), and reduction in the need to mine and process virgin materials and the associated environmental impacts.

a. Greenhouse Gas and Energy Benefits

The beneficial use of CCR reduces energy consumption and GHG emissions in a number of ways. Three of the most widely recognized beneficial applications of CCR are the use of coal fly ash as a substitute for Portland cement in the manufacture of concrete, the use of FGD gypsum as a substitute for mined gypsum in the manufacture of wallboard, and the use of CCR as a substitute for sand, gravel, and other materials in structural fill. Reducing the amount of cement, mined gypsum, and virgin fill produced by substituting CCR leads to large supply chain-wide reductions in energy use and GHG emissions. Specifically, the RIA estimates three-year rolling average of 53,054,246 million British thermal units (MMBtu) per year in energy savings and 11,571,116 tons per year in GHG (*i.e.,* carbon dioxide and methane) emissions reductions in 2015. This estimate is likely to underestimate the total benefits that can be achieved from all beneficial uses. Furthermore, 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.

b. Benefits From Reducing the Need To Mine and Process Virgin Materials

CCR 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, 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.

c. Benefits From Reducing the Disposal of CCR

Beneficially using CCR instead of disposing of it in landfills and surface impoundments also reduces the need for additional landfill space and any risks associated with their disposal. In particular, the United States disposed of over 57.8 million tons of CCR in landfills and surface impoundments in 2012, which is equivalent to the space required of 20,222 quarter-acre home sites under eight feet of CCR.

As discussed in the final rule RIA, the current beneficial use of CCR 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, the three-year rolling average of environmental benefits estimated for 2015 includes: (1) 53,054,246 MMBtu per year in energy savings; (2) 1,661,900 million gallons per year in water savings; (3) 11,571,116 tons per year in GHG (*i.e.,* carbon dioxide and methane) emissions reductions; (4) 45,770 tons of criteria air pollutant (*i.e.,* NO_X, SO_X, particulate matter, and CO) emissions reductions; and (5) 3,207 pounds of toxic air pollutant (*i.e.,* mercury and lead) emissions reductions. All together, the beneficial use of CCR in 2015 is estimated to provide over $2.3 billion in annual national environmental benefits. In addition, since EPA estimates annual baseline disposal costs of approximately $2.4 billion for the just over 50 percent of tons disposed each year, current beneficial use and minefilling also result in annual material and disposal cost savings of approximately $2 billion annually.

6. Current and Potential Utilization of CCR

In 2012, nearly 36 percent (39 million tons) of CCR were beneficially used (excluding minefill operations) and nearly 12 percent (12.8 million tons) were placed in minefills. (This compares to 23 percent of CCR that were beneficially used, excluding minefilling, at the time of the May 2000 Regulatory Determination, and represents a significant increase.)

7. Conclusions

On balance, after considering all of the available information, EPA has concluded that the most appropriate approach toward beneficial use is to retain the May 2000 Regulatory Determination that regulation under subtitle C of the beneficial use of CCR is not warranted. EPA has also determined that regulation under subtitle D is generally not necessary for these beneficial uses.

As discussed in the preceding section, the most important of the section 8002(n) factors are those relating to the potential risks to human health and the environment. See *e.g., Horsehead Resource Development Co.* v. *EPA*, 16 F.3d 1246, 1258 (D.C. Cir, 1994) (Upholding EPA's interpretation that wastes resulting from the combustion of mixtures of Bevill-exempt and non-exempt wastes could only retain Bevill-exempt status so long as the combustion waste remained of low toxicity); *EDF* v. *EPA*, 852 F.2d 1316, 1328–1329 (D.C. Cir. 1988) (Overturning EPA rule that included as Bevill exempt, wastes that were not of low toxicity). EPA is adopting this Regulatory Determination in recognition that many uses of CCR, such as encapsulated uses in concrete, and use as an ingredient in the manufacture of wallboard, provide environmental benefits and raise minimal health or environmental concerns. To date, the information available does not demonstrate the existence of any risks associated with encapsulated uses of CCR that merit regulation under either subtitle C or subtitle D of RCRA.

While there can be some risks associated with unencapsulated uses—for example, the placement of unencapsulated CCR on the land, such as in large scale fill operations or in agricultural uses, depending on the specific site conditions—in general the amounts and, in some cases, the manner in which they are used are very different than land disposal. For example, agricultural uses involve the placement of inches rather than tons of CCR, and placement of CCR in a thin layer rather than mounded in a single concentrated location. In addition, these uses are subject to engineering specifications and materials requirements, which will limit the ultimate amount of material placed on the land.

EPA recognizes that several proven damage cases involving the large-scale placement, akin to disposal, of CCR have occurred under the guise of ''beneficial use''— the ''beneficial'' use being the filling up of old quarries or gravel pits, or the re-grading of landscape with large quantities of CCR. EPA did not consider this type of use as a ''beneficial'' use in its May 2000 Regulatory Determination, and still does not consider this type of use to be covered by the exclusion. Therefore, the final rule explicitly removes these types of uses from the category of beneficial use, and from this Regulatory Determination. As discussed in the next section of this preamble, EPA has adopted criteria in the final rule to ensure that inappropriate uses that effectively are disposal will be regulated as disposal. The final rule expressly defines the placement of CCR in sand and gravel pits or quarries as disposal in a landfill. In addition, the final rule provides that the use of large volumes of CCR in restructuring landscape that does not meet specific criteria will constitute disposal.

While EPA has not definitively concluded that all unencapsulated beneficial uses are ''safe,'' based on the current record for this rulemaking, EPA is unable to point to evidence demonstrating that the unencapsulated uses subject to this Determination warrant federal regulation. While the absence of demonstrated harm in this instance is not proof of safety, neither is the lack of information proof of risk.[35]

In this regard, EPA notes that many states have developed beneficial use programs that allow the use of CCR, provided they are demonstrated to be non-hazardous materials; and many require a site specific assessment before authorizing placement on the land of large amounts of unencapsulated CCR. 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, provided they meet the specified criteria. In addition, the ASTSWMO 2006 Beneficial Use Survey Report states that 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. (*http://www.astswmo.org/Files/Policies_and_Publications/Solid_Waste/2007BUSurveyReport11-30-07.pdf*)[36] Because EPA has not identified significant risks associated with the beneficial uses covered by this Regulatory Determination, the adequacy of these state programs does not factor into EPA's Determination. Nevertheless, to the extent that that these materials do have the potential to pose risk at an individual site, the fact that many states exercise regulatory oversight of these materials provides an additional level of assurance.

Finally, EPA does not wish to inhibit or eliminate the measurable environmental and economic benefits derived from the use of this valuable material given the current lack of evidence affirmatively demonstrating an environmental or health risk. Consequently, EPA is confident that the combination of the final rule, EPA guidance, current industrial standards and practices, and in many cases, state regulatory oversight is sufficient to address concerns associated with the beneficial uses to which this Determination applies.

V. Development of the Final Rule—RCRA Subtitle D Regulatory Approach

As previously discussed in Unit II of this document, the authority to develop and promulgate the national minimum criteria governing the disposal of CCR in landfills and surface impoundments is found under the provisions of sections 1008(a), 4004, and 4005(a) of RCRA (*i.e.*, subtitle D of RCRA). These authorities, however, do not provide EPA with the ability to issue permits, require states to issue permits, approve state programs to operate in lieu of the federal program, or to enforce any of the requirements addressing the disposal of CCR. Consequently, EPA designed the proposed RCRA subtitle D option to ensure that the requirements will effectively protect human health and the environment within those limitations. The final rule establishes self-implementing requirements—primarily performance standards—that owners or operators of regulated units can implement without any interaction with regulatory officials.

In developing the subtitle D option for the proposal, EPA considered a number of existing programs as relevant models. EPA drew most heavily on the existing 40 CFR part 258 program applicable to MSWLFs. While this program does not address CCR disposal in surface impoundments, it provided EPA with a general regulatory framework that addressed all aspects of disposal in certain land-based units. Given the Agency's expansive history and experience with these requirements, EPA concluded that the part 258 criteria with certain modifications for other land-based disposal units (*i.e.*, surface impoundments) represented a reasonable balance between ensuring the protection of human health and the environment from the risk of CCR disposal and the absence of any regulatory oversight. (See 75 FR 35192–35195.)

EPA also considered that many of the technical requirements developed to specifically address the risks from the disposal of CCR as part of the subtitle C alternative would be equally justified under a RCRA subtitle D regulatory regime. The factual record—*i.e.*, the risk analysis and the damage cases—supporting such requirements was the same, irrespective of the statutory authority under which the Agency was operating. Thus, several of the provisions under RCRA subtitle D either corresponded to the proposal under RCRA subtitle C, or were modeled after the existing subtitle C requirements; for example, EPA proposed the same MSHA-based structural stability standards for surface impoundments under the subtitle C and subtitle D options. However, because there is no corresponding guaranteed permit mechanism under the RCRA subtitle D requirements, EPA also considered the 40 CFR part 265 interim status requirements for hazardous waste facilities, which were designed to operate in the absence of a permit. These requirements were particularly

[35] The Agency is currently developing a Framework to address the risks associated with the beneficial use of unencapsulated materials. This Framework is expected to be finalized in 2015. See Unit VI of this document for more information.

[36] EPA has worked with the states 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.

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relevant in developing the requirements for surface impoundments since such units are not regulated under 40 CFR part 258. Beyond their self-implementing design, these requirements provided a useful model because, based on decades of experience in implementing these requirements, EPA had assurance that these requirements were protective for a variety of waste, under a wide variety of site conditions.

In an effort to ensure that the proposed RCRA subtitle D requirements would achieve the statutory standard of ''*no reasonable probability of adverse effects on health and the environment*'' in the absence of guaranteed regulatory oversight, EPA also proposed to require facilities to obtain third party certifications and to provide enhanced state and public notifications of actions taken to comply with the regulatory requirements. Specifically, EPA proposed that certain technical demonstrations made by the owner or operator be certified by an independent registered professional engineer or hydrologist, in order to provide verification and otherwise ensure that the provisions of the rule were properly applied. EPA also provided a regulatory definition of the term, ''independent registered professional engineer or hydrologist,'' to identify the minimum qualifications necessary to make these certifications. While EPA acknowledged that relying upon a third party certification was not the same as relying upon a state or federal regulatory authority and was not expected to provide the same level of independence as a state permit program, the availability of meaningful third party (*i.e.*, independent) verification provided critical support that the rule would achieve the statutory standard, as it would provide at least some degree of control over a facility's discretion in implementing the rule.

As part of the notification requirements, EPA further proposed that all owners and operators create and maintain an operating record and publically accessible Web site, containing comprehensive documentation of compliance with the rule. EPA also proposed that owners or operators provide notification to the state and the public of third party certifications as well as other information documenting actions taken to comply with the technical criteria of the rule.

A. The Self-Implementing Approach

While the vast majority of state and industry commenters supported regulating the management of CCR under subtitle D of RCRA, a very limited number of commenters favored the proposed self-implementing option. Most commenters argued that if the Agency were to adopt the proposed subtitle D approach it would most certainly result in parallel and redundant regulatory programs for CCR in many states, creating an unworkable situation for industry, as well as the state. Some commenters argued that under this dual regulatory approach, an owner or operator of a CCR unit could conceivably be in non-compliance with both a federal requirement and an independently administered state regulatory requirement, subjecting the owner or operator to both a citizen suit enforcement action in federal court for the alleged violation and to a wholly separate enforcement action in state court for violation of the parallel state requirement. Commenters argued that this regulatory construct made no sense and would waste federal and state judicial resources and company resources, as well as possibly resulting in inconsistent federal and state court determinations with respect to an identical regulatory requirement. It also could result in duplicative federal and state penalties for essentially the same regulatory infraction.

Commenters further argued that the prescriptive one-size-fits-all approach was overly stringent and inflexible and had the potential to greatly disrupt implementation of a state's regulatory programs, which have been tailored to provide for site specific conditions and situations. Moreover, commenters argued that because of the many state regulatory programs addressing CCR disposal, there would be many instances where state requirements could be in conflict with, in addition to, or separate from the federal requirements and it was unclear how these differences would be resolved.

Many commenters simply argued that a permitting program similar to that for MSWLFs was the only viable approach for the regulation of CCR. A significant number of commenters, however, proposed various alternative approaches for regulating CCR disposal under subtitle D of RCRA. One option would have EPA allow qualified state programs to directly administer the subtitle D requirements for CCR when the state regulatory program meets or exceeds the federal requirements, thereby minimizing duplicative regulations and avoiding the self-implementing ''one size fits all'' approach contained in EPA's proposal. This option, commenters reasoned, could be implemented utilizing a process developed by the Agency for evaluating whether the state's CCR regulations were equivalent to the federal minimum criteria (much like EPA does now in the case of MSWLFs under 40 CFR part 258). Another suggested approach involved EPA clarifying that a state can be more restrictive than the federal rule, and that where a state has a subtitle D regulatory program that is more restrictive, the state program and permitting process would take precedence over any self-implementation aspects of a final rule. (The proposed rule had simply stated that an owner or operator must comply with any other applicable federal, state, tribal or local laws or other requirements.) Commenters also proposed a third option, similar to the 40 CFR part 258 program, recognizing that EPA cannot approve state programs in this rule. Specifically, 40 CFR part 258 provides a definition for ''Director of an approved state'' that means they are the chief administrative officer of a state agency responsible for implementing the state permit program that is deemed to be adequate by EPA under regulations published pursuant to sections 2002 and 4005 of RCRA. The commenters suggested that the final rule adopt a similar approach by defining a ''state permit program'' and allowing a state permit program that met the definition to approve compliance with a specified regulatory requirement, *e.g.*, landfill design. The commenter suggested the following definition: ''state permit program means a permit program implemented by a state agency that adopts and implements the minimum requirements for the disposal of coal combustion residuals outlined in this final rule.'' The commenter claimed that such an approach should not affect enforcement through citizen suits under RCRA section 7002 or by EPA under RCRA section 7003. Taking such an approach, commenters reasoned, would allow states to utilize their own enforcement authority and not rely upon the citizen suit authority under RCRA section 7002. Furthermore, allowing states to consider alternative approaches to the technical standards may give states an incentive to adopt the minimum requirements of the final federal rule into their state permit programs.

As noted, many commenters suggested that EPA rely on the same combination of RCRA statutory authorities, *i.e.*, RCRA sections 4010(c) and 4005(c), to establish controls for CCR units that it employed in promulgating federally enforceable subtitle D rules for MSWLFs and for non-MSWLFs that receive household hazardous waste and small quantity generator waste under 40 CFR parts 257 and 258. RCRA sections 4010(c) and 4005(c), the commenters reasoned, provides EPA that authority because non-hazardous waste CCR disposal facilities have the potential to receive household wastes or conditionally exempt small quantity generator waste, whether or not such waste is actually received at the CCR disposal facility. Commenters contended that the combination of these two provisions could enable EPA to promulgate non-hazardous waste rules for CCR that could be directly administered through state permitting programs and backed up by direct EPA enforcement powers in those states that fail to adequately implement the federal rules. Such an approach, commenters concluded provides the Agency with the enforcement authority it desires under a subtitle D regulatory program, while enabling states to have a prominent role in the administration of any subtitle D rules, and preventing the duplication of potentially conflicting federal and state controls.

Finally, some commenters encouraged EPA to request from Congress the statutory authority necessary to propose non-hazardous regulations under subtitle D that could be implemented by the states and provide federal enforceability (similar to RCRA's part 258 requirements for MSWLFs). Commenters argued that states should be allowed to enforce compliance through a traditional permitting system, and that solid waste operating permits are critical to ensuring coal ash disposal facilities design, construct, operate and close their waste facilities safely. Commenters argued that permits are important because they can dictate the use of specific operating practices and control technologies that may be essential for minimizing releases. Permits also provide an important enforcement vehicle, as well as a process by which the public can be informed and participate in the siting, operation and closure of the waste disposal unit.

While the Agency appreciates commenters' attempts to craft alternative approaches to address the limitations in the proposed self-implementing subtitle D option, EPA has not ''chosen'' to design standards under subtitle D that are self-implementing. The sections of RCRA that are currently applicable to CCR—sections 1008(a), 4004(a), and 4005(a)—only authorize the Agency to establish minimum national criteria that apply to ''facilities.''

As previously discussed, these provisions do not authorize EPA to require that facilities obtain a permit from EPA or a state. The fact that section 4004(a) does not contain any provision that either expressly requires a permit to manage waste, such as in section 3005, or that requires states to adopt a permit program, such as in section 4004(c)(1), provides strong evidence that Congress did not authorize EPA to impose such a requirement on facilities managing solid waste. Compare 42 U.S.C. 6925(a), 6944(a), and 6945(c)(1). This is further confirmed by the fact that Congress thought it necessary to expressly add provisions to require state permit programs in 4010(c) and 4005(c). And the fact that the HSWA provisions are limited to two specifically enumerated types of units provides further evidence that Congress intended to authorize EPA to require permits only for these units.

The restriction that the criteria apply only to ''facilities'' also means that EPA cannot establish any requirements on states or state programs, either directly or indirectly. This means, for example, that EPA cannot adopt a regulation that restricts certain provisions to those ''state permit programs'' that meet EPA requirements, as one commenter suggested, since this would indirectly regulate state programs—leaving aside that EPA never proposed anything of the sort. This also means that EPA cannot require a facility to obtain state approval, as this not only presupposes the existence of a state permit program, but also that the state will approve the facility action on the basis of EPA's criteria. EPA cannot condition a facility's compliance on actions beyond its control.

However, these provisions restrict EPA's authority only. The legislation is clear that these are minimum requirements only, and without preemptive effect; states may therefore impose more stringent requirements, including the requirement that CCR facilities obtain a permit. This is also wholly consistent with longstanding EPA interpretations. See 44 FR 53438, 53439 (September 13, 1979) (''the standards established in the criteria constitute minimum requirements. These criteria do not preempt other state and federal requirements. Nothing in the Act precludes the imposition of additional obligations under authority of other laws on parties engaged in solid waste disposal.''); see also 44 FR 45066 (July 31, 1979) (''EPA establishes only 'minimum' requirements under this portion of the Act which should not prevent States from developing broader programs or stricter standards under authority of State law.''). States may also incorporate the federal requirements into state law—whether through revisions to existing legislation or regulation, or through incorporating them into any permits issued to CCR facilities. Such an approach would also resolve commenters' concerns about the potential for ''parallel and redundant regulatory programs.''

While subtitle C and 4005(c) provide for state oversight on rule implementation and allow approved state requirements to operate in lieu of federal criteria, the Agency lacks the authority to do so under the subsections of RCRA currently applicable to CCR. The provisions applicable to solid waste—sections 1008(a)(3), 4003, 4004(a) and 4005(a)—establish a regulatory structure that differs in key respects from those established under subtitle C and for MSWLFs under section 4005(c). Under subtitle C and section 4005(c), Congress required EPA to establish federal criteria that will serve as national minimum standards, which is comparable to the authority under section 4004(a). But subtitle C and section 4005(c) also include detailed provisions governing both the state implementation of those requirements and the relationship between the federal requirements and the state programs that implement them. No comparable provisions appear in either section 4004(a) or section 4003, which governs the approval of state SWMPs. And the consequences of these omissions are significant.

Subtitle C of RCRA contains several provisions that establish the relationship between the federal program and state requirements; these include provisions authorizing EPA to approve state programs and to retain a direct role in the implementation of the federal minimum requirements, whether through continued oversight of state implementation or direct implementation of the regulations. See, 42 U.S.C. 6926, 6928(a)(2), and 6929. For purposes of this issue, the most critical of these is the explicit direction in section 3006 that authorized state programs ''operate in lieu of the Federal program.'' 42 U.S.C. 6926(b), (c)(1). See also 42 U.S.C. 6929 (prohibiting the adoption of less stringent state requirements than those in EPA regulations, and authorizing states to establish more stringent requirements).

The provisions for MSWLFs under section 4005(c) are less detailed, but establish a similar regulatory structure. Section 4005(c)(1) expressly directs the states to ''adopt and implement a permit program or other system of prior approval and conditions,'' for covered

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facilities in order to implement federal requirements established for such facilities. 42 U.S.C. 6945(c)(1). The statute directs EPA to determine the adequacy of such programs, and directs EPA to enforce the federal requirements in states that have not adopted an adequate program. 42 U.S.C. 6945(c)(1)(C), (2). While less detailed than the provisions under subtitle C, section 4005(c) establishes a system that is equally predicated on mandated implementation by a state regulatory authority of the federal requirements, rather than the potential coexistence of two separate regulatory systems.

The absence of any similar provisions in the ''solid waste'' provisions of subtitle D demonstrates that Congress intended to create a different regulatory structure. EPA's role under sections 1008(a)(3) and 4004(a) is to establish minimum criteria to determine which facilities ''shall be classified as sanitary landfills and which shall be classified as open dumps,'' and to encourage states to use the criteria as a part of their solid waste management planning. Under this regulatory structure, Congress intended that the federal requirements apply directly to facilities and operate independent of state involvement, unless *the state* chooses to do otherwise. The ability to approve state SWMPs under section 4003 does not alter this relationship. Indeed, the fact that Congress thought it necessary to revise section 4005 to include the specific provisions in subsection (c) confirms that Congress did not believe such authority already existed under sections 4003 and 4004.

Approval of a state's SWMP pursuant to section 4003 qualifies the state to receive federal funds (no longer available) and authorizes the state to issue compliance schedules; but unlike under section 3006 or 4005(c), an authorized plan does not affect the federal minimum standards themselves, or authorize states to do so. Section 4003 contains nothing that explicitly or implicitly authorizes state requirements to operate ''in lieu of'' the federal requirement as a consequence of EPA approval of the state plan. The closest analogue is that states with an approved plan may establish a ''timetable or schedule'' to bring existing open dumps into compliance with the federal requirements; but notably, Congress only authorized the state to modify the timeframes by which such facilities must be in compliance, not the substantive requirements themselves. 42 U.S.C. 6945(a).

The combination of this regulatory structure and the need to demonstrate that the final rule achieves section 4004(a)'s protectiveness standard based on the record at the time the rule is promulgated also effectively limits EPA's ability to establish the kind of regulatory provisions commenters have requested (*i.e.*, establish an alternative that allows a state permit program to approve a less stringent technical requirement based on site specific conditions). Because as discussed in Unit IV of this document, EPA is currently unable to reach a conclusion regarding the adequacy of state programs, EPA cannot demonstrate that such an alternative would meet the section 4004(a) standard. And in the absence of a mandatory mechanism for subsequent public involvement and review, which would create decisions with their own record, subject to judicial review in their own right, the lack of such information is dispositive.

With respect to the proposal to rely on RCRA sections 4010(c) and 4005(c) authorities, EPA also disagrees that this is a viable option. As the comment appears to acknowledge, construing sections 4010(c) and 4005(c) to apply to CCR units on the basis that they could *potentially* receive conditionally-exempt small quantity generator waste is inconsistent with EPA's longstanding interpretation of those sections. EPA directly addressed this issue nearly 20 years ago in the preamble for EPA's final rules at 40 CFR part 257, subpart B. In that discussion which we summarize in the next several paragraphs, EPA explained that the proposed rule was written to provide that only those non-municipal non-hazardous waste disposal units which meet the requirements in §§ 257.5 through 257.30 ''may receive'' CESQG waste, as required by RCRA section 4010(c). Any non-municipal non-hazardous waste disposal unit that did not meet the proposed requirements may not receive CESQG hazardous wastes. The proposal was written to apply to non-municipal non-hazardous waste disposal units that receive CESQG waste for storage, treatment, or disposal, including such units as surface impoundments, landfills, land application units and waste piles. The regulatory definition of the term ''disposal'' cover all placement of wastes on the land. See 40 CFR 257.2.

EPA further noted that several commenters addressed the Agency's interpretation of the statutory language ''may receive.'' One commenter supported the Agency's decision to limit the proposed regulatory requirements to only those non-municipal non-hazardous waste disposal units that receive CESQG wastes. Another commenter, however, stated that a closer reading of section 4010(c) reveals that Congress was not only concerned about modifying the criteria for ''facilities that may receive hazardous household wastes or hazardous wastes from small quantity generators . . .'' but also for ''facilities potentially receiving such wastes.'' According to the commenter, the ''may receive'' clause of the first sentence in section 4010(c) merely refers to whether a facility may legally receive CESQG waste for disposal. The ''potentially receiving such wastes'' clause of the third sentence of Section 4010(c) refers to the actual potential for such facilities to receive CESQG wastes. The potential for CESQG waste to be disposed of at many types of industrial D landfills is high even with the proposed prohibition under § 261.5. It is the ''potentially receiving'' clause that specifically commands the Agency to promulgate provisions for all industrial facilities that could potentially receive CESQG wastes.

EPA disagreed with the commenter's interpretation of the statutory language in RCRA section 4010(c). More specifically, for a number of reasons, the Agency did not believe that the statutory language cited by the commenter evidenced congressional intent that the revised criteria promulgated in the rule should address disposal of solid waste in all industrial disposal facilities. First, EPA believed that the commenter erred by focusing only on the ''facilities potentially receiving'' language in the last sentence of section 4010(c). If one reviews this language together with the statutory language in RCRA section 4010(a), it is clear that Congress did not intend for the revised criteria being promulgated in this rule to apply to all industrial landfills.

RCRA section 4010(a) required EPA to conduct a study of the then existing guidelines and criteria issued under RCRA sections 1008 and 4004 which were applicable to ''solid waste management and disposal facilities, including, but not limited to landfills and surface impoundments.'' 42 U.S.C. 6949a(a). This statutory language does indeed suggest that EPA was to study a wide range of solid waste disposal facilities, including industrial landfills. (As the commenter stated, because the information on industrial disposal facilities was quite limited, EPA's report to Congress did focus on municipal landfills.)

However, the statutory language in section 4010(c) directing EPA to promulgate a rule revising the criteria in 40 CFR part 257 limits the rule's applicability only to those facilities which may receive hazardous

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household waste or small quantity generator waste. 42 U.S.C. 6949a(c). If Congress had intended the revised criteria under section 4010(c) to apply to all solid waste disposal facilities, including industrial landfills and surface impoundments, it clearly could have done so by enacting language similar to that already used in section 4010(a).

Secondly, the legislative history of RCRA section 4010 suggests that Congress expressly rejected a provision that would have required rules to be promulgated under section 4010(c) to apply to the entire universe of RCRA subtitle D solid waste disposal facilities. Indeed, the House version of section 4010 would have required EPA to promulgate revised guidelines and criteria such that they would be applicable to all ''solid waste management and disposal facilities, including, but not limited to landfills and surface impoundments. . . .'' H.R. 2867, section 30, 98th Cong., 1st Sess. (as introduced in the Senate on November 9, 1983). However, the Conference Committee instead adopted a Senate amendment which limited the scope of the revised criteria to those facilities that may receive hazardous household waste or small quantity generator waste. H. Rept. No. 98–1133, 98th Cong., 2d Sess., at 116–117.

Another indication that RCRA section 4010(c) was not intended to cover the entire universe of solid waste disposal facilities is the fact that subsequent to the enactment of section 4010(c) (as part of the Hazardous and Solid Waste Amendments in 1984), a number of bills were introduced in Congress which would have either authorized or required EPA to issue additional regulations that would address all disposal facilities receiving industrial waste as opposed to addressing those which may receive CESQG waste as stated in section 4010(c). See, *e.g.,* H.R. 3735, ''Waste Materials Management Act of 1989,'' section 324 (would have required EPA to promulgate standards for the management of industrial solid waste) (Luken Bill); S. 1113, ''Waste Minimization and Control Act of 1989,'' section 204 (would have required EPA to promulgate requirements for facilities that manage different types of industrial waste) (Baucus Bill). Neither of these provisions (although neither was enacted) would have been necessary if RCRA section 4010(c) required EPA to promulgate revised criteria for all types of industrial disposal facilities. (See 61 FR 34252, 34254–55 (July 1, 1996).)

The commenter on the proposed CCR rule makes essentially the same argument based on the same language in 4010(c) that EPA rejected in the 1996 rule. The commenter provided no legal analysis that contravenes the basis for EPA's interpretation of subtitle D. EPA thus declines to reopen or reconsider this interpretative question. EPA also notes that in any case, information in its record for this rulemaking indicates that CCR landfills or surface impoundments do not actually or potentially receive CESQG wastes.

Nevertheless, EPA recognizes that this regulatory structure gives rise to legitimate concerns about the potential for duplicative or conflicting state and federal regulatory systems. EPA has adopted measures to address these concerns within the confines of the regulatory structure that Congress established in subtitle D. First, EPA has made every effort to ensure that the final rule does not establish any requirements that truly conflict with existing state programs. To clarify, this does not mean that the requirements are necessarily the same, but rather that it is possible to comply with both federal and state requirements simultaneously. Or in other words, compliance with the more stringent standard—whether federal or state—will ensure compliance with the less stringent. Based on the comments received, EPA is aware of no example of a situation in which truly conflicting requirements will exist. Second, as discussed, these regulations do not constrain or direct state action. States can impose more stringent or different requirements, such as requiring a permit. Nor does the regulation require the state to enforce the federal requirements; even with promulgation of the final rule, the decision to bring an action under section 7002 remains entirely within the state's discretion. Third, as discussed in greater detail in Unit IX of this document, EPA has developed a number of measures to clarify the relationship between an individual state program, or particular requirements, and the federal criteria. Specifically, for those states that choose to submit a revised SWMP that incorporates the federal criteria, EPA intends to rely on the existing processes in 40 CFR part 256 relating to approval of SWMPs. EPA expects that approval of a state SWMP, while it cannot prevent a citizen group from filing a lawsuit, will carry substantial weight in any court proceeding charged with determining whether compliance with state requirements constitutes compliance with the federal criteria.

B. Enforceability of the Subtitle D Approach

Numerous commenters raised concern that reliance on a RCRA citizen suit as the basic enforcement mechanism to address non-compliance with the CCR requirements presents environmental justice concerns. Commenters argued that as a practical matter, this self-implementing approach would result in unenforced regulations affecting neighborhoods where environmental, legal, and technical services are unavailable or difficult to obtain. Commenters stated that it would be highly unreasonable for EPA to place the burden of enforcement of the CCR regulations on citizens, arguing that it is EPA's duty to make sure federal regulations protecting human health and the environment are enforced fairly and effectively, and that enforcement by citizen suits puts an unacceptable burden on low income populations located near these facilities. Commenters contended that environmental justice communities were the least likely to mount a serious challenge to the industry because low income people are often less well-educated, have less access to computers and internet technology, are less knowledgeable of how to access and interpret environmental data, and are the least likely to have the resources for a time consuming legal battle. Commenters argued that given the high number of damage cases in this industry, it was clear that the industry cannot police itself and neither can state governments. For these reasons, commenters asserted that the regulations and the enforcement must come from the federal level.

Conversely, other commenters were encouraged by the opportunity to enforce the rule through citizen suits, stating that it would result in very effective regulation since citizens have shown no reluctance to challenge companies that they believe are not responsibly following environmental regulations. Similarly, other commenters noted that other incentives existed to comply with the regulations, including the possibility of state and third party litigation (for both regulatory compliance and actual damages), and the requirements of investors, lenders, and insurers to demonstrate compliance with environmental requirements, *i.e.,* investors and lenders typically condition capital investments and loans on environmental compliance. Commenters also noted that incentives to comply were created by environmental insurance policies, which ''invariably exclude damage claims arising from non-compliance from covered events'' as well as typical corporate policies that call for environmental compliance as a standard operating procedure.

Other commenters focused on the role of the professional engineer in the self-implementing framework, arguing that EPA is requiring the certifying professional to inappropriately take on a quasi-regulatory and enforcement role which places the certifying professional at great risk of being subject to nuisance lawsuits from project opponents, creating a scenario where some professionals may decline to be involved in such reviews. Still other commenters argued with EPA's basic premise that the RCRA subtitle D program lacks federal enforceability. Commenters contended that EPA's concerns about the lack of direct federal enforcement authority failed to recognize the significant enforcement opportunities available under existing law, namely the ''imminent and substantial endangerment authority'' under RCRA section 7003 to take action against any CCR unit that posed a risk to human health and the environment, as well as, the imminent and substantial endangerment authorities under CERCLA, as well as other federal authorities, including the federal Clean Water Act, to address circumstances where a CCR unit posed a threat.

EPA acknowledges that the lack of federal enforcement under Subtitle D presents challenges. However, as discussed above, issuing minimum national standards under the authority that is currently applicable to CCR (*i.e.,* subtitle D) is significantly more protective than the current federal standards in part 257 that apply to these wastes. It is more consistent with EPA's obligations under RCRA to put in place the additional protections that, based on the information currently available, are needed to protect health and the environment. As part of those requirements, EPA has developed a number of provisions designed to facilitate citizens to enforce the rule pursuant to RCRA section 7002. Chief among these is the requirement to publicly post monitoring data, along with critical documentation of facility operations, so that the public will have access to the information to monitor activities at CCR disposal facilities. Moreover, as noted elsewhere, a state seeking EPA's approval for a State SWMP would be required to conduct a public comment process to avail itself of the benefits of an EPA's approval.

EPA also agrees that the Agency retains the authority to bring an action under RCRA section 7003, as well as other statutes, when the facts support the necessary findings. However, an action under section 7003 does not enforce the requirements of this rule. Certainly, EPA believes that the failure to comply with the requirements of the rule increases the probability that an imminent and substantial endangerment may arise, but the fact that a facility has not complied with one or more of the requirements of this rule does not *per se* establish that a section 7003 order is warranted.

The Agency also acknowledges that the self-implementing frameworks could potentially place certifying professionals at risk for lawsuits; several of the performance standards in the proposed rule were adopted from part 258, which were designed to operate in the context of an approved state program, under the oversight of a state regulatory authority, rather than a purely private entity. In part due to this concern, the Agency has re-evaluated the performance standards throughout the final rule, and has revised them where necessary to ensure that the requirements are sufficiently objective and technically precise that a qualified professional engineer will be able to certify that they have been met.

C. Reliance on Certification by Independent Qualified Professional Engineers

As previously discussed, the majority of commenters were highly skeptical of a regulatory approach that substituted state oversight with an owner or operator hiring a consultant or professional, *i.e.,* an independent registered professional engineer or hydrologist, to certify compliance with a federal regulatory requirement and posting that information on an internet site. More specifically, commenters were concerned that relying almost entirely on professional certifications for ensuring regulatory compliance did not seem like a reliable way to provide for protection of human health and or the environment.

As explained in Unit IV.A of this document, EPA is issuing national minimum criteria under subtitle D to put in place the technical requirements the Agency has determined are necessary to protect human health and the environment from the disposal of CCR in surface impoundments and landfills, while the Agency completes its Bevill Determination. EPA is relying on the certification in this context to partially compensate for one of the more significant limitations under the authorities currently applicable to CCR: The lack of any guaranteed regulatory oversight mechanism. However, EPA disagrees that the rules rely ''almost entirely'' on professional engineers to protect human health and the environment. The final rule relies on multiple mechanisms to ensure that the regulated community properly implements requirements in this rule. As one part of this multi-mechanism approach, owners or operators must obtain certifications by qualified individuals verifying that the technical provisions of the rule have been properly applied and met. However, a more significant component supporting EPA's determination that the technical requirements will achieve the level of protection required under section 4004(a) is the performance standards that the rules lay out. These standards impose specific technical requirements, and, even where they provide flexibility, will operate to significantly constrain the facility's activities and discretion. The certifications required by the rule supplement these technical requirements, and while they are important, they are not the sole mechanism ensuring regulatory compliance.

The rule also contains a number of provisions requiring the owner or operator to document their compliance with the rule's technical requirements, and to post those documents on a publically available Web site in a timely and transparent manner. The rule also requires owners or operators to notify State Directors of numerous actions, including that certified demonstrations have been completed. This transparency will facilitate citizen and state oversight and overall enforcement of the requirements. Finally, the rule establishes specific timeframes by which these actions must occur, including timeframes by which facilities must document compliance with the various technical requirements in the rule. Timeframes have been established for: (1) Technical compliance demonstrations made by the owner or operator; (2) certifications made by a qualified professional engineer verifying the technical accuracy and veracity of the compliance demonstration; (3) notifications made to the State Director; (4) submittals (*e.g.,* data, reports and other documentation) to the operating record; and (5) postings to the owner or operator's publicly accessible internet site. Further details pertaining to all of these requirements can be found in the Recordkeeping, Notification, and Posting of Information to the Internet section of the regulations published in this rule.

1. Changes to the Definition of Independent Registered Professional Engineer or Hydrologist

EPA proposed to define ''*independent registered professional engineer or* *hydrologist''* to mean a scientist or engineer who is not an employee of the owner or operator of a CCR landfill or CCR surface impoundment, who has received a baccalaureate or post-graduate degree in the natural sciences or engineering, and who 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 judgment regarding the technical information for which a certification under this subpart is necessary.

Many comments were received on the definition. Some commenters agreed with the proposed definition, but most commenters argued that significant changes were needed. These changes included removing the requirement that the engineer be ''independent,'' adding the word ''qualified,'' and limiting the ability to make certifications to ''licensed'' professional engineers. Still other commenters felt that EPA should broaden the qualifications beyond a professional engineer or hydrologist, to include geologists, hydrogeologists, groundwater scientists or ''other qualified environmental professionals'' among the individuals able to certify regulatory demonstrations.

By far the issue receiving the most comment was whether the Agency should require a professional engineer to be ''independent.'' Commenters disagreed with EPA that the certification must be made by an independent registered professional engineer (*i.e.,* not an employee of the owner or operator of the CCR unit). Commenters argued that most utilities employ a number of professional engineers that typically possess the most relevant experience and knowledge about the unit, and that company-employed engineers and hydrologists were in a much better technical position to certify technical provisions of the rule were being met. Furthermore, commenters asserted that these professionals would be subject to the same state registration and licensing requirements as those not employed by the facility and would have an equally strong incentive to maintain their licenses in good standing as those that are independent of the utility. These commenters also pointed to several EPA rulemakings in which EPA allowed ''qualified'' professional engineers to make the kind of certifications contemplated by this rulemaking, without requiring that they be ''independent.'' Commenters also contended that state licensing and registration programs help to ensure that all professionals exercise proper judgment or ''independence'' regarding the operation of CCR landfills and CCR surface impoundments. Similarly, commenters claimed that a professional engineer without the required expertise would refuse to make any certifications for which they were not qualified. Some commenters suggested that EPA provide some criteria requiring demonstrated experience and training. Commenters also took issue with the fact that the definition focused entirely on groundwater hydrology and failed to include training or experience in other areas that would also be necessary to effectively certify specific technical criteria of the rule (*e.g.,* structural integrity, composite liner design).

The definition EPA proposed for ''independent registered professional engineer or hydrologist,'' focused on three components that were intended to define the minimum qualifications necessary to independently verify that a specific technical standard was met and to provide sufficient objectivity to reduce the opportunity for abuse. These components were: (1) The individual was a scientist or engineer by academic training or education; (2) the individual was not an employee of the owner or operator of the CCR unit; and (3) the individual had sufficient training in groundwater hydrology or related fields. The proposed definition did not require the individual to be a licensed professional engineer or hydrologist; instead the Agency prohibited the individual providing the certification from being an employee of the owner or operator of the CCR unit, reasoning that this requirement would provide some degree of independent verification of facility practices.[37] The Agency stated that the availability of meaningful independent verification was critical to EPA's ability to conclude that the performance standards laid out in the proposed rule would meet the RCRA section 4004 protectiveness standard.

In the course of developing this final rule, the Agency concluded that it needed to better define the connection between the technical requirements of the rule and the technical qualifications an individual must possess to certify the demonstrations being made by the owner or operator of the CCR unit. In doing so, the Agency looked for direction in the following rules, the ''Resource Conservation and Recovery Act (RCRA) Burden Reduction Initiative'' (71 FR 16826, April 4, 2006) and the ''Oil Pollution Prevention and Response; Non-Transportation-Related Onshore and Offshore Facilities rule (67 FR 47042, July 17, 2002). In both of these actions, the Agency had come to similar conclusions. First, that professional engineers, whether independent or employees of a facility, being professionals, will uphold the integrity of their profession and only certify documents that meet the prescribed regulatory requirements; and that the integrity of both the professional engineer and the professional oversight of boards licensing professional engineers are sufficient to prevent any abuses. (For an example see: 67 FR 47084, July 17, 2002.) And second, that in-house professional engineers may be the persons most familiar with the design and operation of the facility and that a restriction on in-house professional certifications might place an undue and unnecessary financial burden on owners or operators of facilities by forcing them to hire an outside engineer.

Reviewing these other regulatory actions and the Agency's rationale for making its decisions, has led the Agency to a similar conclusion with regard to this rule—that it is unnecessary to require the individual making certifications under this rule to be ''independent.'' Thus the final rule does not prohibit an employee of the facility from making the certification, provided they are a professional engineer that is licensed by a state licensing board. The personal liability of the professional engineer provides strong support for both the requirement that certifications must be performed by licensed professional engineers, and for removing the requirement that the engineer be ''independent.''

While other commenters argued that the word ''independent'' should be retained because an independent review and certification avoids any potential of conflict of interest, the Agency is convinced that an employee of a facility, who is a qualified professional engineer and who has been licensed by a state licensing board would be no more likely to be biased than a qualified professional engineer who is not an employee of the owner or operator. Moreover, it is not clear that an in-house engineer faces a greater economic temptation than an independent

[37] While the definition did not require the independent registered professional engineer or hydrologist to be licensed, the preamble did state that EPA expects that professionals in the field will have adequate incentive to provide an honest certification, given that the regulations require that the engineer not be an employee of the owner or operator of the CCR landfill or CCR surface impoundment, and that they operate under penalty of losing their license, implying that the professional was, in fact, licensed. This narrative and the title of independent registered professional engineer caused many commenters to assume that the certifiers indeed had to be licensed professional engineers. (See 75 FR 35194, June 21, 2010.)

engineer seeking to cultivate an ongoing relationship with a client. EPA has concluded that the programs established by state licensing boards provide sufficient guarantees that a professional engineer, regardless of whether he/she is ''independent'' of the facility, will give a fair technical review.

As an additional protection, the Agency has re-evaluated the performance standards throughout the final rule to ensure that the requirements are sufficiently objective and technically precise that a qualified professional engineer will be able to certify that they have been met.

The Agency agrees with concerns that a professional engineer may not be qualified to address all the varied aspects of CCR landfill and CCR surface impoundment design, and has amended the definition to clarify and strengthen the qualifications of the individual authorized to certify the technical demonstrations under the rule. In the proposed rule, the Agency did not require an independent registered professional engineer to be licensed, only that they be an engineer or hydrologist who had received a baccalaureate or post graduate degree in the natural sciences with training and experience in groundwater hydrology or a related field. While the term ''independent registered professional engineer or hydrologist'' conveyed to some commenters that the individual was in fact ''licensed,'' the definition in the proposal did not require it. Furthermore, as noted by commenters, the proposed definition focused primarily on hydrogeology expertise and did not include training and experience qualifications necessary to accurately certify some of the requirements being promulgated in the rule, *e.g.,* landfill and surface impoundment design and construction, structural stability assessments, analysis of unstable areas. In reviewing this proposed requirement, the Agency has determined that specifying exact qualifications and or experience for the professional engineer is neither necessary nor practical, given the range of technical specifications that will require certification. EPA has therefore adopted a more succinct requirement focused on the professional engineer's qualifications to perform the task or certification.

In making this change, the Agency was again strongly influenced by the ''Resource Conservation and Recovery Act (RCRA) Burden Reduction Initiative'' rule. (See 71 FR 16826, April 4, 2006.) In that rule, EPA amended the majority of RCRA provisions requiring the certification of an ''independent, qualified, registered, professional engineer'' to substitute the phrase, a ''qualified professional engineer,'' reasoning that a requirement for a qualified professional engineer maintains the most important components of any certification requirement: (1) That the engineer be qualified to perform the task based on training and experience; and (2) that she or he be a professional engineer licensed to practice engineering under the title Professional Engineer which requires following a code of ethics with the potential of losing his/her license for negligence (see 71 FR 16868.)

In the ''Burden Reduction Rule'' the Agency concluded that a professional engineer is able to give fair and technical review because of the oversight programs established by the state licensing boards that will subject the professional engineer to penalties, including the loss of license and potential fines if certifications are provided when the facts do not warrant it. In fact, this personal liability of the professional engineer is one of the primary reasons that commenters to the ''Burden Reduction Rule'' supported the idea that RCRA certifications should only be done by licensed professional engineers (See 71 FR 16868.) Upon further analysis and reflection, the Agency sees no reason to deviate from the position EPA held in that rule. Despite some concerns raised by commenters that problems could occur if an owner or operator hires an engineering firm that is small, inexperienced, or operating outside of their past professional practice, the Agency continues to believe that with the protections afforded by the specific performance standards in this rule and the standards and ethics to which a qualified professional engineer is subject, situations in which an unqualified or un-licensed engineer certifies a technical demonstration will be avoided. Furthermore, it is important to reiterate that state licensing boards can investigate complaints of negligence or incompetence on the part of professional engineers, and may impose fines and other disciplinary actions, such as cease-and-desist orders or license revocation. (See 71 FR 16868.) In light of the third party oversight provided by the state licensing boards in combination with the numerous recordkeeping and recording requirements established in this rule, the Agency is confident that abuses of the certification requirements will be minimal and that human health and the environment will be protected.

The Agency wants to make it clear that qualified professional engineers can utilize a qualified team of professionals in performing the analyses that underlie these certifications. In most instances, EPA expects that the basis for certification by a qualified professional engineer will be the result of a team of professionals (*e.g.,* geologists, hydrologists, scientists and engineers) who have collectively worked together in order to provide the data and analyses necessary for the professional engineer to certify the specific demonstration.

The Agency is convinced that the change to the certification requirements to allow the use of in-house expertise will not compromise environmental safety. Professional engineers employed by a facility are more familiar with the facility's particular situation and are in a position to provide more on-site review and oversight of the activity being certified. To this end, the Agency is also requiring that the qualified professional engineer be licensed in the state in which the CCR unit is located. The Agency has made this decision for a number of reasons, but primarily because state licensing boards can provide the necessary oversight on the actions of the professional engineer and investigate complaints of negligence or incompetence as well as impose fines and other disciplinary actions such as cease-and-desist orders or license revocation. Oversight may not be as rigorous if the professional engineer is operating under a license issued from another state.

Finally, the Agency disagrees with comments that professional geologists or geoscientists should be added to the list of those professionals that have expertise and authority to certify compliance with certain RCRA subtitle D regulatory requirements. In developing this final rule, the Agency has re-considered the qualifications necessary to certify compliance with the technical requirements of the rule and is limiting compliance certifications to qualified professional engineers only. While some environmental professionals, *e.g.,* hydrologists, geologists may be qualified to make certain certifications, EPA is not convinced that hydrologists or geologists licensed by a state are held to the same standards as a professional engineer licensed by a state licensing board. For example, it is unclear that hydrologists or geologists are subject to the rigorous testing required by professional engineers or that state licensing boards can investigate complaints of negligence or incompetence. Further, professional engineers have licensing boards in all 50 states, a standard not achieved by other professional disciplines. Consequently, hydrologists, geologists, or other professionals may only perform analyses that underlie the certification, but it is the responsibility of a qualified professional engineer to make the actual certification.

D. State and Public Notifications of Certifications

To address concerns about the absence of adequate regulatory oversight under subtitle D, EPA proposed to require state and public notifications of the third party certifications, as well as other information documenting the decisions made or actions taken by the owner or operator to comply with the technical criteria in the rule. As stated in the proposal and reiterated here, the Agency cannot conclude that the regulations promulgated in this rule will ensure there is no reasonable probability of adverse effects on health or the environment unless there is a mechanism for states and citizens, as the entities responsible for enforcing the rule, to effectively monitor or oversee its implementation. Mandated documentation and transparency of the owner or operator's actions to comply with the rule provides this mechanism, and will help to minimize the potential for abuse. The proposal specified that the documentation of how the various technical standards had been met were to be placed in the facility's operating record, along with notification to the appropriate state authority. Additionally, EPA proposed to require the owner or operator to maintain a Web site available to the public that would also provide access to this documentation. EPA proposed that owners or operators post notices and relevant information on the internet site with a link clearly identified as being a link to notifications, reports, and demonstrations required under the regulations. While EPA recognized that the internet is currently the most widely accessible means for gathering and disseminating information, the Agency also solicited comments regarding alternative methods to provide notifications to the public and the states. The Agency also solicited comment on whether to require the establishment of a publicly accessible internet site to provide regulatory information to the public and the states, including whether there could be homeland security implications associated with internet posting of information, and whether the posting would duplicate information that is already available to the public through the state.

In response to most of these proposals, the Agency received little comment. Significant comment, however, was received on the publicly accessible internet site. Commenters argued that absent specific statutory authorization, it was inappropriate for EPA to delegate a regulatory oversight function to the regulated community by requiring the creation of a Web site and posting of regulatory compliance information. Commenters identified at least three substantial problems associated with ''outsourcing information management responsibilities'' to CCR facilities. First, commenters argued that EPA lacked the authority to impose such a requirement. Specifically, the commenters alleged that no statute authorizes EPA to demand that private parties act as an information clearinghouse for information pertaining to EPA's regulatory functions, either generally or in the specific context of CCR. To the contrary, the commenters argued, public information access statutes, such as the Freedom of Information Act are predicated on an assumption that information held by the government is presumptively public, while information held by a private entity presumptively is not.

Second, some commenters were concerned that facilities would not post information the facility deems to be confidential (*e.g.,* the structural stability of ash pond impoundments) and by attempting to outsource the information management role to industry, EPA effectively allows industry to make the initial determination as to confidentiality and places the burden on citizens and EPA to take action to compel disclosure.

Third, commenters were concerned that citizen groups would not accept an electric utility's self-reported information, regardless of the amount of effort the facility exerts to ensure the accuracy of the information, without a regulatory agency acting as the intermediary or providing some degree of oversight (*e.g.,* EPA's Toxic Release Inventory, EPA's Biennial Report of hazardous waste facilities). By requiring citizen groups to obtain their information from industry instead of a regulator, the commenters argued that EPA is inviting conflict as to the adequacy of data and the sufficiency of the utilities' responses to citizen groups' requests for clarification or additional information. The fact that the industry has provided information to a federal agency, subject to criminal penalties for providing false information, provides a useful public assurance of the integrity of the information.

Other commenters stated that the proposed requirement to maintain a Web site was excessive, and generated a regulatory burden upon companies that serves no useful function. Commenters urged that the same purpose could be served simply through making the certification of the registered professional engineer available on the Web site. Other commenters argued that internet posting of information on a surface impoundment's construction raised homeland security issues. These commenters alleged that the information ''can be extremely sensitive and may contain information that could be used by certain individuals with an intent to destroy a dam (*e.g.,* engineering information on the structure's foundation, detailed information on physical and engineering properties, the basis for the structure hazard classification, slope stability information, etc.).''

Finally, some commenters offered an alternative to the requirement to establish and maintain a publicly accessible internet site. Under this alternative the information would be included in the owner or operator's operating record only, and persons with ''legitimate interests in reviewing these data'' could make a written request to the owner or operator or the permitting authority to obtain the information. The commenters alleged that this would also allow the owner, operator, and federal and state authorities to know the names and identities of all organizations requesting information on the facility, which would help protect against the misuse of these data.

EPA disagrees that RCRA section 4004(a) does not authorize EPA to require facilities to disclose all of the information required under these final rule provisions. Section 4004(a) delegates broad authority to EPA to establish criteria governing facilities' management of solid waste, requiring only that such criteria ensure that there will be no reasonable probability of adverse effects on health or the environment from the disposal of solid waste. The statute imposes no limits on the actions EPA may require facilities to perform to achieve that level of protection. Moreover, unlike other statutes, *e.g.,* the Toxic Substances Control Act, or the Federal Insecticide, Rodenticide and Fungicide Act, RCRA contains neither provisions that grant facilities the right to withhold regulatory compliance information from the public, nor provisions that establish any reasonable expectation that such information will be kept confidential. To the contrary, section 7004 explicitly provides that ''[p]ublic participation in the . . . implementation, and enforcement of any regulation under this chapter shall be provided for, encouraged, and assisted by the Administrator.'' 42 U.S.C. 6974(b). And in fact, this kind of information would routinely be publically available under the permitting process for hazardous waste facilities. Accordingly, RCRA provides more than ample authority to support these requirements.

As repeatedly discussed throughout this preamble, under section 4004(a) EPA must be able to demonstrate, based on the record available at the time the rule is promulgated that the final rule provisions will achieve the statutory standard. EPA explained in the proposal that a key component of EPA's support for determining that the rule achieves the statutory standard is the existence of a mechanism for states and citizens to monitor the situation, such as when groundwater monitoring shows evidence of potential contamination, so that they can determine when intervention is appropriate. The existence of effective oversight measures provides critical support for the statutory finding, particularly with respect to some of the more flexible alternatives EPA has adopted in certain of the technical standards in response to commenters' requests for greater flexibility. These ''transparency'' requirements serve as a key component by ensuring that the entities primarily responsible for enforcing the requirements have access to the information necessary to determine whether enforcement is warranted. Unlike a federal or state regulatory authority, private citizens cannot access a private facility to conduct inspections. While EPA encourages states to adopt and implement a CCR regulatory program, and seek EPA's approval of it via a state SWMP, EPA cannot require it. The final rule therefore must establish oversight mechanisms that will function effectively even in the absence of a state regulatory authority.

Such notifications will also reduce the incentives for owners or operators to abuse the rule's self-implementing requirements, and can improve compliance. Indeed, the public disclosure of information is an increasingly common and important regulatory tool, as evidenced by the 2010 guidance issued by the Office of Management and Budget (OMB), with principles to assist agencies in using information disclosure to achieve regulatory objectives.

Thus, even if the commenters were correct that there exists a general ''presumption'' that information held by private entities need not be made publically available, that presumption can be, and has been, effectively rebutted by the facts at hand.

None of the alternatives offered by the commenters would fulfill these same objectives. For example, simply making the certification of the qualified professional engineer available on the Web site without the underlying support information fails to provide the same incentives because no one could evaluate the accuracy of that certification. This alternative could also present the same concerns raised in comments on other sections of the rule, *i.e.,* that such a requirement could place the engineer at great risk of being subject to lawsuits. Requiring persons with ''legitimate interests in reviewing these data'' to request the data from the owner or operator also fails to provide an effective guarantee, as facilities that have failed to comply will have a strong incentive to withhold information documenting their non-compliance, however ''legitimate'' the request. And as noted, the absence of a guaranteed state permitting program means that requiring citizens to request information from such entities is also not a viable alternative. Given the absence of a guaranteed regulatory authority, EPA also disagrees that posting such information on a company internet site is necessarily duplicative, particularly in those states that have no regulatory program for controlling CCR. In addition, state requirements, whether pursuant to permits or other regulatory mechanisms, may not necessarily correspond to the requirements of this rule.

EPA acknowledges that parties may be suspicious of information self-reported by regulated entities. However, it is important to remember that facilities that provide information in compliance with these regulation remain subject to the penalties for providing false information under 18 U.S.C. 1001, even though the information will not be submitted to EPA. For example, the Tenth Circuit has held that federal jurisdiction lies under 18 U.S.C. 1001 when a defendant has submitted false information to a state delegated to enforce a federal environmental statute. *United States* v. *Wright,* 988 F.2d 1036 (10th Cir. 1993) (defendant submitted false monitoring reports required by the Safe Drinking Water Act to Oklahoma officials). This is consistent with rulings in other areas that the false statement need not be made directly to the federal government. *United States* v. *Uni Oil Co.,* 646 F.2d 946, 954–55 (9th Cir. 1981); *see also United States* v. *Patullo,* 709 F.2d 1178, 1180 (7th Cir. 1983); *United States* v. *Ross,* 77 F.3d 1525, 1544 (7th Cir. 1996) (''This court has repeatedly found the submission of a fraudulent statement to a private (or non-federal government) entity to be within the jurisdiction of a federal agency where the agency has given funding to the entity and fraudulent statements cause the entity to utilize the funds improperly.''). As commenters recognized, the potential for criminal penalties under 18 U.S.C. 1001 provides a significant guarantee, as well as a strong incentive for compliance.

EPA also disagrees with the comments raising concern about the homeland security implications of posting information on a CCR surface impoundment's construction, as it relates to structural stability. Much of the information relevant to an impoundment's structural stability is currently available through Google Earth or through EPA's Web site. For example, EPA's Web site currently provides access to all of the information from the responses to EPA's original 104(e) information requires and the information obtained through the CCR Assessment Program. This information can be accessed at the following pages: *http://www.epa.gov/osw/nonhaz/industrial/special/fossil/surveys/index.htm*, *http://www.epa.gov/osw/nonhaz/industrial/special/fossil/surveys2/index.htm*, and *http://www.epa.gov/osw/nonhaz/industrial/special/fossil/ccrs-fs/index.htm.* Moreover, the Department of Homeland Security has cleared both the internet posting of all of the information currently on EPA's Web site, as well as, in general, information on the design, hydraulic parameters, volume of contained liquids and solids, and hazard rating of all major CCR surface impoundments across the U.S.

VI. Development of the Final Rule—Technical Requirements

A. Applicability

EPA proposed general provisions to identify those solid waste disposal units subject to the proposed RCRA subpart D requirements (*i.e.,* CCR landfills and CCR surface impoundments as defined under proposed § 257.40(b)). The applicability section also identified three of the existing subpart A criteria that would continue to apply to these facilities: § 257.3–1 *Floodplains,* § 257.3–2 *Endangered Species,* and § 257.3–3 *Surface Water.* Consistent with RCRA section 4004(c), EPA specified an effective date of 180 days after publication of the final rule.

The Agency received numerous comments on this part of the rule. In general, commenters were concerned with three specific areas. First, commenters requested additional clarification as to the specific sources of CCR that would be subject to the requirements of the rule, *i.e.,* CCR generated by the electric utilities and independent power producers. Second, commenters requested clarification on the applicability of the proposed regulations to MSWLFs disposing of CCR and third, the definition and status of ''uniquely associated wastes.'' Uniquely associated wastes are addressed in Unit XIII of this preamble. EPA also received numerous comments regarding the proposal to apply the rule to ''inactive'' CCR surface impoundments that had not completed closure prior to the effective date of the rule.

EPA is finalizing minimum national criteria that apply to owners and operators of new and existing CCR landfills and CCR surface impoundments, including any lateral expansions of these units that dispose, or otherwise conduct solid waste management of CCR generated from the combustion of coal at electric utilities and independent power producers. The rule applies only to CCR units at ''active'' electric utilities and independent power producers, *i.e.,* those that generate electricity, regardless of the fuel currently used to produce electricity. However, disposal units at facilities that are ''closed''—*i.e.,* the entire facility has been permanently taken out of service and no longer produces electricity—are outside of the scope of this rule.

Unless otherwise provided, the rule applies to CCR units located both on-site and off-site of the electric utility or independent power producer.

1. CCR Generated by Non-Utility Boilers

The requirements of this rule do not apply to wastes, including fly ash, bottom ash, boiler slag, and FGD materials generated at facilities that are not part of the electric power sector or an independent power producer and that use coal as the fuel in non-utility boilers, such as manufacturing facilities, universities, and hospitals. 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 any excess may be sold in the wholesale market. According to the Energy Information Administration (EIA), CHPs produced less than one percent of the total electricity generated from coal combustion in 2013 and, similarly, burned less than one percent of the total coal consumed for electricity generation or less than 5 million tons (*http://www.eia.gov/electricity/data.cfm*).

EPA never proposed to include these wastes in the rule because EPA lacked critical data from these facilities that would allow us to address key Bevill criteria (see 75 FR 35165). These other industries, and the manufacturing industries in particular, generate other types of wastes which are likely to be mixed or co-managed with the CCR at least at some facilities. As a result, the chemical compositions of the co-managed wastes are likely to be fundamentally different from the chemical composition of CCR generated by electric utilities or independent power producers. In addition, EPA noted that insufficient information was available on non-utility boilers burning coal to determine whether a regulatory flexibility analysis would be required under the Regulatory Flexibility Act, and to conduct one if it is necessary. Without such data, we were unable to fully assess CCR wastes from non-utility operations and indicated that we would decide on an appropriate course of action for these wastes after completing this rulemaking (see 75 FR 35129).

Several commenters stated that EPA's decision to propose limiting the scope of the rule only to CCR generated by the electric power sector (electric utilities and independent power producers) was arbitrary. These commenters claimed that CCR generated by the electric power sector and CCR generated by non-utilities are generally comparable in physical and chemical composition and are typically managed similarly. As a result, these commenters suggested that EPA amend the applicability of the rule to subject all facilities that generate CCR to the same disposal requirements. EPA also received comments maintaining that important differences exist between CCR generated by electric power sector facilities and non-utility facilities, and that supported EPA's proposed decision to exclude CCR generated by non-utilities from the rule. Differences identified by the commenters included waste management issues (*e.g.,* mixing and subsequent co-management of non-utility CCR and other industrial wastes generated by non-utilities), CCR generation rates, CCR management unit design, and CCR management unit operation. In response to our request for additional information, a few commenters provided either waste characterization data for non-utility CCR or information on alleged damage cases involving non-utility CCR.

Based on the proposed rule, EPA cannot include these facilities in this final rule, even if the Agency had concluded that it had received the necessary information from commenters. EPA specifically stated its intention to exclude them, and clearly stated that it had not assessed the operations. (See 75 FR 35166.) The Agency provided no indication of any intention to include such facilities, and did not solicit comment on such an option. Moreover, under the Administrative Procedure Act, the public must be given the opportunity to comment on not only the information that would support such an action, but also EPA's evaluation of that information, and the reasoning behind the Agency's decision. And with respect to this subset of facilities, no such opportunity has been presented. EPA will consider the information provided by commenters at a future point, and will determine whether the information is sufficient to address key Bevill criteria and to decide on the appropriate regulatory scheme for disposal of CCR generated by non-utilities. Accordingly, this rule does not apply to owners and operators of landfills and surface impoundments in which CCR are disposed that were generated by non-utility boilers burning coal.

2. CCR Generated Primarily From the Combustion of Fuels Other Than Coal

These requirements also do not apply to fly ash, bottom ash, boiler slag, and flue gas desulfurization materials, generated primarily from the combustion of fuels (including other fossil fuels) other than coal, for the purpose of generating electricity unless the coal comprises more than fifty percent (50%) of the fuel burned on a total heat input or mass input basis, whichever results in the greater mass feed rate of coal (see § 266.112). Fuel mixtures that contain less than 50% coal are not considered to be CCR, but other fossil fuel wastes. Other fossil fuels that are typically co-combusted with coal are oil and natural gas. In the May 22, 2000 Regulatory Determination, EPA determined that it is not appropriate to establish national regulations applicable to oil combustion wastes (OCW) because: (1) We found in most cases that OCW, whether managed alone or co-managed, are rarely characteristically hazardous; (2) we have not identified any beneficial uses that are likely to present significant risks to human health or the environment; (3) we identified no significant ecological risks posed by land disposal of OCW; (4) we identified only one documented damage case involving OCW in combination with coal combustion wastes, and it did not affect human receptors; and (5) except for two unlined surface impoundments, we have not identified any significant risks to human health and the environment associated with any waste management practices. Similarly, EPA determined that regulating natural gas combustion wastes is not warranted because the burning of natural gas produces virtually no solid waste. Therefore, the Agency has determined that regulations for wastes generated primarily from the combustion of fuels (including other fossil fuels) other than coal are not warranted unless the fuel mixture consists primarily of coal.

3. Placement of CCR in Minefilling Operations

Consistent with the approach in the proposed rule, this rule does not apply to CCR placed in active or abandoned underground or surface coal mines. The U. S. Department of Interior (DOI) and EPA will address the management of CCR in minefills in a separate regulatory action(s). EPA 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 CCR 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 (CCR) in Mines,'' which is available at *http://books.nap.edu/openbook.php?isbn=0309100496*.

The report concluded that the ''placement of CCR 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 CCR 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.

4. Municipal Solid Waste Landfills

The issue receiving the majority of comment in this section focused on the applicability of the rule to MSWLFs accepting CCR. The vast majority of commenters on this issue requested that EPA clarify that permitted MSWLFs, receiving CCR as daily cover or for disposal were not covered by the rule.

While most CCR is currently disposed of at electric utility owned CCR landfills or surface impoundments, there is no prohibition against disposing of CCR in state-permitted MSWLFs. However, many commenters interpreted the proposed CCR subtitle D regulations to apply to a state permitted MSWLF disposing of CCR, which as a consequence would be subject to the additional burden of posting documentation to a Web site, having a professional engineer review certification, etc. (See 75 FR 35210, where the preamble states that under a subtitle D regulation, regulated CCR wastes shipped off-site for disposal would have to be sent to facilities that meet the standards above.) Commenters argued that since MSWLFs were never mentioned in the proposed rule, that it should be made clear that the rule did not apply to these facilities. Commenters further contended that since the requirements for CCR landfills were directly modeled from the MSWLF requirements found at 40 CFR part 258, disposal in MSWLFs would be protective of human health and the environment. Commenters also contended that a benefit of MSWLFs would be their ability to provide additional capacity for the disposal of CCR as utilities seek to close, upgrade, or develop their own compliant CCR disposal sites.

EPA recognizes that there are MSWLFs that either accept CCR for disposal, use CCR for as daily cover, or both. Since the proposed and final RCRA subtitle D standards for CCR landfills are modeled after the standards for MSWLFs found at 40 CFR part 258, EPA has concluded that disposal of CCR in MSWLFs is as protective as disposal in a CCR landfill and that permitted MSWLFs are not subject to the requirements of this rule. Like the MSWLF requirements, the CCR technical criteria require new units to have composite liners or their equivalent, and all units are subject to location restrictions, run-on and run-off controls, fugitive dust controls, groundwater monitoring and corrective action, closure and post-closure care requirements.[38]

While the MSWLF fugitive dust criteria (air criteria) are not as specific as those in this rule, § 258.4(a) states that owners or operators of all MSWLFs must ensure that the units not violate any applicable requirements developed under a State Implementation Plan (SIP) approved or promulgated by the Administrator pursuant to section 110 of the Clean Air Act, as amended. It is expected that states will impose additional requirements to address fugitive dusts, of the sort codified in Illinois' 415 ILCS 5/9(a)(2012)[39] and enforced by the state (see *People of the State of Illinois* v. *KCBX Terminals Company,* Injunction no. 2013CH24788 in the Circuit Court of Cook County, Illinois. Moreover, if used as a daily cover, § 258.21 requires that the alternative cover (*i.e.,* CCR) control disease, vectors, odors, blowing litter, and scavenging without presenting a threat to human health and the environment.

The Agency is not requiring MSWLFs that receive CCR for disposal or for use as daily cover to modify their groundwater monitoring programs to comply with the rule; however the Agency expects that State Directors will require MSWLFs to modify their MSWLF permits to address the addition of CCR to the unit as it relates to groundwater monitoring and corrective action. Section 258.54(a)(2) allows for the Director of an approved state to establish an alternative list of inorganic indicator parameters for a MSWLF unit if the alternative parameters provide a reliable indication of inorganic releases

[38] One significant difference however is that MSWLFs are required to have financial assurance, a requirement not applicable to CCR under the subtitle D requirements.

[39] ''No person shall (a) Cause or threaten or allow the discharge or emission of any contaminant into the environment in any state so as to cause or tend to cause air pollution in Illinois, either alone or in combination with contaminants from other sources, or so as to violate regulations or standards adopted by the Board under this Act; (b) Construct, install or operate any equipment, facility, vehicle, vessel, or aircraft capable of causing or contributing to air pollution or designed to prevent air pollution, of any typed designated by Board regulations, (1) without a permit granted by the Agency unless otherwise exempt by this Act or Board regulations; or (2) in violation of any conditions imposed by such permit.''

from the MSWLF unit to the groundwater (*i.e.,* as would be the case if CCR was disposed in the MSWLF unit). In determining alternative parameters, the Director shall consider, among other things: (1) The types, quantities, and concentrations in wastes managed at the MSWLF unit; (2) the mobility, stability, and persistence of waste constituents or their reaction products in the unsaturated zone beneath the MSWLF unit; and (3) the detectability of indicator parameters, waste constituents, and reaction products in the groundwater. In situations where the MSWLF unit is receiving CCR for disposal and/or daily cover, EPA expects the controlled management of CCR in these units. Specifically, EPA expects State Directors to utilize the provisions in § 258.54(a)(2) to revise the detection monitoring constituents to include those constituents being promulgated in this rule under § 257.90. These detection monitoring constituents or inorganic indicator parameters are: boron, calcium, chloride, fluoride, pH, sulfate and total dissolved solids (TDS). These inorganic indicator parameters are known to be leading indicators of releases of contaminants associated with CCR and the Agency strongly recommends that State Directors add these constituents to the list of indicator parameters to be monitored during detection monitoring of groundwater if and when a MSWLF decides to accept CCR.

The Agency has concluded that CCR can readily be handled in permitted MSWLFs provided that they are evaluated for waste compatibility and placement as required under the part 258 requirements. Furthermore, consistent with the recordkeeping requirements in § 258.29, the Agency further expects State Directors to encourage MSWLF units receiving CCR after the effective date of this rule to do so pursuant to a ''CCR acceptance plan'' that is maintained in the facility operating record. This plan would assure that the MSWLF facility is aware of the physical and chemical characteristics of the waste received (*i.e.,* CCR) and handles it with the additional precautions necessary to avoid dust, maintain structural integrity, and avoid compromising the gas and leachate collection systems of the landfill so that human health and the environment are protected. While the Agency sees no need to impose duplicative requirements for MSWLFs that receive CCR for disposal or daily cover; development of these acceptance plans as well as a revised list of groundwater detection monitoring constituents will help ensure that CCR is being managed in the most protective manner consistent with the Part 258 requirements.

5. Inactive CCR Surface Impoundments

The final rule also applies to ''inactive'' CCR surface impoundments at any active electric utilities or independent power producers, regardless of the fuel currently being used to produce electricity; *i.e.,* surface impoundments at any active electric utility or independent power producer that have ceased receiving CCR or otherwise actively managing CCR. While it is true that EPA exempted inactive units from the part 258 requirements in 1990, the original subtitle D regulations at 40 CFR part 257 (which are currently applicable to CCR wastes) applied to ''all solid waste disposal facilities and practices'' except for eleven specifically enumerated exemptions (none of which are relevant). 40 CFR 257.1(c). See also, 40 CFR 257.1(a)(1)–(2). And as discussed in greater detail below, subtitle D of RCRA does not limit EPA's authority to active units—that is, units that receive or otherwise manage wastes after the effective date of the regulations. EPA has documented several damage cases that have occurred due to inactive CCR surface impoundments, including the release of CCR and wastewater from an inactive CCR surface impoundment into the Dan River which occurred since publication of the CCR proposed rule. As discussed in the proposal, the risks associated with inactive CCR surface impoundments do not differ significantly from the risks associated with active CCR surface impoundments; much of the risk from these units is driven by the hydraulic head imposed by impounded units. These conditions remain present in both active and inactive units, which continue to impound liquid along with CCR. For all these reasons, the Agency has concluded that inactive CCR surface impoundments require regulatory oversight.

The sole exception is for ''inactive'' CCR surface impoundments that have completed dewatering and capping operations (in accordance with the capping requirements finalized in this rule) within three years of the publication of this rule. EPA considers these units to be analogous to inactive CCR landfills, which are not subject to the final rule. As noted, EPA's risk assessment shows that the highest risks are associated with CCR surface impoundments due to the hydraulic head imposed by impounded water. Dewatered CCR surface impoundments will no longer be subjected to hydraulic head so the risk of releases, including the risk that the unit will leach into the groundwater, would be no greater than those from CCR landfills. Similarly, the requirements of this rule do not apply to inactive CCR landfills—which are CCR landfills that do not accept waste after the effective date of the regulations. The Agency is not aware of any damage cases associated with inactive CCR landfills, and as noted, the risks of release from such units are significantly lower than CCR surface impoundments or active CCR landfills. In the absence of this type of evidence, and consistent with the proposal, the Agency has decided not to cover these units in this final rule.

Under both the subtitle C and subtitle D options, EPA proposed to regulate ''inactive'' CCR surface impoundments that had not completed closure prior to the effective date of the rule. EPA proposed that if any inactive CCR surface impoundment had not met the interim status closure requirements (*i.e.,* dewatered and capped) by the effective date of the rule, the unit would be subject to all of the requirements applicable to CCR surface impoundments. Under the subtitle C option, those requirements would have included compliance with the interim status and permitting regulations. Under subtitle D, such units would have been required to comply with all of the criteria applicable to CCR surface impoundments that continued to receive wastes, including groundwater monitoring, corrective action, and closure.

EPA acknowledged that this represented a departure from the Agency's long-standing implementation of the regulatory program under subtitle C. While the statutory definition of ''disposal'' has been broadly interpreted to include passive leaking, historically EPA has construed the definition of ''disposal'' more narrowly for the purposes of implementing the subtitle C regulatory requirements. For examples see 43 FR 58984 (Dec. 18, 1978); and 45 FR 33074 (May 1980). Although in some situations, post-placement management has been considered to be disposal triggering RCRA subtitle C regulatory requirements, *e.g.,* dredging of impoundments or management of leachate, EPA has generally interpreted the statute to require a permit only if a facility treats, stores, or actively disposes of the waste after the effective date of its designation as a hazardous waste. EPA explained that relying on a broader interpretation was appropriate in this instance given that the substantial risks associated with currently operating CCR surface impoundments, *i.e.,* the potential for leachate and other releases to contaminate groundwater and the potential for catastrophic releases from structural failures, were not measurably different than the risks associated with ''inactive'' CCR surface impoundments that continued to impound liquid, even though the facility had ceased to place additional wastes in the unit. EPA noted as well that the risks are primarily driven by the older existing units, which are generally unlined.

In the section of the preamble discussing the subtitle D option, EPA did not expressly highlight the application of the rule to inactive CCR surface impoundments, but generally explained that EPA's approach to developing the proposed subtitle D requirements for surface impoundments (which are not addressed by the part 258 regulations that served as the model for the proposed landfill requirements) was to seek to be consistent with the technical requirements developed under the subtitle C option. (See 75 FR 35193.) (''In addition, EPA considered that many of the technical requirements that EPA developed to specifically address the risks from the disposal of CCR as part of the subtitle C alternative would be equally justified under a RCRA subtitle D regime . . . The factual record—*i.e.,* the risk analysis and the damage cases—supporting such requirements is the same, irrespective of the statutory authority under which the Agency is operating . . . Thus several of the provisions EPA is proposing under RCRA subtitle D either correspond to the provisions EPA is proposing to establish for RCRA subtitle C requirement. These provisions include the following regulatory provisions specific to CCR that EPA is proposing to establish: *Scope and applicability (i.e., who will be subject to the rule criteria/ requirements*) . . .'') (emphasis added).

EPA received numerous comments on this aspect of the proposal. On the whole, the comments were focused on EPA's legal authority under subtitle C to regulate inactive and closed units, as well as inactive and closed facilities. One group of commenters, however, specifically criticized the proposed subtitle D regulation on the grounds that it failed to address the risks from inactive CCR surface impoundments. The majority of commenters, however, argued that RCRA does not authorize EPA to regulate inactive or closed surface impoundments. These commenters focused on two primary arguments: first, that RCRA's definition of ''disposal'' cannot be interpreted to include ''passive migration'' based on the plain language of the statute, and second, that such an interpretation conflicted with court decisions in several circuits, holding that under CERCLA ''disposal'' does not include passive leaking or the migration of contaminants.

In support of their first argument, commenters argued that the plain language of RCRA demonstrates that the requirements are ''prospective in nature'' and thus cannot be interpreted to apply to past activities, *i.e.,* the past disposals in inactive CCR units. They also argued that the absence of the word ''leaching'' from the definition of ''disposal'' clearly indicates that Congress did not intend to cover passive leaking or migration from CCR units. The commenters also selectively quoted portions of past EPA statements, claiming that these demonstrated that EPA had conclusively interpreted RCRA to preclude jurisdiction over inactive units and facilities. In particular, they pointed to EPA's decision in 1980 not to require permits for closed or inactive facilities.

Commenters cited several cases to support their second claim. These include *Carson Harbor Vill.* v. *Unocal Corp.,* 270 F.3d 863 (9th Cir. 2001); *United States* v. *150 Acres of Land,* 204 F.3d 698, 706 (2000); *ABB Industrial Systems* v. *Prime Technology,* 120 F.3d 351, 358 (2d Cir. 1997); *United States* v. *CMDG Realty Co.,* 96 F.3d 706, 711 (3rd Cir. 1996); *Joslyn Mfg. Co.* v. *Koppers Co.,* 40 F.3d 750, 762 (5th Cir. 1994); *Delaney* v. *Town of Carmel,* 55 F. Supp. 2d 237, 256 (S.D.N.Y. 1999); *see also Interfaith Cmty. Org.* v. *Honey-Well Intl Inc.,* 263 F. Supp. 2d 796, 846 n.10 (D.N.J. 2003). The commenters acknowledged that these cases were all decided under CERCLA, but claim that the cases are all equally dispositive with respect to RCRA's definition of disposal because CERCLA specifically incorporates by reference RCRA's statutory definition of disposal.

As an initial matter, it is important to correct certain misunderstandings contained throughout a number of the comments. First, EPA did propose to include inactive units under the subtitle D alternative. EPA clearly signaled its intent to cover the same universe of units and facilities covered under the subtitle C proposal. EPA did not include a corresponding discussion in its explanation of the subtitle D alternative because application of the criteria to inactive units did not represent such a significant departure from EPA's past practice or interpretation. As discussed in more detail below, the original subtitle D regulations applied to all existing disposal units. See 40 CFR 257.1(a)(1)–(2), (c) and 43 FR 4942–4943, 4944.

Second, several commenters criticized EPA's purported proposal to cover both ''closed'' and ''inactive'' surface impoundments, using the terms interchangeably. These same commenters also refer to both ''inactive facilities'' and ''inactive units.'' These are all different concepts, and EPA clearly distinguished between them.

EPA proposed to regulate only ''inactive'' surface impoundments that had not completed closure of the surface impoundment before the effective date. ''Inactive'' surface impoundments are those that contain both CCR and water, but no longer receive additional wastes. By contrast, a ''closed'' surface impoundment would no longer contain water, although it may continue to contain CCR (or other wastes), and would be capped or otherwise maintained. There is little difference between the potential risks of an active and inactive surface impoundment; both can leak into groundwater, and both are subject to structural failures that release the wastes into the environment, including catastrophic failures leading to massive releases that threaten both human health and the environment. This is clearly demonstrated by the recent spill in the Dan River in North Carolina, which occurred as the result of a structural failure at an inactive surface impoundment. Similarly, as demonstrated by the discovery of additional damage cases upon the recent installation of groundwater monitoring systems at existing CCR surface impoundments in Michigan and Illinois, many existing CCR surface impoundments are currently leaking, albeit currently undetected. These are the risks the disposal rule specifically seeks to address, and there is no logical basis for distinguishing between units that present the same risks.

EPA did not propose to require ''closed'' surface impoundments to ''reclose.'' Nor did EPA intend, as the same commenters claim, that ''literally hundreds of previously closed . . . surface impoundments—many of which were properly closed decades ago under state solid waste programs, have changed owners, and now have structures built on top of them—would be considered active CCR units.'' Accordingly, the final rule does not impose any requirements on any CCR surface impoundments that have in fact ''closed'' before the rule's effective date—*i.e.,* those that no longer contain water and can no longer impound liquid.

Further, EPA never proposed that the rule would apply to inactive facilities. The proposal was clear that the regulations would apply to active facilities—*i.e.,* those that continue to generate electricity for distribution to the public, and those that continue to manage CCR. Consistent with that proposal, the final rule applies only to inactive surface impoundments at active electric utilities, *i.e.,* facilities that are actively generating electricity irrespective of the fuel used.

Finally, some comments focused on issues that were specific to the plain language of subtitle C provisions. While most of the issues the commenters raised relate equally to EPA's authority under both subtitles C and D, because the final rule establishes standards under subtitle D of RCRA, EPA has not addressed comments that are purely relevant or applicable to the extent of EPA's authority under subtitle C.

a. Plain Language of RCRA and EPA's Past Interpretations

Under both subtitle C and subtitle D, EPA's authority to regulate ''inactive'' units primarily stems from the agency's authority to regulate ''disposal.'' The term is defined once in RCRA and applies to both subtitles C and D. Moreover, the definition explicitly includes ''leaking'' and ''placing of any solid waste . . . into or on any land so that such [waste] or any constituent thereof may enter the environment . . . or be discharged into any waters, including groundwaters.'' 42 U.S.C. 6903(3).

Commenters focused on the past statements that EPA cited in the proposal in acknowledging that the Agency was proposing to revise its interpretation for this rulemaking. In general, the comments misconstrue the significance of these past statements. The cited passages merely explain that the *permitting requirements* in subtitle C were written to be ''prospective in nature'' and as a consequence, EPA has chosen to interpret ''disposal'' more narrowly *in that context.* Thus EPA's historic interpretation under subtitle C was not based on an interpretation that the plain language of RCRA's definition of ''disposal'' precluded reaching inactive units, but on a determination that a narrower interpretation would be reasonable in light of specific language in sections 3004 and 3005, and the practical consequences of applying *these* requirements to inactive facilities.[40]

None of EPA's past statements included any interpretation that ''leaking'' does not include leaking from an inactive disposal unit, or that the statutory definition of ''disposal'' cannot be interpreted to apply to the current consequences of past disposals. To the contrary, EPA was clear in the original 1978 proposed hazardous waste regulations that leaking from inactive disposal units constitutes ''disposal'' under RCRA.

Neither RCRA nor its legislative history discusses whether section 3004 standards for owners and operators of hazardous waste treatment, storage, or disposal facilities apply or were intended to apply to inactive facilities, *i.e.,* those facilities which have ceased receiving, treating, storing, and disposing of wastes prior to the effective date of the subtitle C regulations. ''*This is an important issue, however, because some, and perhaps most, inactive facilities may still be ''disposing of waste'' within the meaning of that term in Section 1004(3) of RCRA.* 'Disposal' includes: the discharge, dumping, spilling, leaking, . . . of any solid waste or hazardous waste into or on any land or water so that such solid waste or hazardous waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including groundwaters. *Many inactive facilities may well be leaking solid or hazardous waste into groundwater and thus be ''disposing'' under RCRA.*'' 43 FR 58984 (emphasis added).

Note as well that EPA declined to impose requirements on ''inactive *facilities*'' not ''inactive *units* at active facilities,'' which are the entities covered in this final CCR rule. Further, the complications discussed in 1978 were specific to inactive or closed facilities: the concern that the present owner of the land on which an inactive site was located might have no connection (other than present ownership of the land) with the prior disposal activities. Id. These considerations are not relevant to inactive CCR surface impoundments at active electric utilities.

EPA further clarified this position in the 1980 final hazardous waste rule, explaining that, while the Agency did not generally intend to regulate those portions of facilities that had closed before the effective date, there were exceptions to this, and that in individual cases, inactive portions of a facility—or in other words, inactive units, might be regulated.

> [O]wners and operators which continue to operate after the effective date of the regulations must ensure that portions of facilities closed before the effective date of these rules do not interfere with the monitoring or control of active portions. This requirement regulates the facility which operates under the RCRA regulations, although it may require the owner or operator before he receives a permit, or, as a permit condition, to take certain measures on portions of his facility closed before the effective date of these regulations.

45 FR 33068. (See also 45 FR 33170.)

In other words, EPA was clear that its jurisdiction under RCRA extended to these portions of the facility but that the Agency had made a policy choice not to exert its regulatory jurisdiction as a general matter over inactive facilities, choosing instead to rely on section 7003 and CERCLA to address the risks and require clean-up of these sites. EPA has adopted a substantially similar approach here, requiring the current owner or operator of an active facility to address the risks associated with an inactive portion of the facility that could potentially interfere with the monitoring or control of the actively operating portion of the facility through leaking contaminants or other releases.

Similarly, in the 1980 final rules, EPA expressly declined to revise the regulatory definition of disposal to exclude accidental or unintentional releases. EPA noted that ''[r]egardless of whether a discharge of hazardous waste is intentional or not, the human health and environmental effects are the same. Thus intentional and unintentional discharges are included in the definition of 'disposal.' '' (See 45 FR 33068.) While EPA revised other provisions to clarify that a permit would not be required for accidental discharges, EPA was clear that such activities are properly considered to be ''disposal.''

By contrast, EPA's past implementation of subtitle D, following from the legislative history and the statutory language, consistently applied regulatory requirements equally to all facilities, without distinguishing between active and inactive or new and existing facilities.

Congress was clear that subtitle D was intended to specifically address the problem of abandoned leaking ''open dumps'' scattered across the country, ''where frequently the use of the site for waste disposal is neither authorized nor supervised.'' H. Rep. No. 94–1491, p 37, 94th Cong., 2d Sess (1976). For example, the report described the consequences when ''the City of Texarcana Arkansas/Texas, abandoned its six open dumps, in 1968'' to support the need to require open dumps to upgrade or close.

[40] It is also clear that certain subtitle C requirements in fact do apply to inactive units, for example, section 3004(u) requires facilities to clean up releases from inactive units located on the facility site.

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Similarly, in describing the need for the legislation, the House report stated:

> Disposal of solid wastes, including hazardous wastes, can have adverse environmental impacts in several ways. The following paragraphs discuss five different types of such impacts.
>
> (i) Perhaps the most pernicious effect is the contamination of groundwater by leachate from land disposal of waste. About half of the U.S. domestic water supply is from underground water, and thus is potentially subject to contamination. Such contamination is particularly vexing because often it is discovered after the damage is done and because the contamination is very long lasting. Thus leachate from a landfill or dump may not show up for years, *maybe not even until after the landfill is closed*.

Id. at 89 (emphasis added).

Consequently, subtitle D of RCRA provides clear authority to address inactive or abandoned disposal sites. The relevant provisions of RCRA subtitle D do not distinguish between ''active'' and ''inactive'' disposal units. Nor do any of the relevant provisions tie jurisdiction to the receipt or disposal of waste after a specific date.

RCRA section 1004(14) defines an ''open dump'' as ''*any* facility or site where solid waste is disposed of which is not a sanitary landfill which meets the criteria promulgated under section [4004] of this chapter and which is not a facility for disposal of hazardous waste.'' 42 U.S.C. 6903(14) (emphasis added). Section 4004(a) delegates broad authority to EPA to determine the facilities that will be considered ''open dumps,'' without any requirement that the units or facilities be in operation. ''[T]he Administrator shall promulgate regulations containing criteria for determining which facilities shall be classified as sanitary landfills and which shall be classified open dumps within the meaning of this chapter.'' 42 U.S.C. 6944(a). Section 4005(a), which is titled, ''Closing or upgrading of existing open dumps,'' is also not limited in scope: ''Upon promulgation of criteria under [1008(a)(3)] of this title, *any* solid waste management practice of disposal of solid waste or hazardous waste which constitutes the open dumping of solid or hazardous waste is prohibited, . . .'' 42 U.S.C. 6945(a) (emphasis added). See also, section 4003(a)(3), requiring state plans to provide for the closing or upgrading of ''*all existing* open dumps''). 42 U.S.C. 6943(a)(3) (emphasis added).

Consistent with the statutory provisions, EPA's current subtitle D regulations at 40 CFR part 257 apply to ''all solid waste disposal facilities and practices'' whether active or inactive, and did not differentiate between new and existing facilities.[41] 40 CFR 257.1(c). See also, 40 CFR 257.1(a)(1)–(2). EPA was clear in both the proposed and final rules that the rules applied to all existing facilities: ''These criteria for the classification of disposal facilities apply to all ''solid waste'' and ''disposal'' facilities, which are defined in the Act [in] (section 1004).'' 43 FR 4942–4943, 4944. The final rule was equally clear: ''These criteria apply to the full range of facilities and practices for ''disposal'' of ''solid waste,'' as those terms are defined in the Act.'' 44 FR 53440. (See also 44 FR 53438.) The final rule describes eight categories of materials or activities that are excluded; inactive facilities or units are not among them. This stands in stark contrast to the hazardous waste regulations, which, as discussed, specifically exempted inactive facilities from the permitting and associated regulatory requirements.

b. Case Law on the Definition of Disposal

EPA also disagrees with the commenters' second claim that regulating inactive surface impoundments would be inconsistent with case law in six circuits. The commenters are correct that some courts have held that the subsequent passive migration of contamination left on-site is insufficient to support liability against a *third party* that merely owned the property *under CERCLA*. But the commenters misconstrue this case law and fundamentally overstate its significance to the issue at hand. Of greater significance, however, is that federal courts have almost universally reached different conclusions under RCRA, holding that the statutory definition of disposal does include the passive migration of contamination from previously disposed of wastes.

As an initial matter, the issue decided by the courts in the cited CERCLA cases was narrower than the commenters allege; these cases generally focused on whether current or past owners of land contaminated by the activities of *other owners* were liable for passive migration that occurred during their ownership of the land. This is very different than the situation at hand, in which regulatory requirements are being imposed to address the existing and future contamination caused by the past and current activities of the current owner.

In addition, these decisions were largely predicated on language that is unique to CERCLA, rather than on a definitive reading of RCRA's definition of disposal. *See, e.g., United States* v. *CMDG Realty Co.,* supra at 712–717. For example, in *CMDG Realty,* the court found that passive migration was not disposal because Congress had clearly distinguished between ''releases,'' and ''disposal,'' defining the two terms differently and imposing liability on different parties for the two activities. Id. *Accord, Carson Harbor Village, supra,* at 880–885; *ABB Industrial Systems* v. *Prime Technology,* supra at 358.

Moreover, even under CERCLA courts have not universally reached the same conclusions on whether ''passive migration'' can be considered ''disposal.'' *See, e.g., Nurad, Inc.* v. *William E. Hooper & Sons Co.,* 966 F.2d 837, 844–46 (4th Cir. 1992) (concluding that because the definition of disposal includes ''leaking,'' prior owners are liable if they acquired a site with leaking barrels or underground storage tanks even though the prior owner's actions are purely passive); *ABB Industrial Systems,* Id., n.3 (expressly declining to decide whether passive migration could ever be considered ''disposal'').

But in any event, courts have consistently interpreted RCRA to apply to passive migration. Two cases under RCRA are the most directly analogous to the current situation as they address the extent of EPA's authority to regulate based on the statutory definition of ''disposal'': *In re Consolidated Land Disposal Regulation Litigation,* 938 F.2d 1386 (D.C. Cir. 1991), and *United States* v. *Power Engineering Co.,* 10 F. Supp. 2d 1145 (D. Colo. 1998), *aff'd* 191 F.3d 1224 (10th Cir. 1999). In both cases, the court considered whether EPA could impose or enforce regulatory requirements to address passive migration under the interpretation that this constituted ''disposal'' under RCRA. And in both cases the court agreed that RCRA's definition encompassed such activities.

The issue in *Consolidated Land Disposal* was whether EPA could require closed hazardous waste facilities to obtain a ''post-closure'' permit. 938 F.2d at 1388–1389. EPA had relied on the definition of disposal to support the regulation, concluding that a facility ''at which hazardous wastes have been disposed by placement in or on the land'' remains subject to both permitting and regulation because ''such hazardous wastes or constituents may continue 'leaking' or 'may enter the environment or be emitted . . . or discharged . . .' '' into the environment.'' Id. Similar to the commenters' current arguments, the petitioners argued that under § 3005, a permit can only be required for ''on-

[41] The regulations establish eleven specifically enumerated exemptions, none of which are relevant to the units at issue.

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going activities''—the treatment, storage, or disposal of waste at such facilities—not for the facility itself post-closure. The petitioners argued that linguistically, ''disposal . . . is not a continuing activity but occurs anew each time waste is placed into or on land.'' The D.C. Circuit summarily rejected the petitioners' interpretation, holding that this ''may be one way in which the word is used in ordinary language, but is not necessarily how it is used in the statute; the equation of ''disposal'' with ''leaking,'' which is a continuous phenomenon rather than a discrete event, is enough to blunt the sting of the petitioners' point.'' Id. This case is essentially dispositive of the issue, given the similarities between the requirement for a post-closure permit and the final requirements applicable to inactive CCR surface impoundments. Electric utilities retain ownership and control over these existing CCR units, just as hazardous waste facilities retain ownership and control over the closed units subject to post-closure permitting. In both situations, EPA requirements are designed to address both the existing and future risks of further ''releases'' or ''leaking'' from these units—*i.e.,* further disposal, as that term is defined in section 1004.

Similarly, in *Power Engineering* the court considered whether under section 3008 of RCRA, EPA could bring an action to compel the operator of a metal refinishing plant to comply with the state's RCRA regulations relating to financial assurance.[42] 10 F. Supp.2d at 1159. The defendants argued that since they were not currently disposing of waste, they were operating in compliance with state regulations and were exempt from financial assurance requirements. The court disagreed. It held that the use of the word ''leaking'' in the definition of ''disposal'' indicated that the leaching of hazardous waste into the groundwater constitutes the continuing disposal of hazardous waste. Id. at 1159–60 (''Because the definition of ''disposal'' includes the word ''leaking,'' disposal occurs not only when a solid waste or a hazardous waste is first deposited onto ground or into water, but also when such wastes migrate from their initial disposal location.'').

Courts in several circuits have also considered whether the passive migration of previously dumped waste constitutes a current or ongoing violation of RCRA, *i.e.,* illegal ''disposal,'' under the citizen suit provisions of section 7002(a)(1)(A). Most have concluded that it does. *See, Scarlett & Associates* v. *Briarcliff Center Partners,* 2009 WL 3151089 (N.D. Ga 2009) (deciding to ''follow the majority rule'' and holding that ''the continued presence of migrating waste constitutes a continuing violation under the RCRA''); *Marrero Hernandez* v. *Esso Standard Oil Co.,* 597 F. Supp. 2d 272, 283 (D.P.R. 2009) (holding that unremedied, migrating contamination is not a wholly past violation); *Cameron* v. *Peach County, GA,* No. 5:02–CV–41–1 (CAR), 2004 WL 5520003 (M.D. Ga. 2004) (holding that the continued presence of illegal contamination that remains remedial constitutes a continuing violation, even though the acts of unlawful disposal occurred in the past); *California* v. *M&P Investments,* 308 F. Supp. 2d 1137, 1146–1147 (E.D. CA 2003) (Allowing RCRA 7002 claim of continuing violation to proceed on evidence that wastes ''continue to exist unremediated'' as a result of improper discharge that had ceased over 20 years prior to filing of suit); *Aurora National Bank* v. *TriStar Marketing,* 990 F. Supp. 1020, 1025 (N.D. Ill. 1998) (''Although subsection (a)(1)(A) does not permit a citizen suit for wholly past violations of the statute, the continued presence of illegally dumped materials generally constitutes a 'continuing violation' of the RCRA, which is cognizable under § 6972(a)(1)(A).'') (internal citation omitted); *City of Toledo* v. *Beazer Materials & Servs., Inc.,* 833 F. Supp. 646, 656 (N.D. Ohio 1993) (''[T]he disposal of wastes can constitute a continuing violation so long as no proper disposal procedures are put into effect or as long as the waste has not been cleaned up and the environmental effects remain remediable.''); *Gache* v. *Town of Harrison,* 813 F. Supp. 1037, 1041–42 (S.D.N.Y. 1993) (''The environmental harms do not stem from the act of dumping when waste materials slide off the dump truck but rather after they land and begin to seep into the ground, contaminating soil and water. So long as wastes remain in the landfill threatening to leach into the surrounding soil and water, a continuing violation sure may exist.''); *Acme Printing Ink Co.* v. *Menard, Inc.,* 812 F. Supp. 1498, 1512 (E.D. Wisc. 1992) (''RCRA includes in its broad definition of 'disposal' the continuous leaking of hazardous substances. . . . Accordingly, leaking of hazardous substances may constitute a continuous or intermittent violation of RCRA.''); *Fallowfield Dev. Corp.* v. *Strunk,* No. 89–8644, 1990 WL 52745 (E.D. Pa. 1990) (''If a person disposes of hazardous waste on a parcel of property, the hazardous waste remains in that property insidiously infecting the soil and groundwater aquifers. In other words, the violation continues until the proper disposal procedures are put into effect or the hazardous waste is cleaned up.''). It is particularly notable that these cases were all decided under subsection (A); in contrast to subsection (B), section 7002(a)(1)(A) does not include any reference to liability for past actions or for prior owners. *Compare,* 42 U.S.C. 6972(a)(1)(A) and (B). In reaching their holdings, therefore, the courts necessarily relied [solely] on the reach of the statutory definition of ''disposal,'' which is at the heart of EPA's authority to regulate inactive CCR surface impoundments.

Courts have also addressed the limits of RCRA's definition of ''disposal'' is in the context of an EPA action under RCRA section 7003. Section 7003 authorizes EPA to obtain injunctive relief for actions, including disposal that ''may present an imminent and substantial endangerment to health or the environment.'' 42 U.S.C. 6973(a). Several courts have evaluated whether an inactive disposal site, where no affirmative acts of disposal are occurring, constitute an ''imminent and substantial endangerment'' under this provision. Once again, most courts accept a definition of disposal that encompasses leaking or contaminant migration from previously discarded wastes. *See United States* v. *Price,* 523 F. Supp. 1055, 1071 (D.N.J. 1981), *aff'd United States* v. *Price,* 688 F.2d 204 (3rd Cir. 1982) (''There is no doubt, however, that [section 70003] authorizes the cleanup of a site, even a dormant one, if that action is necessary to abate a present threat to the public health or the environment.'') *citing* S. Rep. No. 96–848, 96th Cong., 2d Sess., at 11 (1980); H. R. Rep. 96–1016 (Part I), 96th Cong., 2nd Sess., at 21 reprinted in [1980] U.S. Code Cong. & Ad. News, 6119, 6124; *United States* v. *Waste Indus.,* 734 F.2d 159 (4th Cir. 1984) (Rejecting district court interpretation that disposal only includes ''active human conduct'' based on the inclusion of ''leaking'' in the definition of disposal, and interpreting the ''movement of the waste after it has been placed in a state of repose [to be] encompassed in the broad definition of disposal''); *United States* v. *Diamond Shamrock Corp.,* 12 Envtl. L. Rep. 20819, 20821 (N.D. Ohio May 29, 1981) (noting that ''a disposal clearly requires no active human conduct''); *United States* v. *Conservation Chemical Co.,*

[42] Under RCRA's financial assurance regulations, owners and operators of hazardous waste facilities must document that they have sufficient resources to close their facilities and pay third-party claims that may arise.

619 F. Supp. 162, 200 (D. Mo. 1985) ("'disposal' occurs. . .when [wastes] migrate from their initial location''). See also S. Rep. 98–284, p 58 (98th Cong. 1st Sess.) (''The Environmental Protection Agency and the Department of Justice have used the equitable authority and [sic] granted in section 7003 to seek court orders directing those persons whose past or present acts have contributed to or are contributing to the existence of an imminent and substantial endangerment to abate such conditions. This has been an intended use of the section 7003 since 1976. . . . An [sic] evidenced by the definition of 'disposal' in section 1004(3), which includes the leaking of hazardous wastes, section 7003 has always provided the authority to require the abatement of present conditions of endangerment resulting from past disposal practices, whether intentional or unintentional.'').

While EPA continues to maintain that the statutory definition of disposal does in fact authorize regulation of inactive CCR surface impoundments, this is not the sole basis for that authority. Under section 1008(a)(3), EPA is authorized to establish criteria governing solid waste management, which includes the ''storage'' of solid waste. 42 U.S.C. 6904(28) and 6908(a)(3). RCRA's definition of ''storage'' is limited to hazardous waste; under subtitle D, therefore, the definition Congress intended was the dictionary definition, which incontrovertibly covers the activities associated with continuing to maintain CCR in inactive surface impoundments. For example, Merriam Webster defines ''storage'' as ''the state of being kept in a place when not being used'' and ''the act of putting something that is not being used in a place where it is available, where it can be kept safely, etc.''

Finally, consistent with the proposed rule and the final Regulatory Determination in Unit IV.B of this document, the final rule does not apply to CCR that is beneficially used.

6. Beneficial Use

The proposed rule generally distinguished between the disposal of CCR and the beneficial use of CCR. Disposal activities would be subject to regulation under one of two alternative regulatory schemes. But under either alternative, beneficial use would remain Bevill exempt and would not be subject to regulation. The proposal identified specific criteria that would be used to distinguish between legitimate beneficial uses of CCR and the disposal of CCR. These criteria were largely drawn from the approach contained in the May 2000 Bevill Regulatory Determination. The criteria were:

—The material used must provide a functional benefit. For example, CCR in concrete increases the durability of concrete—and is more effective in combating degradation from salt water; synthetic gypsum serves exactly the same function in wallboard as mined gypsum, and meets all commercial specifications; CCR 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. CCR used in road bed replace quarried aggregate or other industrial materials.

—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. For example, when CCR is used as a commercial product, the amount of CCR 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 kPa (400 psi). If excessive volumes of CCR are used—*i.e.,* greater than were necessary for a specific project,—that could be grounds for a determination that the use is not beneficial, but rather is being disposed of. 75 FR 35162–35163.

EPA explained that in the case of agricultural uses, CCR 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 CCR as soil amendments, EPA stated that the Agency would consider application of CCR 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. (75 FR 35162–35163, June 21, 2010)

EPA proposed to codify these criteria in the term, ''beneficial use of coal combustion products (CCPs).'' This definition stated that the beneficial use of CCPs was 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 yields), placed as fill in sand and gravel pits, or used in large scale fill projects, such as restructuring the landscape, are excluded from this definition. (75 FR 35129–35130, June 21, 2010).

Commenters generally supported the criteria in the proposal but raised concern that the criteria lacked specificity; some commenters stated that the criteria were those that states already considered in doing their beneficial use determination. Commenters also suggested the use of a ''no toxics'' provision and others suggested that the criteria include a requirement that ''environmental benefits'' be achieved. A more general comment raised by several commenters was that the proposed criteria failed to establish any standard that ensured protection of human health and the environment. Finally, one commenter raised concern that EPA's approach to beneficial use, and particularly to large scale fill operations, inappropriately assumed that these operations constituted the disposal of solid waste, which, the commenter claimed was inconsistent with a series of judicial decisions.

There are generally three critical issues in determining whether a material is regulated under RCRA subtitle D: whether the material is a ''solid waste,'' whether the activity constitutes ''disposal,'' and whether regulation of the disposal is warranted. Although there can be some overlap between these issues in that the same facts may be relevant to each of them, understanding the distinction between them is critical to understanding the final approach to the beneficial use of CCR adopted in this rulemaking.

In order to be subject to RCRA, the material must be a solid waste. The statute defines a solid waste as ''any garbage, refuse . . . and other discarded material. . . .'' 42 U.S.C. 6903(27). As EPA noted in the proposed rule, for some beneficial uses, CCR is a raw

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material used as an ingredient in a manufacturing process that have never been ''discarded,'' and thus, would not be considered solid wastes under the existing RCRA regulations. 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 CCR that meet product specifications would not be regulated under the final rule.

However, this does not describe the majority of CCR, which are unambiguously wastes; after generation in the boiler, they are placed into landfills or surface impoundments. While they may subsequently be dredged from these units and reused, placement in a landfill or surface impoundment presents prima facie evidence of discard. At the time the material is placed into the unit, the utility is not treating the material as a valuable product or otherwise seeking to protect the material for use. Although the material may subsequently be reused if a buyer is found, the material is originally placed in the unit with the intent to let it remain in place if no buyer is found. The waste designation does not change merely because a material in a surface impoundment or landfill may in the future be beneficially reused.

For those materials that are ''wastes'' the second issue becomes relevant: whether the activities involved with the material constitutes ''disposal'' or ''solid waste management.'' The statute distinguishes between these activities and ''use;'' several activities are listed in the definitions of ''disposal'' and ''solid waste management'' and ''use'' is not among them. See 42 U.S.C. 6903(3) and (28). In general, commenters agreed that the three criteria in the proposal, and discussed above, would identify those activities that were properly considered to be legitimate beneficial uses rather than disposal. As several commenters noted, many state beneficial use programs rely on similar (or identical) criteria. And for encapsulated uses, EPA agrees that these three criteria are sufficient to distinguish between the activities that will be regulated as disposal under this final rule and those that will be considered beneficial use. Accordingly, EPA has adopted them in the final definition of ''beneficial use.''

But as EPA acknowledged in the proposal, the issues are more difficult with regard to unencapsulated uses. Because these uses involve the direct placement of CCR on the land, they are clearly more analogous to activities that have consistently been considered to be ''disposal.'' RCRA defines disposal to specifically include the ''placing of any solid waste or hazardous waste into or on any land or water so that such solid waste or hazardous waste or any constituent thereof may enter the environment . . .'' 42 U.S.C. 6903(3). The issue is further complicated by the fact that there can be risks associated with placement of unencapsulated CCR on the land. As described in the proposal, CCR can leach toxic metals at levels of concern. The major risks associated with the placement of unencapsulated CCR on the land for beneficial use involved using large volumes of CCR to restructure the landscape, such as occurred at the Battlefield golf course, and placement in quarries and sand and gravel pits, such as occurred at the Gambrills, Maryland site. EPA acknowledged in the proposal that these types of operations would be subject to regulation as disposal, and so were not directly on point. However, because these damage cases involved the placement of unencapsulated CCR on the land, they raised questions regarding the safety of other uses of unencapsulated CCR that involved direct placement on the land. In addition, previous risk analyses do not address many of the use applications currently being implemented, and have not addressed the improved leachate characterization methods. EPA also noted that some scientific literature indicates that the uncontrolled (*i.e.,* excessive) application of CCR can lead to the potentially toxic accumulation of metals.[43]

As noted, several commenters raised concern that EPA's beneficial use criteria did not include any standard that ensured protection of human health and the environment. EPA agrees that a criterion that accounted for the potential risks of the land placement of unencapsulated CCR would be an appropriate element to include in differentiating between disposal and beneficial use. RCRA's definition of disposal includes some elements related to risk: specifically, the definition includes as a relevant concept that the waste or any constituent of concern ''may enter the environment.'' In this regard it is also relevant that not all disposal activities are regulated by EPA under subtitle D; rather, EPA only regulates those that present risks that exceed the Agency's acceptable risk levels.

Building off of these concepts, the Agency has developed an additional criterion to address both the question of whether the activity is appropriately considered to be ''disposal,'' and the question of whether that ''disposal'' warrants regulation. Because uses that fail to meet the beneficial use criteria will be considered disposal and would therefore be considered disposal subject to the final regulation, this fourth criterion was designed to exclude uses likely to present the same risks as the management practices regulated under other sections of the final rule. Thus, the final criterion directly correlates to the practices and the risks that the disposal regulations are designed to address: the risks associated with the placement of large quantities of CCR in a single concentrated location, such as a CCR landfill, as documented in the 2014 risk assessment and the damage cases.

As discussed in more detail below, to be considered a ''beneficial use,'' prior to initiating an activity that involves placing unencapsulated CCR on the land in amounts greater than 12,400 tons, in non-roadway applications, the user must demonstrate that environmental releases to groundwater, surface water, soil and air are comparable to or lower than those from analogous products made without CCR, or that environmental releases to groundwater, surface water, soil and air will be at or below relevant regulatory and health-based benchmarks for human and ecological receptors during use.

EPA acknowledges that there may be risks associated with uses that are below this threshold, depending on the characteristics of the CCR, the amount of material and the manner in which it is placed, and (perhaps most important) the site conditions. Consequently, all unencapsulated uses, including use in road construction and agriculture, should be conducted with care, according to appropriate management

[43] 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*; 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*.

practices, and with appropriate characterization of the material and the site where the material will be placed. However, as discussed in the previous section, because the amounts and, in some cases, the manner in which the CCR are used are very different from the land disposal modeled in the risk assessment, EPA cannot extrapolate from the risk assessment to reach conclusions regarding the risks these uses may pose. And in the absence of such information, EPA cannot establish criteria to regulate these uses.

a. Final Definition of the Term ''Beneficial Use of CCR''

The final beneficial use criteria are as follows: (1) The CCR must provide a functional benefit; (2) The CCR must substitute for the use of a virgin material, conserving natural resources that would otherwise need to be obtained through practices such as extraction; (3) the use of CCR must meet relevant product specifications, regulatory standards, or design standards when available, and when such standards are not available, CCR are not used in excess quantities; and (4) when unencapsulated use of CCR involves placement on the land of 12,400 tons or more in non-roadway applications, the user must demonstrate and keep records, and provide such documentation upon request, that environmental releases to groundwater, surface water, soil and air are comparable to or lower than those from analogous products made without CCR, or that environmental releases to groundwater, surface water, soil and air will be at or below relevant regulatory and health-based benchmarks for human and ecological receptors during use. Any use that fails to comply with all of the relevant criteria will be considered to be disposal of CCR, subject to all of the requirements in the disposal regulations, and the user will be considered to be the owner or operator of a CCR disposal unit. Encapsulated uses need only comply with the first three criteria. Unencapsulated uses involving placement on the land of 12,400 tons or more in non-roadway applications that fail to meet all of the beneficial use criteria are considered a CCR unit. As previously noted, the first three criteria were discussed in the proposal and commenters generally supported these criteria, which establish flexible performance standards. As discussed above, the Agency has developed an additional criterion in response to comments, which generally reflects the issues discussed in the proposal. This additional criterion is designed to address the environmental and human health concerns associated with large-scale, unencapsulated uses that have features similar to landfills. These four criteria are discussed in greater detail in the sections below. Any user of CCR that, at a later time, believes that there could be a health or environmental issue associated with their beneficial use should work with their state agency to address any potential issue.

As noted above, encapsulated uses of CCR must only comply with the first three criteria. Encapsulated beneficial uses are those that bind the CCR into a solid matrix that minimizes their mobilization into the surrounding environment. Examples of encapsulated uses include, but are not limited to: (1) Filler or lightweight aggregate in concrete; (2) a replacement for, or raw material used in production of, cementitious components in concrete or bricks; (3) filler in plastics, rubber, and similar products; and (4) raw material in wallboard production.

Compliance with the first three criteria suffices because, as discussed in Unit IV of this document, the available information demonstrates that encapsulated uses of CCR raise minimal health or environmental concerns. The Agency did not receive any data to contradict this assessment during any of the comment periods. In addition, since publication of the proposal, the Agency conducted a study of FGD gypsum in wallboard and fly ash concrete, which further supports this conclusion. This study ''*Coal Combustion Residual Beneficial Use Evaluation: Fly Ash Concrete and FGD Gypsum Wallboard*'' (February 2014) concluded that ''environmental releases of constituents of potential concern (COPCs) from CCR fly ash concrete and FGD gypsum wallboard during use by the consumer are comparable to or lower than those from analogous non-CCR products, or are at or below relevant regulatory and health-based benchmarks for human and ecological receptors.''

Criteria 1: CCR must provide a functional benefit. This criterion is designed to ensure that the material performs a genuine function in the product or use; while it need not improve product performance when compared to the material for which it is substituting, CCR must genuinely be a necessary component of the product. In other words, there must be a legitimate reason for using CCR in the product other than the fact that it is an alternative to disposal of the material, *e.g.,* the material fulfils material specifications. For example, CCR provides a functional benefit when used as a replacement for cement in concrete because the CCR increases the durability of the concrete and is also more effective against degradation from salt water. FGD gypsum serves the same function in the production of wallboard as mined gypsum, and meets all product specification. Additionally, CCR can be used to adjust the pH of soils thereby increasing and promoting plant growth.

One commenter noted that many states already consider whether the material provides a functional benefit when making beneficial use determinations under their regulatory programs. The Agency agrees that this is an important criterion in determining whether a use is a ''beneficial use.'' To the extent that a state regulatory program has determined that a particular use provides a functional benefit, this may serve as evidence that this criterion has been met.

Criteria 2: CCR must substitute for the use of a virgin material, conserving natural resources that would otherwise need to be obtained through practices, such as extraction. This criterion is intended to ensure that the use is truly ''beneficial'' from an environmental perspective. Examples of CCR used as a substitute for a virgin material include FGD gypsum for mined gypsum and the use of fly ash in lieu of Portland cement thereby reducing the need for cement. The use of FGD gypsum in the manufacture of wallboard reduces the need to use virgin gypsum, thereby conserving natural resources (virgin gypsum) while conserving valuable energy that would be needed to mine the virgin gypsum. Similarly, the use of CCR fly ash in lieu of Portland cement reduces the overall need for cement. CCR used in a road bed application substitutes for the use of quarried natural materials that provide structural support for the road surface.

One commenter again highlighted that many states consider this criterion in their current state beneficial use programs. The Agency agrees that this second criterion is appropriate, and that conserving natural resources is an important function that should be encouraged. Here as well, potential users of CCR materials may choose to rely on a state determination to provide evidence that this criterion has been met.

Criteria 3: The use of CCR must meet relevant product specifications, regulatory standards, or design standards, when available, and where such specifications or standards have not been established, CCR may not be used in excess quantities. This criterion was intended to address both the legitimacy of the use and the potential environmental and human health consequences associated with the use of excess quantities of CCR, particularly unencapsulated CCR. If excessive volumes of CCR are used—*i.e.,* greater than necessary for a specific project—that calls into question whether the purpose of the application was in fact a sham to avoid compliance with the disposal regulations. In addition, the record demonstrates that the risks from use of CCR are more likely to be associated with large volumes, particularly for unencapsulated uses.

The Agency has modified this criterion slightly from the proposed rule. The proposed rule merely referenced ''relevant product specifications or regulatory standards'' and EPA was concerned that this was too narrow, and might not incorporate all of the relevant technical information currently available that provides guidance on what constitutes an excess amount. Consequently, in the final definition the Agency has added the phrase ''design standards.'' Design standards are different from product specifications, because they include things other than ''products.'' An example of a ''design standard'' would be technical guidance specifying that six inches of CCR is to be used in constructing a road.

EPA received several comments on this provision, several of which criticized the sole reliance on engineering performance standards. For example, one commenter questioned how the Agency would quantify acceptable amounts for each use if no specifications or standards were in place. One commenter stated that the Agency needs to rely on more than the existence of engineering performance standards or comparisons to typical application rates of mined materials as coal combustion wastes are unique materials and comparisons to typical rates of application of natural gypsum or other soil amendments are inappropriate. Another commenter suggested a provision that would require users to follow a plan to only use what is necessary to reach the desired effect, in lieu of product specifications.

EPA purposely did not attempt to establish product specifications for each potential beneficial use application. The potential products are too varied, and in many instances EPA lacks the necessary expertise (*e.g.,* to develop manufacturing specifications for individual products.). Nor is such an approach necessary. When CCR substitutes for other materials, the amount used is typically controlled by product specifications, particularly for encapsulated uses. Product specifications currently exist for many, if not most, of the significant uses of CCR and can be found in a variety of sources. For example, as previously described, fly ash used as a stabilized base course in highway construction is subject to both regulatory standards under DOT/FHWA, and engineering specifications, 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 kPa (400 psi).

Similarly, in an agricultural setting, EPA expects all appropriate standards, constituent levels, prescribed total loads, and application rates to be met. For example, EPA has developed specific standards governing the agricultural application of biosolids. While the management scenarios differ between biosludge application and the use of CCR as soil amendments, EPA would consider application of CCR 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. Several commenters also noted that agronomic rates currently exist for certain items such as peanuts, cotton, tomatoes, corn and soybeans.[44] EPA would generally consider application of CCR above these rates, or any other rate that has been scientifically justified, to constitute disposal rather than beneficial use.

Many other sources of technical reports and documents exist for other uses. ASTM Standard E2277–03 provides standard guidance and a methodology for using CCR in a structural fill and includes a consideration of engineering properties and behaviors, testing procedures, and design considerations relevant to constructing a structural fill project using CCR. Industry guidance, such as USWAG's ''*Engineering and Environmental Guidance on the Beneficial Use of Coal Combustion Products in Engineered Structural Fill Projects*'' may also provide information relevant to this issue. Further, some states, such as Wisconsin and Virginia, have developed environmental guidance for evaluating the suitability of a site prior to construction of a CCR structural fill.

While many of these documents do not establish binding requirements, nor is EPA seeking to make them binding on users, they provide evidence of the design and construction practices, including the amounts that are typically used throughout the industry, and provide a basis on which to evaluate whether excessive quantities have been used in a particular application. These types of documents are also relevant in making judgments on the larger question—whether the activity is legitimate reuse or merely sham disposal. In essence, product specifications serve the same function as the requirement suggested by a commenter for a plan to only use what is necessary to reach the desired effect.

Commenters were also concerned that the proposed standards, and particularly this criterion, did not include any provision that would ensure that CCR reuse was protective of human health and the environment. One commenter stated that product specifications and engineering standards do not speak to environmental risk or consumer exposure. This same commenter was concerned that the proposed criteria used circular logic by stating that excess materials were not to be used in cases where specifications or standards have not been established. Another commenter criticized this criterion because it did not include threshold levels that protect public health from the range of toxicants routinely found in coal ash.

EPA generally disagrees that the requirement to ensure that excessive volumes have not been used is unrelated to environmental and safety concerns. Minimizing the amount of material used in a product or released to the environment decreases potential exposures to the material. EPA agrees, however, that an additional criterion that more directly addresses the potential health and environmental risks is appropriate for unencapsulated uses, which present the greater potential for exposures of concern. As discussed in more detail below, the Agency has added a criterion to specifically require users of unencapsulated CCR to demonstrate that environmental and health related standards have been met. The criterion is a general performance standard that is equally applicable to all sites and uses and will account for a wide variety of potential exposures. By contrast, in order to establish toxicant ''threshold levels,'' EPA would need to develop risk assessments that account for the wide variety of potential uses and exposures. This is neither practical nor feasible, given the site specific nature of the potential risks and the myriad of potential uses. In addition, EPA disagrees that this is necessary, as the performance standard laid out in the fourth criterion will appropriately address the risks documented in the current record for these uses.

[44] Commenters argued that, at least in agronomic settings, there is no incentive to use excess amounts because it simply increases the grower's cost.

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Furthermore, as the Agency has previously stated in the May 2000 Regulatory Determination and the 2010 proposal, leaving the Bevill determination in place for beneficial use does not conflict with EPA's view that certain beneficial uses, *e.g.,* use in road construction and agriculture, should be conducted with care, according to appropriate management practices, and with appropriate characterization of the material and the site where the materials will be placed. EPA has concluded that the potential risks of these uses do not warrant federal regulation, but can be addressed, if necessary, in other ways.

State programs exist and have the expertise to address beneficial use applications. In addition, the Agency is currently developing a framework to address the risks associated with the beneficial use of unencapsulated materials. This framework is expected to be finalized in 2015; the framework will be available to assist in the implementation of issues associated with the unencapsulated uses of CCR. The Agency has also been working with the U.S. Department of Agriculture to address the risks associated with the agricultural use of CCR. In conclusion, the Agency believes that sufficient tools are available (or will soon be available) to address the site-specific risks associated with the beneficial use of CCR.

Criteria 4: When unencapsulated use of CCR involving placement on the land of 12,400 tons or more in non-roadway applications, the user must demonstrate and keep records, and provide such documentation upon request, that environmental releases to groundwater, surface water, soil and air are comparable to or lower than those from analogous products made without CCR, or that environmental releases to groundwater, surface water, soil and air will be at or below relevant regulatory and health-based benchmarks for human and ecological receptors during use. The Agency has established an environmental criterion to protect human health and the environment in response to numerous comments received on the proposal raising concern that additional provisions were necessary to ensure that unencapsulated uses of CCR needed to be conducted in an environmentally protective manner. The Agency discussed in the proposed rule the ways in which the use of CCR in an unencapsulated manner could affect groundwater, surface water, air and be associated with dust emissions. This fourth ''environmental'' criterion requires potential users to addresses potential risks from all of these pathways in order to avoid compliance with the final disposal requirements. Existing sources of guidance and standards (*e.g.,* ASTM E2277–03 and USWAG's ''*Engineering and Environmental Guidance on the Beneficial Use of Coal Combustion Products in Engineered Structural Fill Projects,*'' to name just two that are currently available), are available and may provide useful assistance for determining if the use of CCR are comparable to or lower than those from analogous products made without CCR, or that environmental releases to groundwater, surface water, soil and air will be at or below relevant regulatory and health-based benchmarks for human and ecological receptors during use. Information (*e.g.,* modeling results, proposed designs, risk assessments, etc.) that have been proposed or developed to comply with state standards that explicitly address the environmental impacts of unencapsulated uses may also be relevant to this determination.

i. Source of the 12,400 Ton Threshold and Fill Operations.

As discussed earlier in this section, the fourth criterion was designed to address whether the activity is appropriately considered to be ''disposal'' and whether that ''disposal'' warrants regulation. Thus, the final criterion correlates to the practices and the risks at issue: The placement of large quantities of CCR in a single concentrated location, as documented by the 2014 risk assessment and the damage cases.

In the proposed rule, EPA explained that the risks of greatest concern from unencapsulated beneficial uses were associated with the placement of CCR in quarries and sand and gravel pits, and with large scale fill operations used to re-grade the landscape. EPA generally proposed to define these operations as ''disposal'' rather than ''beneficial use.'' As discussed below, EPA has retained that approach with respect to the placement in sand and gravel pits and quarries; consequently the fourth criterion need not account for these uses. By contrast, EPA has not definitively concluded that ''large scale fill operations,'' per se, constitute the disposal of CCR. This is because EPA agrees with commenters that, if constructed correctly, large scale fill operations can meet all of the criteria for a beneficial use. But EPA also agrees that these applications can present risks to human health and the environment, and therefore has drafted the fourth criterion to specifically address the risks presented by these operations. The fourth criterion is thus tied to the Agency's general approach to large scale fill.

The Agency acknowledged in the proposal that additional guidance was warranted on what would constitute a large scale fill operation, and received numerous comments on this issue in response to the proposal. EPA requested comments again on the topic of large scale fills in a Notice of Data Availability (NODA). 78 FR 46940 (August 2, 2013). The NODA discussed the fact that many commenters on the proposed CCR rule stated that EPA should have developed a size criterion to define large scale fill operations. One commenter suggested 5,000 cubic yards as a size criterion for a CCR landfill, but did not provide a basis for this. Other commenters suggested size criteria but for different reasons than defining disposal criteria; for example, Wisconsin has a standard where all CCR used for unconfined and confined ''fill projects exceeding 5,000 cubic yards require concurrence by the State prior to commencement of the project.'' Similarly, West Virginia stated that ''unencapsulated use of CCR as structural fills not exceeding 10,000 cubic yards are approvable on a case-by-case basis.''

In the NODA, EPA identified three different types of data sets that could provide information relevant to developing appropriate criteria or to otherwise defining what constitutes a ''large scale'' fill operation. EPA solicited comment on the adequacy of the data sets and whether EPA should consider them for the purpose of creating criteria or a definition. The three data sets were: (1) The size of the structural fills that have resulted in damage cases; (2) the distribution of landfill sizes, derived either from an EPA Office of Water's questionnaire or from the landfill size distribution used in the proposed rule; and (3) the size distribution for large scale fills that have been constructed in North Carolina. Many commenters argued that it was entirely inappropriate for EPA to specify in the rule when a project constitutes beneficial use simply by volume or amount of structural fill necessary to construct a stable base for a building. Commenters argued that a large scale fill operation, if designed appropriately, constituted a legitimate beneficial use. In fact, industry commenters universally claimed that they were not aware of any damage cases or adverse environmental impacts associated with structural fills that had adhered to industry guidance (*e.g.,* ASTM standard E2277–03 for structural fills and the USWAG *Engineering and Environmental Guidance on the Beneficial Use of CCPs* *in Engineered Structural Fill Projects*), and argued that the history of well-designed and implemented engineered structural fills demonstrate that CCR can serve as a valuable resource in avoiding disturbing native ground to secure borrow soils where fill materials are needed to establish a final grade for a project site that meets the need of the proposed final use. To this end, the commenters also acknowledged that site characterization and characterization of the CCR are fundamental to the construction of fills across the U.S. Similarly, other commenters stated that size should not be the only criterion used to define large scale fill operations and highlighted that the site conditions, including such features as the hydraulic conductivity of the area, should also be an important criterion to consider. Still other commenters stated that CCR landfills cannot include large scale fill CCR beneficial use projects because such operations do not involve disposal of a solid waste. Rather, industry commenters argue that the determination as to what is disposal as opposed to beneficial use should be a determination that rests solely with state agencies. These commenters suggested that the determination as to whether a particular fill project constituted disposal, rather than beneficial use should be based on a series of factors, and not simply a size-cut-off. Finally, other commenters argued that the Agency incorrectly presumed that only large scale fill operations could cause environmental damage, and suggested that rather than regulating large scale fill operations solely on the basis of the volume or the amount of CCR involved, the information available to EPA from damage cases and monitoring data suggests that an additional, if not primary criteria for regulating fill operations, including those involved in highway construction, should include the prevention of CCR coming into contact with water. Focusing on the risks of concern—that large scale fills were effectively operating as landfills—the Agency reviewed the database of landfills used in the 2014 risk assessment and has established a threshold limit that corresponds to the smallest size landfill in the risk assessment database. EPA selected this threshold as the trigger for requiring an affirmative demonstration by the user that there will be no releases of concern as a consequence of the land application, because the available evidence in the record (*i.e.,* the 2014 risk assessment) demonstrates that at these volumes the potential risks are of such significance to warrant regulation. Based on this evidence, the burden then shifts to the potential user to demonstrate that these potential risks do not exist at the particular site or have been adequately mitigated. Under this approach, unencapsulated beneficial use applications greater than or equal to 12,400 tons can still be conducted without becoming subject to the disposal regulations by using engineering principles, such as a liner system, and demonstrating that environmental releases to groundwater, surface water, soil and air are comparable to or lower than those from analogous products made without CCR, or that environmental releases to groundwater, surface water, soil and air will be at or below relevant regulatory and health-based benchmarks for human and ecological receptors. EPA agrees that the volume of CCR involved should not be the sole basis for determining whether an operation constitutes disposal. As such, the Agency is requiring the use of the fourth criterion in order to address any potential risks associated with unencapsulated uses of CCR that are in excess of 12,400 tons. Users will be required to make an affirmative demonstration relating to the potential environmental releases and the potential risks of the application (in addition to requiring compliance with the other three criteria). Specifically, users will be required to demonstrate that environmental releases to groundwater, surface water, soil and air are comparable to or lower than those from analogous products made without CCR, or that environmental releases to groundwater, surface water, soil and air will be at or below relevant regulatory and health-based benchmarks for human and ecological receptors during use. EPA expects such determinations to take into account a wide variety of factors, including the hydraulic conductivity of the area, proximity of the material to water, and the likelihood of contact with water. EPA also expects that such determinations would take into account, as many commenters acknowledged to be appropriate and necessary, the need for site characterization and characterization of the CCR. The fourth criterion was adopted in part, to address commenters' concern that the EPA should include a criterion that prevents the placement of CCR in water sources. These are legitimate concerns; existing damage cases show that the placement of CCR in sand and gravel pits was almost always associated with CCR being placed in contact with water. The fourth criterion will require the user to demonstrate that environmental releases to groundwater, surface water, soil and air are comparable to or lower than those from analogous products made without CCR, or that environmental releases to groundwater, surface water, soil and air will be at or below relevant regulatory and health-based benchmarks for human and ecological receptors during use. As a consequence of this requirement, EPA expects that significant changes may need to be made in order to proceed with a proposed use; for example, conducting the required assessment, may demonstrate that the only way to achieve the performance standard is to install engineering features, such a liner, as part of the proposed project.

Application of unencapsulated CCR to the land in volumes less than the 12,400 tons will not require an affirmative demonstration to be considered a beneficial use. While the Agency has sufficient information to document that unencapsulated uses can present a hazard, based on the current rulemaking record, EPA lacks the information necessary to demonstrate that unencapsulated uses in smaller amounts are likely to present a risk.[45] In other words, the evidence relating to these uses is not sufficient to shift the burden to the potential user to affirmatively demonstrate the safety of the proposed use. Nevertheless, the Agency expects potential users of unencapsulated CCR below this threshold to work with the states to determine the potential risks of the proposed use at the site and to adopt the appropriate controls necessary to address the risks. In this regard, EPA notes that the composition and leaching behavior of CCR being beneficially used may change over time due to upgrades in air pollution controls devices at coal-fired power plants. Further, initial determinations for existing beneficial use (BU) applications may have relied on single-point pH test methods (*e.g.,* TCLP, SPLP) that, depending on actual field conditions in which the applications are occurring, can under- or over-estimate leachate concentrations. Scientific advancements

[45] In November 2014, EPA received reports alleging that extensive groundwater monitoring data collected by the Wisconsin Department of Natural Resources demonstrated a correlation between beneficial uses of unencapsulated CCR below these thresholds and contaminated drinking water wells in southeastern Wisconsin. Insufficient time was available to allow EPA to evaluate these reports as part of this rulemaking. However, EPA will continue to evaluate the issues associated with unencapsulated uses of CCR, and to the extent available data demonstrate the need for revisions to these criteria, EPA will initiate the necessary rulemaking procedures.

in leach test protocols have found that the degree of leaching can vary by several orders of magnitude. Accordingly, states overseeing CCR BU programs are encouraged to closely evaluate existing BU applications in light of ongoing scientific advances in tools and technologies to ensure these applications remain protective of human health and the environment. In addition, the Agency is working to provide assistance to states and potential users; this includes the release of the Agency's *Industrial Waste Evaluation Model* (IWEM), and the development of a framework for systematically assessing unencapsulated BU applications to aid in assessing whether there are environmental risks associated with site specific structural fills.

ii. Exclusion of Roadway Applications from the 4th Criterion. In the 2010 proposal, the Agency stated that the placement of unencapsulated CCR on the land, such as in road embankments, presented concerns, but that the amount and the manner in which they are used—subject to engineering specifications and material requirements rather than landfilling techniques—are very different from land disposal. The Agency highlighted the 2005 guidance that was developed by EPA, FHWA, DOE, ACAA, and USWAG, addressing the appropriate methodologies and engineering requirements for the use of coal ash in highway construction. Lastly, the Agency noted the difference in terms of volume; the difference between the amounts of CCR that could be disposed of in a landfill vs. the amount of CCR used in the construction of a roadbase (typically on the order of six to twelve inches thick).

EPA received a number of comments requesting that the definition of a CCR landfill exclude CCR used in highway and road construction projects and similar beneficial use projects authorized by an appropriate state agency. These commenters reasoned that the ''arbitrary cutoff' discussed in the NODA would inappropriately capture such uses.

The Agency has excluded roadways and associated embankments from the fourth criterion because the methods of application are sufficiently different from CCR landfills that EPA cannot extrapolate from the available risk information to determine whether these activities present similar risks. Roadways are subject to engineering specifications that generally specify CCR to be placed in a thin layer (*e.g.,* six to 12 inches) under a road. The placement under the surface of the road limits the degree to which rainwater can influence the leaching of the CCR.

There are also significant differences between the manner in which roadways and landfills can potentially impact groundwater. These include the nature of mixing in the media, the leaching patterns, and how input infiltration rates are generated. First, CCR landfills are typically a homogenously mixed system, and as a result, there are no spatial variations of the chemical and physical properties of the media (for example, bulk density, hydraulic conductivity and contaminant concentration). By contrast, roadways are generally constructed of several layers with different material properties (heterogeneity). This difference affects the hydraulic conductivity of a mass of CCR in a landfill, as compared to CCR placed in an embankment. Any potential leaching will tend to spread over the length of the embankment, as opposed to the leaching in a downward motion that would occur in a homogenously filled landfill.

Finally, (and perhaps most critically) the construction of roads and associated embankments are supervised and approved by State and/or Federal Department of Transportation (DOT) engineers who ensure compliance with engineering specifications

While EPA is exempting roadbed applications of 12,400 tons or larger from the fourth criterion, EPA is mindful of situations where large quantities of CCR have been used without appropriate engineering controls or where placement on the land has apparently far exceeded those necessary for the engineering use of the materials. One such situation occurred in Puerto Rico with CCR generated by the AES Coal Fired Power Plant in Guayama. As discussed in Unit IV.B of this document, CCR and an aggregate created from them (''AGREMAX'') were being used as fill in housing developments and in road projects. Over two million tons of this material was used between 2004 and 2012. When made aware of the situation, EPA raised concerns over the use of CCR and AGREMAX based on the fact that the Environmental Quality Board had not imposed engineering controls, specified appropriate uses, or otherwise limited the use of AGREMAX by the end users. Inspections of some of the sites where the material had been placed showed use in residential areas, areas close to wetlands and surface waters and/or over shallow sole source drinking water aquifers. In addition, in some cases the volumes appeared to be in excess of what was necessary for engineering uses and some sites appeared to be abandoned. This kind of situation will be directly addressed by the new beneficial use criteria promulgated in the final rule. To qualify as a beneficial use, the use of AGREMAX would need to meet all four of the criteria—that is, it must provide a functional benefit, substitute for a virgin material, meet product specifications, and in this case, the user would be required to make the environmental demonstration for the non-roadbed applications.

iii. Kinds of unencapsulated uses of CCR required to comply with the fourth criterion.

Unencapsulated uses of CCR are numerous and range, in total use, from hundreds of thousands of tons to millions of tons per year. These applications include, as examples, the following: (1) Flowable fill; (2) structural fills; (3) soil modification/stabilization; (4) waste stabilization/solidification; (5) use in agriculture as a soil amendment; and (6) aggregate.

Many of these unencapsulated uses, other than structural fills, are not generally expected to be used in amounts that would require an environmental demonstration under the fourth criterion. And for several of these applications, which can be structurally very different from landfills, EPA expects that even if these applications are used in amounts greater than 12,400 tons, potential users will be easily able to meet the performance standard. For example, the use of CCR for soil modification or stabilization, agriculture, waste stabilization/solidification, aggregate or flowable fill applications, is generally not similar to the mounding that occurs in a landfill situation. These differences can have a tremendous bearing on the leaching potential of the CCR materials.

Structural fills, however, can be larger applications and so may be required to demonstrate compliance with the environmental standards in the fourth criterion more frequently. In addition, because structural fills can be similar to the landfills regulated in the final disposal rule, some proposed applications may need to install engineering features to meet the performance standard.

iv. Demonstration that ''environmental releases to groundwater, surface water, soil and air are comparable to or lower than those from analogous products made without CCR, or that environmental releases to groundwater, surface water, soil and air will be at or below relevant regulatory and health-based benchmarks for human and ecological receptors during use.''

The environmental fourth criterion requires a potential use of CCR to compare analogous products or to perform an environmental assessment evaluating whether releases to the environment are at or below relevant regulatory and health-based benchmarks for human and ecological receptors during use. A demonstration should consider the development of a conceptual model to assist in the determination of whether the environmental criteria contained in the definition of the term ''beneficial use of CCR'' can be demonstrated. Numerous potential pathways exist and these should be evaluated as necessary depending on the potential application of the CCR. Potential exposure pathways include exposure to groundwater, surface water, air, and soils. Generation of dust, leaching to groundwater and surface water, inhalation of mercury, and plant uptake are areas that need to be evaluated. A complete evaluation of the types of releases, the types of exposure and the receptors that may be potentially affected by a potential application will need to be conducted. A screening comparison will need to be performed comparing the concentrations of individual constituents of potential concern to the following benchmarks: human soil ingestion, ecological soil, tap water ingestion, fish ingestion, surface water, sediment, and inhalation. As an example, a user could compare a mercury concentration to a human health screening benchmark with an inhalation value of 300 ng/m^3. Existing documents that can be used to gain an understanding of conceptual models, pathways and regulatory limits include: *Risk Assessment Guidance for Superfund, Exposure Factors Handbook, Volumes I, II and III, Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual Part A, Industrial Waste Management Model (IWEM) Technical Backgrounds Document, Exposure Factors Handbook, Human and Ecological Risk Assessment of Coal Combustion Wastes*. In addition, although it is not directly applicable, a potential user of unencapsulated CCR may find it useful to consult the previously mentioned ''*Coal Combustion Residual Beneficial Use Evaluation: Fly Ash Concrete and FGD Gypsum Wallboard''* and the ''*Methodology for Evaluating Encapsulated Beneficial Uses of Coal Combustion Residuals*'' to assist in the determination of whether the unencapsulated CCR is comparable to or lower than those from analogous products made without CCR, or that environmental releases to groundwater, surface water, soil and air will be at or below relevant regulatory and health-based benchmarks for human and ecological receptors during use.

After the effective date of the final rule, any potential user of CCR that makes the demonstration in the fourth criterion must keep records and provide such documentation upon request.

b. Placement in Sand and Gravel Pits and Quarries

EPA proposed that, without exception, unencapsulated CCR placed in sand and gravel pits, and quarries should not constitute beneficial use, but disposal. The Agency highlighted a number of damage cases that involved the filling of old, unlined quarries or gravel pits with large quantities of unencapsulated CCR, under the guise of ''beneficial use.'' Because of the damage cases and the concern that in such instances, sand and gravel pits and quarries were essentially operating as landfills, EPA proposed to define the placement of CCR in sand and gravel pits or quarries as land disposal that would be subject to regulation under either of the proposed regulatory options. The proposal specifically defined a *CCR landfill* as a disposal facility or part of a facility where CCR 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 part, 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.

Commenters stated that there were numerous examples of harm caused by the unencapsulated ''reuse'' in sand and gravel pits and quarries, which demonstrate that these unencapsulated uses were merely disposal in disguise, and must be regulated stringently under Subtitle C of RCRA to prevent the risks they pose of contaminating groundwater, surface water, and ecological systems with heavy metals and other harmful pollutants. In particular, they argue that ''There have already been at least 13 damage cases caused by the disposal of coal ash in sand and gravel pits or former quarries that led to contamination of water sources and/or ecological damages.'' Some commenters also agreed that placement in sand and gravel pits and quarries should not be considered beneficial use. For example, one commenter agreed that CCR placement in sand and gravel pits and quarries is ''disposal'' and not beneficial use while another commenter wrote that it concurs that large-scale fills in quarries in poorly engineered applications can cause negative impacts. Other commenters highlighted that damage cases related to sand and gravel pits and quarries were old practices that no longer take place. These commenters argued that while sand and gravel quarries have been used to dispose of CCR, it is not correct to assume that with proper engineering and environmental standards that CCR cannot be used beneficially to reclaim quarries for uses such as recreational areas, commercial or industrial uses, or to aesthetically improve the characteristics of the land.

EPA is finalizing its proposal that placement of CCR in sand and gravel pits constitutes disposal, rather than beneficial use. The final definition of a CCR landfill explicitly includes placement of CCR in sand and gravel pits and quarries. EPA has adopted this approach because the practice has resulted in numerous damage cases as a result of the highly permeable strata typically present at such sites. Moreover, while the commenters may be correct that ''with proper engineering measures, placement in sand and gravel pits and quarries can be conducted safely'', they submitted no data to support this contention. The only engineering features the available information demonstrate would be protective are those that have been determined to be necessary for CCR landfills—*i.e.,* composite liners and groundwater monitoring. And in the absence of these features, any future placement in sand and gravel pits and quarries could not meet the performance standard in the fourth criterion: *i.e.,* that environmental releases to groundwater, surface water, soil and air will be at or below relevant regulatory and health-based benchmarks for human and ecological receptors during use.

B. Definitions

EPA proposed definitions for a number of key terms used in the proposed subtitle D rule that the Agency determined were necessary for the proper interpretation of the proposed requirements, *e.g., coal combustion residuals, existing CCR landfill.* (See 75 FR 35196–97, June 21, 2010.) In addition, EPA also proposed definitions for terms that were specific to certain regulatory requirements, *e.g., seismic impact zone*.

EPA is finalizing many of the regulatory definitions that were proposed, some with modifications. Several definitions that were proposed have been removed because they are no longer relevant to this rulemaking and a number of new definitions have been added. Specifically, definitions that have been removed from the final rule include: natural water table, probable maximum precipitation, surface water, systemic toxicants and upstream toe. New definitions are discussed in the technical section of the rule for which they apply. The majority of the regulatory definitions contained in the proposed rule have been retained in the final rule, as proposed or with minor clarifying changes. These definitions are codified in § 257.53 and include the following: *acre foot, active life, aquifer, area capacity curves, areas susceptible to mass movement, coal combustion residuals (CCR), displacement, facility, factor of safety, fault, freeboard, groundwater, hazard potential classification, high hazard potential surface impoundment, significant hazard potential surface impoundment, low hazard potential surface impoundment, holocene, hydraulic conductivity, karst terrain, lithified earth material, maximum horizontal acceleration in lithified earth material, new CCR landfill, new CCR surface impoundment, operator, owner, poor foundation conditions, recognized and generally accepted good engineering practices, representative sample, run-off, run-on, sand and gravel pit or quarry, seismic impact zone, state, structural components, unstable area, uppermost aquifer,* and *waste boundary*.

Several definitions received a significant number of comments and upon further evaluation by EPA have been modified to better explain their meaning or intent. This includes the definitions for the following terms: *CCR landfill or landfill, CCR surface impoundment or impoundment, existing CCR landfill* and *existing CCR surface impoundment*. These comments, along with the revisions made in response are discussed in more detail below. In addition, EPA has revised a number of definitions, or added new definitions, to be consistent with revisions made in the corresponding technical requirements. These are discussed in the various sections of the preamble that address the specific technical requirement. For example, as discussed in Unit V of this document, EPA has revised the definition of ''independent registered professional engineer or hydrologist'' to ''qualified professional engineer'' to address the concerns raised in comments.

1. Definition of *CCR Landfill*

EPA proposed to define a *CCR landfill* as a disposal facility or part of a facility where CCR is 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 subpart, 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. (See 75 FR 35239.) The Agency received a significant number of comments on the proposed definition. These comments focused almost exclusively on the inclusion of ''large-scale fill operations'' and ''piles'' within the definition of CCR landfill. Regarding large-scale fills, commenters argued that one of the fundamental problems with the proposed definition was that it assumed all CCR placed in large scale fill operations constituted ''disposal'' of CCR (and that these operations therefore constitute CCR landfills) rather than beneficial use. Commenters further argued that CCR is often used in engineered fills, such as road base and road embankments and that these legitimate beneficial use operations should not be subject to the CCR landfill regulations.

Commenters also argued that ''piles'' should be omitted from the definition of a CCR landfill for a variety of reasons. Several commenters argued that including the word ''pile'' was overly broad and insufficiently prescriptive and would inappropriately capture on-going or short-term CCR management activities that did not constitute disposal, such as storage for beneficial use. These commenters also raised concern that including ''piles'' in the definition of CCR landfill without further clarification or specificity, *i.e.,* when used as part of a beneficial use operation, would negatively affect beneficial use activities. Other commenters raised concern that the term ''piles'' was too vague, and suggested that whether piles were treated as CCR landfills should be determined by the size of the piles, or the intent for which such piles exist. These commenters suggested the Agency should exclude small piles of CCR that are staged and/or consolidated prior to transport or placement for disposal. These commenters argued that subjecting all CCR piles to all of the landfill requirements was ''illogical and inappropriate.''

Certain commenters argued that piles should not be regulated under this rule because they do not present a significant risk to the environment, as evidenced by a lack of damage cases. Alternately, other commenters suggested that if EPA were to regulate piles, the Agency should consider a regulatory strategy other than regulation as a CCR landfill. One alternative regulatory strategy suggested was to include an option establishing a limit (*e.g.,* 180 days) on the amount of time that the CCR could be allowed to be maintained in a pile without regulation as a CCR landfill. Another option suggested was to develop a set of reasonable design and operating standards consistent with the uses and risks posed by piles. Such design standards could include the requirement for a low permeability underlayment or base such as asphalt, concrete or a high density polyethylene (HDPE) liner. Operating standards could include such provisions as labeling, and the requirement to remove at least 90 percent of the contents every 90 days, with a full cleanout annually.

EPA believes the suggested option to establish a time limit would be difficult to oversee and verify. States and citizens would have no way to determine when CCR is placed in a pile and when the CCR was subsequently removed. Therefore, EPA is rejecting this suggested option. The suggested option to develop appropriate design and operating standards is essentially the approach EPA has adopted, as discussed in more detail below. However, the final design and operating standards differ according to the management practices, and include measures to control fugitive dust, and for certain practices, require the installation of a composite liner and leachate collection system.

EPA discussed its final approach to large-scale fill operations in Unit V of this document; the definition of a CCR landfill has been revised to be consistent with the approach described in that section. As explained at length, EPA has adopted a final approach that distinguishes between beneficial use and the ''disposal'' of CCR. Activities that meet the definition of beneficial use are not subject to these regulations. Activities that do not meet all of the criteria in the definition of a beneficial use—and in particular, such activities that involve the placement of unencapsulated CCR on the land—are considered disposal and are subject to the requirements of this final rule. Consistent with this approach the final definition of a CCR landfill has been revised to clarify that it includes ''the

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use of CCR that does not meet the definition of a beneficial use of CCR.'' Waste piles, including those used to temporarily store or manage CCR on-site prior to disposal in a CCR landfill or subsequent beneficial use, have been retained within the definition of a CCR landfill. In making this determination the Agency was strongly influenced by the similarities in the potential risks posed by both waste piles and CCR landfills to human health, groundwater resources, or the air if improperly managed. Both CCR piles and CCR landfills are subject to external factors such as rain and wind, which can adversely affect human health and the environment. For example, uncontrolled run-on and run-off can result in ponding of water in and around the unit resulting in increased leachate which has the potential to affect groundwater. Similarly, absent dust control measures, such as the conditioning of CCR, both CCR landfills and CCR piles have the potential to generate significant amount of fugitive dust. Indeed, CCR piles are generally more susceptible to the creation of fugitive dusts. And contrary to the commenters' contention about the absence of damage cases, the single most frequent issue presented during the public hearings was the allegation by individual citizens of damage caused by fugitive dusts from neighboring CCR facilities. Moreover, the same pollution control measures, such as liners, leachate collection systems, and groundwater monitoring, will address the potential adverse effects from both of these units. As such, the Agency sees no reason to treat piles and landfills differently.

EPA also disagrees that the inclusion of CCR piles would capture on-going or short-term CCR management activities that do not constitute disposal. Irrespective of whether the facility is using the pile as ''temporary storage'' or ultimately intends to direct the CCR to beneficial use, by placing the CCR on the land with no containment or other method of preventing environmental exposures, the facility is engaging in an activity that clearly falls within the statutory definition of disposal. See 42 U.S.C. 6903(3)(''placing of solid waste . . . on any land, so that such solid waste . . . or any constituent thereof may enter the environment.'') Moreover, even where the facility intends the pile to be ''temporary,'' some amount of CCR inevitably remains in place. And if this was not the case, under section 1008(a)(3), EPA is authorized to establish criteria governing all aspects of solid waste management—which explicitly is defined to include ''storage'' as well as all of the other activities identified by the commenters—to ensure the protection of human health and the environment. See 42 U.S.C. 6903(28).

Nevertheless, EPA agrees that not every activity that involves the management of CCR must occur in a unit that meets all of the technical requirements of a CCR landfill (*e.g.,* groundwater monitoring). The key concern EPA is seeking to address with the inclusion of piles is the uncontrolled exposure from the extended, repeated, or indefinite placement of large amounts of unconsolidated CCR directly on the land. To the extent those exposures are controlled, whether through the use of tanks or some other kind of containment measures, the practice is neither considered to be a ''pile'' nor disposal in a landfill.

To clarify this, and in response to the concern that the term ''piles'' was too vague, EPA has adopted a definition of the term ''CCR pile'' to identify those ''piles'' that are subject to the disposal requirements in this regulation. The final regulation specifies that a CCR pile means any non-containerized accumulation of solid, non-flowing CCR that is placed on the land. This definition mirrors the existing definition of ''waste pile or pile'' from the part 257 regulations, (*i.e.,* the regulations that currently apply to CCR facilities), as well as the definition in part 260. The use of the phrase ''non-containerized'' is not intended to require that all activities occur within tanks or containment structures, but merely that specific measures have been adopted to control exposures to human health and the environment. This could include placement of the CCR on an impervious base such as asphalt, concrete, or a geomembrane; leachate and run-off collection; and walls or wind barriers. CCR managed in such a fashion would not be CCR piles and, therefore, not CCR landfills subject to this regulation. To further clarify how this relates to EPA's overall approach to beneficial use it is important to distinguish between CCR that is actually being used beneficially and CCR that may someday be used beneficially. CCR that is currently being used beneficially—for example, fly ash that has been transferred to a cement manufacturer and that is stored off-site in a ''temporary pile,'' and that complies with all of the criteria in the definition to be considered a beneficial use including the fourth criterion relating to the placement of large quantities of unconsolidated CCR on the land—would not be subject to the regulations applicable to CCR disposal. Accordingly, the final regulation specifies that practices that meet the definition of beneficial use of CCR are not subject to the 'disposal'' requirements of the rule.

By contrast, CCR located on-site that may someday be used beneficially but is not yet beneficially used remains subject to the disposal rule. Given that landfills and surface impoundments can be periodically dredged to provide material for beneficial use, any other approach would be impracticable, and would exclude from regulation many of the greatest sources of risk. An example of a ''pile'' that is not yet beneficially used is unconsolidated CCR placed on the land, that have been designated by the CCR facility to be transferred to another location for subsequent beneficial use (*e.g.,* use as road bed) in the near future.

Several commenters also suggested that the definition of a CCR landfill should explicitly exclude the use of CCR at surface coal mining and reclamation operations, to reflect the Agency's intention not to cover such activities. The Agency agrees and has revised the definition to explicitly provide that the term CCR landfill does not include the use of CCR at coal mining and reclamation operations.

Consequently, the Agency is finalizing a definition of ''CCR landfill or landfill'' that can be found in § 257.73. On a related matter, the definition of CCR landfill or landfill contains the terms ''sand and gravel pits or quarries.'' EPA proposed a ''sand and gravel pit and/or quarry'' to mean an excavation for the commercial extraction of aggregate for use in construction projects. The Agency received comments on the definition of sand and gravel pit and/or quarry suggesting that the term ''commercial extraction'' was too narrow. Specifically commenters were concerned it would exclude non-commercial extraction, such as gravel pits operated by municipalities, and exclude metallic mineral mines, nonmetallic mining for other than sand and gravel, and coal mines. EPA agrees that the use of the term ''commercial extraction'' renders the proposed definition too narrow, as there is no basis for distinguishing between commercial and non-commercial extraction, either because of the risks these activities pose, or any other consideration relevant to this rulemaking. EPA is, therefore, revising ''sand and gravel pit and/or quarry'' to mean an excavation for the extraction of aggregate, minerals, or metals. The term sand and gravel pit and/or quarry does not include subsurface or surface coal mines.

2. Definition of CCR Surface Impoundment

EPA proposed to define a CCR surface impoundment to mean 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 CCR 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 CCR 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.

The Agency received many comments on the proposed definition of CCR surface impoundment. The majority of commenters argued that the definition was overly broad and would inappropriately capture surface impoundments that are not designed to hold an accumulation of CCR. Commenters were concerned that the proposed definition could be interpreted to include downstream secondary and tertiary surface impoundments, such as polishing, cooling, wastewater and holding ponds that receive only de minimis amounts of CCR. Commenters reasoned that these types of units in no practical or technical sense could be described as units ''used to receive CCR that has been sluiced.''

Other commenters raised concern that the definition did not differentiate between temporary and permanent surface impoundments. Commenters stated that many facilities rely on short-term processing and storage before moving CCR off-site for beneficial use or permanent disposal and that these units should not be required to comply with all of the technical criteria required for more permanent disposal impoundments.

Upon further evaluation of the comments, the Agency has amended the definition of CCR surface impoundment to clarify the types of units that are covered by the rule. After reviewing the comments, EPA reviewed the risk assessment and the damage cases to determine the characteristics of the surface impoundments that are the source of the risks the rule seeks to address. Specifically, these are units that contain a large amount of CCR managed with water, under a hydraulic head that promotes the rapid leaching of contaminants. These risks do not differ materially according to the management activity (*i.e.,* whether it was ''treatment,'' ''storage'' or ''disposal'') that occurred in the unit, or whether the facility someday intended to divert the CCR to beneficial use. However, EPA agrees with commenters that units containing only truly ''de minimis'' levels of CCR are unlikely to present the significant risks this rule is intended to address.

EPA has therefore revised the definition to provide that a CCR surface impoundment as defined in this rule must meet three criteria: (1) The unit is a natural topographic depression, man-made excavation or diked area; (2) the unit is designed to hold an accumulation of CCR and liquid; and (3) the unit treats, stores or disposes of CCR. These criteria correspond to the units that are the source of the significant risks covered by this rule, and are consistent with the proposed rule. EPA agrees with commenters that relying solely on the criterion from the proposed rule that the unit be designed to accumulate CCR could inadvertently capture units that present significantly lower risks, such as process water or cooling water ponds, because, although they will accumulate any trace amounts of CCR that are present, they will not contain the significant quantities that give rise to the risks modeled in EPA's assessment. By contrast, units that are designed to hold an accumulation of CCR and in which treatment, storage, or disposal occurs will contain substantial amounts of CCR and consequently are a potentially significant source of contaminants. However, EPA disagrees that impoundments used for ''short-term processing and storage'' should not be required to comply with all of the technical criteria applicable to CCR surface impoundments. By ''short-term,'' the commenters mean that some portion of the CCR is removed from the unit; however, in EPA's experience these units are never completely dredged free of CCR. But however much is present at any given time, over the lifetime of these ''temporary'' units, large quantities of CCR impounded with water under a hydraulic head will be managed for extended periods of time. This gives rise to the conditions that both promote the leaching of contaminants from the CCR and are responsible for the static and dynamic loadings that create the potential for structural instability. These units therefore pose the same risks of releases due to structural instability and of leachate contaminating ground or surface water as the units in which CCR are ''permanently'' disposed.

The final definition makes extremely clear the impoundments that are covered by the rule, so an owner or operator will be able to easily discern whether a particular unit is a CCR surface impoundment. CCR surface impoundments do not include units generally referred to as cooling water ponds, process water ponds, wastewater treatment ponds, storm water holding ponds, or aeration ponds. These units are not designed to hold an accumulation of CCR, and in fact, do not generally contain significant amounts of CCR. Treatment, storage, or disposal of accumulated CCR also does not occur in these units. Conversely, a constructed primary settling pond that receives sluiced CCR directly from the electric utility would meet the definition of a CCR surface impoundment because it meets all three criteria of the definition: It is a man-made excavation and it is designed to hold an accumulation of CCR (*i.e.,* directly sluiced CCR). It also engages in the treatment of CCR through its settling operation. The CCR may be subsequently dredged for disposal or beneficial use elsewhere, or it may be permanently disposed within the unit. Similarly, secondary or tertiary impoundments that receive wet CCR or liquid with significant amounts of CCR from a preceding impoundment (*i.e.,* from a primary impoundment in the case of a secondary impoundment, or from a secondary impoundment in the case of a tertiary impoundment), even if they are ultimately dredged for land disposal elsewhere are also considered CCR surface impoundments and are covered by the rule. To illustrate further, consider a diked area in which wet CCR is accumulated for future transport to a CCR landfill or beneficial use. The unit is accumulating CCR, while allowing for the evaporation or removal of liquid (no free liquids) to facilitate transport to a CCR landfill or for beneficial use. In this instance, the unit again meets all three definition criteria, it is a diked area (*i.e.,* there is an embankment), it is accumulating CCR for ultimate disposal or beneficial use; and it is removing any free liquids, (*i.e.,* treatment). As such, this unit would meet the definition of CCR surface impoundment. In all of these examples significant quantities of CCR are impounded with water under a hydraulic head that will be managed for extended periods of time. This gives rise to the conditions that both promote the leaching of contaminants from the CCR and are responsible for the static and dynamic loadings that create the potential for structural instability. These units therefore all pose the same risks of releases due to structural instability and of leachate contaminating ground or surface water.

3. Definition of Existing CCR Landfill

EPA proposed to define an existing CCR landfill to mean a CCR landfill which was in operation on, or for which construction commenced prior to the effective date of the final rule. The proposed definition specified that 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.

In response to the proposed definition, the Agency received several comments arguing that the use of the phrase ''was in operation on, or for which construction commenced prior to'' would lead to confusion. Commenters contended that most units defined as CCR landfills at some point in time ''were in operation'' and had ''commenced construction'' prior to the effective date of the regulation. Commenters claimed that this definition would unnecessarily capture thousands of closed structural fill projects, including residential properties, commercial properties used by small businesses, and many recreational facilities. Furthermore, commenters doubted that EPA intended for the rule to cover all of these units and urged the Agency to clarify that closed units are excluded from the definition of existing CCR landfill.

Other commenters argued that the proposed definition of *existing CCR landfill* should be modified to include lateral expansions of operation units where such an expansion is within the site footprint of an area already approved and permitted by the state for the landfill. Commenters contended that while the proposed definition included undeveloped areas within the footprint of an approved permitted site, it also required that the construction be initiated at the site or that some type of binding contractual obligation be present. Commenters contended that the existence of a contractual obligation unfairly subjects undeveloped, yet approved permitted areas to design and operating standards for new CCR landfills based merely on the existence of a contract to commence construction. Commenters argued that such a distinction was arbitrary and capricious and provided no practical benefit. Other commenters questioned the usefulness of requiring a contractual obligation at all. As written, the commenters argued, that the definition was vague, unenforceable, and thus, not protective of human health and the environment. Commenters reasoned that there was no definitive or generally accepted meaning for the term ''substantial loss'' or the term ''reasonable time'' and an owner or operator, sensing that these proposed rules may be passed, could sign a contract now with minimum predetermined cancellation or modification penalties and a contract term of say five years or even longer to avoid the new unit requirements, *i.e.,* a composite liner.

The commenters are correct that EPA did not intend to cover inactive landfills under this rule. The Agency agrees that, as drafted, the proposed definition could cause confusion. EPA therefore deleted the phrase ''was in operation on the effective date of the rule'' and has substituted the phrase ''that receives CCR both before and after [the effective date of the rule].'' EPA also agrees that the phrase ''commenced construction prior to the effective date of the rule'' could similarly cause confusion. Therefore, the Agency has made a similar revision, by adding the phrase ''and receives CCR on or after [the effective date of the rule]'' after the phrase ''for which construction commenced prior to [the effective date of the rule].'' These revisions will clarify which units are covered by the technical requirement of the rule and alleviate any confusion. EPA is also making conforming modifications to the definition of *existing CCR surface impoundment.*

EPA disagrees that lateral expansions should be considered to be ''existing'' based solely on the fact that such an expansion is within the site footprint of an area already approved and permitted by the state. EPA has frequently distinguished between the types of requirements applicable to new and existing units, reasoning that in many instances, risk mitigation measures would be adequate such that existing units need not wholly retrofit to meet the new ''state of the art.'' For new units, however, the balance is generally struck in favor of requiring a greater degree of risk prevention, rather than relying solely on risk mitigation measures. In determining whether a unit is ''new'' or ''existing,'' EPA has historically considered that the equities lie in favor of considering a unit to be ''existing'' when there has been an irretrievable commitment of resources on the part of the facility. That has not occurred merely because permits have been obtained. While admittedly resources have been committed, at this stage modifications to the design and construction of the unit are still feasible. Specifically, the critical differences between the requirements applicable to new and existing CCR landfills are the type of liner that must be installed and the location restrictions that apply. Compliance with these requirements can be addressed through modifications to the design and construction of the unit, and are therefore readily feasible until construction has begun.

EPA agrees with those commenters who were concerned that the phrase, ''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,'' is vague and potentially subject to abuse. While this phrase has been included in other EPA regulations, those regulations operate within a regulatory program overseen by a regulatory authority. No similar guarantee exists under these regulations. EPA could not discover a definitive or generally accepted meaning for the terms ''substantial loss'' or ''reasonable time,'' or develop sufficiently objective and determinate criteria for these concepts. Consequently, the Agency has decided to remove this provision from the definition of *existing CCR landfill.* EPA is retaining the two most important elements of the definition that will effectively determine whether the facility has irretrievably committed resources such that it would not reasonable to require compliance with all of the requirements applicable to new units. Accordingly, a unit will be considered to be existing if, first, the owner or operator has obtained the federal, state, and local approvals or permits necessary to begin physical construction; and second, that a continuous on-site, physical construction program has begun (*i.e.,* groundbreaking has occurred). Therefore, EPA is finalizing the definition of *existing CCR landfill* that can be found in § 257.53.

4. Definition of *Existing CCR Surface Impoundment*

EPA proposed to define an *existing CCR surface impoundment* to mean a surface impoundment which was in operation on, or for which construction commenced prior to the effective date of the final rule. The proposal also specified that a CCR surface impoundment has commenced

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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.

EPA received many of the same comments on the definition of an existing CCR surface impoundment that were received on an existing CCR landfill. This included comments requesting clarification that the term did not include impoundments that had ceased receiving CCR before the effective date of the rule. Commenters also suggested that EPA modify the definition to include the phrase that the surface impoundment ''was in operation and had not yet ceased receiving CCR prior to the effective date of the rule'' to make clear that the definition did not encompass units that are no longer receiving CCR on the effective date of the rule, even though the unit may not have completed final closure prior to the rule's effective date. Commenters reasoned that units no longer receiving CCR on the effective date of the rule are not ''in operation'' and therefore should not be subject to the standards applicable to active units. Commenters also requested that EPA clarify that the definition of ''existing CCR surface impoundment'' include units that were in operation on the effective date of the rule and that periodically dredged out during the operating life of the impoundment. Commenters contended that while this may seem self-evident, EPA needed to clarify that these impoundments would not be characterized as ''new CCR surface impoundments.''

The Agency is generally conforming the definition of an existing CCR surface impoundment to the revised definition of an existing CCR landfill. Although inactive CCR surface impoundments are covered by the final rule (unlike inactive CCR landfills), EPA decided it would provide greater clarity to establish a section specific to inactive CCR surface impoundments rather than merely including such units within the definition of an existing CCR surface impoundment. As discussed in greater detail in Unit VI.A of this document, under § 257.100, any CCR surface impoundment that continues to impound CCR and water after the effective date of the rule, must either (1) breach, dewater, and place a cover on the unit within three years or (2) must comply with all of the requirements applicable to existing CCR surface impoundments. Without the need to account for inactive CCR surface impoundments within the definition, the definitions of ''existing'' landfills and surface impoundments should be the same.

Thus, the Agency has removed the term ''in operation'' from the definition and has instead focused on when the surface impoundment received or will receive CCR. EPA has also deleted the provision that would have allowed a unit to be considered to be ''existing'' based on the existence of a contract. Accordingly, for purposes of this rule, a CCR surface impoundment will be considered to be ''existing'' if the unit received CCR both before and after the effective date of the rule. For example, if a CCR surface impoundment received CCR prior to the effective date and was in the process of dredging on the effective date with the intent of receiving additional CCR after the effective date, the unit would still be considered to be an ''existing'' rather than a new unit. Conversely, if a unit received CCR prior to the effective date and was no longer receiving CCR, this unit would be considered ''inactive,'' and would only be subject to the technical criteria applicable to ''existing'' CCR surface impoundments if they had not completed closure within three years. Similarly, if a CCR surface impoundment had commenced construction prior to the effective date with the intention of receiving CCR on or after the effective date of the rule, the unit would be considered an ''existing'' unit only if the physical construction program had begun (*e.g.,* groundbreaking had occurred) with the appropriate federal, state and local approvals or permits in place. But if prior to the effective date of the rule, the permits had been obtained but the physical construction of the unit had not begun (*e.g.,* groundbreaking had not occurred), the unit would be considered ''new'' and would be subject to all the applicable technical criteria for new CCR surface impoundments. Therefore, the Agency is finalizing the definition of *existing CCR surface impoundment* that can be found in § 257.53.

C. Location Restrictions and Individual Location Requirements

In the proposed rule, EPA stated that any RCRA subtitle D regulation would need to ensure that CCR landfills, CCR surface impoundments and all lateral expansions were appropriately sited to ensure that no reasonable probability of adverse effects on health or the environment from the disposal of CCR would occur. Under the subtitle D option, EPA proposed location restrictions for CCR units which included requirements relating to the placement of CCR in five general locations: (1) Above the natural water table; (2) wetlands; (3) fault areas; (4) seismic impact zones; and (5) unstable areas. The proposed requirements relied in large measure, on the record EPA developed to support the 40 CFR part 258 requirements for MSWLFs and on EPA's Guide for Industrial Waste Management (EPA530–R–03–001, February 2003). EPA also chose to add one additional location restriction that would ban the placement of CCR units within two feet of the upper limit of the natural water table. This proposed requirement was originally included in the proposed rule, *Standards for the Management of Cement Kiln Dust* (64 FR 45631, August 20, 1999) because of the potential damage to groundwater caused by the management of cement kiln dust at sites located below the natural water table. While the proposed cement kiln dust rule has not yet been finalized, EPA extended this reasoning to CCR by applying the same location restriction to CCR units. The proposed applicability of these location requirements varied depending on whether the unit was an existing or new CCR landfill, an existing or new CCR surface impoundment, or a lateral expansion of such units. For example, for existing CCR landfills, the Agency proposed that only the location requirement for unstable areas would apply. By contrast, the proposed rule applied all of the location restrictions to new CCR landfills and all CCR surface impoundments, both existing and new—an approach consistent with RCRA subtitle C and Congressional distinctions between the risks presented by landfills and surface impoundments. (See 75 FR 35198–35199.) This meant that owners or operators would need to close existing CCR surface impoundments located less than two feet above the natural water table, or for existing CCR units in sensitive but not prohibited locations, make a technical demonstration that the unit met the requirements of a performance standard that serves as the alternative to the location restriction, retrofit the unit so that it could meet the performance standard, or close. For those CCR units that need to close (*i.e.,* owners or operators that could not make the necessary technical demonstrations), EPA proposed that the unit must close within five years of the effective date of the rule. If closure could not occur within the five year timeframe, the

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Agency proposed allowing for a case-by-case extension for up to two more years if the facility demonstrated that there was no alternative disposal capacity and no immediate threat to health or the environment.

EPA proposed not to impose all of the location requirements on existing CCR landfills based on the conclusion that CCR landfills pose less risk and are structurally less vulnerable than existing CCR surface impoundments. EPA also raised concern that a significant number of these CCR landfills could be located in areas subject to these requirements, (particularly wetlands), which could cause disposal capacity shortfalls in certain regions of the U.S., if existing CCR landfills in these locations were required to close. Disposal capacity shortfalls can pose significant environmental and public health concerns based on the potential for significant disruption of solid waste management state-wide from the closure of these units. EPA concluded that these risks would be greater than the potential risks from allowing existing CCR landfills to remain in these locations, given that these units would be subject to all of the design and operating requirements of the rule. To ensure the accuracy of its preliminary conclusions, the Agency requested commenters to provide any available information regarding the number of existing CCR landfills located in these sensitive areas. The Agency also sought information regarding the extent to which CCR landfill capacity would be affected by applying all of the location restrictions to existing CCR landfills, the extent to which facilities could comply with the proposed performance standards, and the costs that would be incurred to retrofit existing CCR landfills to meet these standards.

The Agency received numerous comments in response to the Agency's request for additional information regarding the extent to which landfill capacity would be affected by applying all the proposed subtitle D location restrictions to existing CCR landfills. Commenters generally agreed with the Agency that applying the other location restrictions to existing CCR landfills would cause a significant decrease in disposal capacity across the country, although they did not provide any data or information which would support this concern. Commenters noted, however, that if existing CCR landfills located in these areas were to close, it would greatly complicate operations at many utilities. Affected facilities would need to find additional disposal capacity, which would require utilities to procure new real estate on which to site a new CCR landfill (which may be a significant distance from a power plant), obtain a new disposal permit for the CCR landfill (which can take an extended period of time), and potentially transport significant volumes of CCR great distances to newly-permitted facilities. Commenters argued that there was simply no environmental basis for causing this level of disruption to utility CCR disposal practices.

EPA received no data or information in response to the Agency's request for the costs associated with retrofitting a CCR surface impoundment or CCR landfill to meet the demonstrations for existing units. Similarly, the Agency received little to no information in response to EPA's request for additional information on the location of these facilities. Some commenters acknowledged that specific states were located in some of these restricted areas but did not provide specific information on specific units.

Overwhelmingly, the issue receiving the most comment was EPA's intention to subject existing CCR surface impoundments to all of the new location criteria. Commenters contended that subjecting existing units to all of the location criteria was a radical departure from the location restriction provisions of the existing MSWLF rules on which the subtitle D option is based (*i.e.,* existing MSWLFs are only subject to the floodplains and unstable areas restrictions) without any justification for regulating CCR surface impoundments more stringently than existing CCR landfills. Commenters argued that EPA must demonstrate that there are increased risks posed by each CCR surface impoundments based on its location; otherwise, they claimed, there was no justification for EPA to subject CCR surface impoundments to more stringent location restrictions. Some commenters suggested that a more reasonable approach would be to limit the restrictions for existing CCR surface impoundments to unstable areas, consistent with the approach proposed for existing CCR landfills. Finally, commenters raised concern about the inconsistency between the preamble language and the corresponding regulatory text. Specifically, the preamble stated EPA's intention to apply all of the location criteria to all CCR surface impoundments (existing and new) while the proposed regulatory language applied all location criteria only to new CCR surface impoundments and lateral expansions.

1. Applicability of the Location Criteria to Existing CCR Surface Impoundments

EPA acknowledges the discrepancies between the preamble language and the regulatory text regarding the proposed regulatory language for the location restrictions as it applies to existing CCR surface impoundments. In the proposed rule, the regulatory language should have included, "all surface impoundments" as opposed to only "new surface impoundments."

EPA disagrees that in order to justify national minimum standards applicable to existing CCR surface impoundments, the Agency must demonstrate an adverse impact to human health and the environment from each individual unit, based on the specific risks posed at each location. As an initial matter, it is well established that an agency may regulate a class of similarly situated entities through rulemaking, rather than on the basis of an individualized assessment of every entity that will be subject to the rule. And indeed, Congress specifically directed EPA to proceed by rulemaking to establish minimum national standards under RCRA sections 1008(a) and 4004(a). Moreover, section 4004(a) does not require a demonstration of actual impacts, merely that these units present an unacceptable *risk* of harm. Thus, it is sufficient for EPA to establish a factual record demonstrating that the specific location restrictions in the final rule are necessary for CCR units (landfills and surface impoundments), as a class, to ensure that there will be no reasonable probability of adverse effects on health or the environment. As discussed in greater detail in the next section and in Unit X of the preamble, the factual record supports the need for all of the location standards for existing CCR surface impoundments imposed by this rule.

The Agency also rejects the suggestion that EPA establish the same location restrictions for both existing CCR landfills and CCR surface impoundments. As laid out in the proposal and elsewhere in this final rule in greater detail, the risks associated with CCR surface impoundments are substantially higher than the risks associated with CCR landfills, by approximately an order of magnitude. Surface impoundments are utilized by 45 percent of coal-fired power plants and in 2000 accounted for disposal of one-third of all CCR generated.[46] Unlike landfills, CCR surface impoundments

[46] Rowe, C.L., Hopkins, W.A., Congdon, J.D., 2002. Ecotoxicological Implications of Aquatic Disposal of Coal Combustion Residues in the United States: A Review. Environmental Monitoring and Assessment, Vol. 80, pp. 207–276.

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contain slurried residuals that remain in contact with ponded waters until closure. In a statewide investigation of impacts to groundwater quality from CCR disposal sites, the Wisconsin Department of Natural Resources reported that closed sites which originally contained sluiced coal-combustion residuals displayed extremely elevated mean arsenic levels (as high as 364 µg/l).[47] The highest contaminant concentrations in the study were associated with sluiced CCR residuals. In addition, releases of toxic contaminants to surface water and groundwater from mostly unlined CCR surface impoundments and ponds are a relevant factor in 34 of 40 cases of proven damage to the environment (as well as in several cases of ''potential'' damage to the environment) from mismanagement of CCR.[48] In many of these cases, effluent discharges from the surface impoundments caused significant ecological damage to aquatic life in nearby streams and wetlands. In one case, in 2002, the structural stability of a CCR surface impoundment was directly compromised by sinkhole development, leading to the release of 2.25 million gallons of CCR slurry. In another, an unusually weak foundation of ash and silt beneath a CCR surface impoundment (*i.e.,* man-made unstable ground) was identified as one of several likely factors contributing to the dike failure that in 2008 resulted in the largest CCR spill in United States history.

Unlike RCRA subtitle C, subtitle D does not explicitly authorize EPA to establish different standards for existing and new units, and Congress specifically intended subtitle D to address the risks from existing, abandoned ''open dumps.'' In the proposed rule preamble, EPA explained the rationale for applying these provisions to existing CCR surface impoundments, and the commenters have submitted nothing to rebut that rationale. Thus, EPA maintains its determination that application of the location standards to existing CCR surface impoundments is necessary to achieve the standard in section 4004(a). Absent these location restrictions, the risk of impacts to human health and the environment from releases from CCR units, including from the rapid and catastrophic destruction of CCR surface impoundments, sited in these sensitive areas would exceed acceptable levels. Given that the risks associated with CCR surface impoundments are substantially higher than the risks posed by CCR landfills, this is the appropriate regulatory course for existing CCR surface impoundments.

In this rule, EPA is finalizing location restrictions that will ensure that CCR units are appropriately sited, that the structure of the CCR unit will not be adversely impacted by conditions at the site, and that overall there will be ''no reasonable probability of harm to human health or the environment'' due to the location of the CCR unit. EPA is finalizing different sets of location restrictions depending on whether the unit is a CCR landfill or CCR surface impoundment and whether it is an existing or new unit. Lateral expansions fall within the definitions of new units and are treated accordingly. These standards provide minimum national siting and performance criteria for all CCR units. The location restrictions under § 257.60 through § 257.64 include: (1) Placement above the uppermost aquifer; (2) wetlands; (3) fault areas; (4) seismic impact zones; and (5) unstable areas. Each of these locations is generally recognized as having the potential to impact the structure of any disposal unit negatively and as such, increase the risks to human health or the environment through structural failures or leaching of contaminants into the groundwater. Under the final rule and as proposed, new CCR landfills, existing and new CCR surface impoundments, and all lateral expansions will be required to comply with all of the location restrictions. Existing CCR landfills however, will be subject to only two of the location restrictions—floodplains, and unstable areas. As noted in the proposed rule, and restated here, existing landfills and surface impoundments are already subject to the location standards in subpart A of 40 CFR part 257 for floodplains, endangered species and surface waters. The final rule does not change this requirement, and so facilities should already be in compliance. The Agency is finalizing, as proposed, the unstable area location restriction for existing CCR landfills because the record clearly shows that failure of CCR units in these areas (*e.g.,* due to instabilities in Karst terrains) have and in all likelihood would continue, in the absence of the restrictions in the final rule, to result in damage caused by the release of CCR constituents, affecting both groundwater and surface waters. As the Agency stated in the proposed rule, the impacts resulting from the failure of CCR units from location instability are of far more concern than any disposal capacity concerns resulting from the closure of existing CCR units in unstable areas.

Conversely, and also consistent with the proposed rule, EPA is not applying the following location restrictions to existing CCR landfills: The requirement to construct a unit with a base located no less than 1.52 meters (five feet) above the upper limit of the uppermost aquifer, as well as the siting restrictions applicable to wetlands, fault areas, and seismic impact areas. Existing CCR landfills pose lower risks and are structurally less vulnerable than existing CCR surface impoundments. In addition, disposal capacity shortfalls, which could result if existing CCR landfills in these locations were required to close, raise greater environmental and public health concerns than the potential failure of the CCR landfills in these locales.

2. Placement Above the Uppermost Aquifer

Under § 257.60(a) EPA is requiring new CCR landfills, existing and new CCR surface impoundments and all lateral expansions to be constructed with a base that is located no less than 1.52 meters (five feet) above the uppermost aquifer, or to demonstrate that there will not be an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuations in groundwater elevations (including groundwater elevations during the wet season). Existing surface impoundments that fail to achieve this standard must close. New CCR landfills, new CCR surface impoundments and all lateral expansions of existing and new CCR landfills and CCR surface impoundments cannot be constructed unless they meet one of these two standards. In response to comment, the Agency has modified the criteria in two ways. First, EPA has replaced ''a base that is located a minimum of two feet above the upper limit of the natural water table'' with ''a base no less than 1.52 meters (five feet) above the uppermost aquifer.'' EPA received comment explaining that fluctuations in groundwater levels in many geological settings can exceed ten feet over the course of the year, and alleging that the proposed two foot minimum buffer between the base of the unit and the top of the water table would therefore be insufficiently protective. The

[47] Zillmer, M. and Fauble, P., 2004. Groundwater Impacts from Coal Combustion Ash Disposal Sites in Wisconsin. Waste & Materials Management, Wisconsin Department of Natural Resources, PUB–WA 1174 2004.

[48] Cases of damage attributable to disposal of coal combustion residuals are summarized in the appendix to the preamble of the proposed rule, 75 FR 35230–35239, June 21, 2010, and can be found in the RCRA Docket.

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commenter recommended that the minimum vertical separation be at least three to five feet from the base of the liner components. After additional research, EPA is finalizing a minimum buffer of five feet instead of two feet. EPA's research confirmed the commenter's claims. In addition, EPA determined that several states consider five feet between the base of the surface impoundment and the top of the uppermost aquifer to be the minimum distance that is protective of human health and the environment. These are California, Michigan, Nebraska, New York, West Virginia, and Wisconsin. The Agency has concluded from geographic and climatic spacing of these states that the hydrogeologic conditions within them encompass the range of conditions found in the United States. Therefore, EPA is finalizing a minimum buffer of five feet instead of two feet.

EPA is also clarifying the definition of the natural water table. As some commenters noted, there are many factors (hydrologic and geologic settings, nearby pumping, etc.) that influence the location of the groundwater table making it difficult to determine the ''natural'' level. In addition, as noted, local site-specific hydrogeologic conditions within the aquifer may cause the natural groundwater table to exceed five feet and vary as much as ten feet. To account for the possibility of such large seasonal fluctuations, EPA is revising the definition of ''uppermost aquifer'' to specify that the measurement of the upper limit of the aquifer must be made at a point nearest to the natural ground surface to which the aquifer rises during the wet season. This definition of ''uppermost aquifer'' will encompass large seasonal variations, and is a more appropriate parameter than ''seasonal high groundwater table'' as suggested by several commenters and the proposed ''natural water table'' because it is more clearly defined.

In § 257.60(a) the term *uppermost aquifer* has the same definition as under the general provisions of § 257.40: The geologic formation nearest the natural ground surface that is an aquifer, as well as lower aquifers that are hydraulically interconnected with this aquifer within the facility's property boundary. This definition includes a shallow, deep, perched, confined or unconfined aquifer, provided it yields usable water. Although EPA originally proposed that all CCR surface impoundments be located ''. . . . above the upper limit of the natural water table'', the Agency is amending this requirement and replacing ''water table'' with ''uppermost aquifer'' to make it consistent with the way natural underground water sources are described elsewhere in the rule. EPA made a second revision to the criteria that were originally proposed. As an alternative to requiring that the CCR units described in this section be constructed with a base that is located no less than five feet above the uppermost aquifer, owners and operators may instead demonstrate that there will not be an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuations in groundwater elevations (including groundwater elevations during the wet season).

This alternative standard was developed in response to concerns from commenters that a single depth to the aquifer failed to account for the wide variations in the level of water table fluctuations in different regions of the country. For example, arid regions of the country, such as Arizona, under normal conditions generally do not experience the same degree of fluctuations in groundwater elevations as more temperate regions, such as Minnesota. Accordingly, EPA developed an alternative performance standard focused on the conditions identified in the damage cases and the risk assessment that this location criterion was designed to prevent: Specifically, where the groundwater elevation is high enough to intersect the base of the waste management unit. In such situations, this hydraulic connection can enhance the transport of contaminants of concern from the CCR unit into groundwater. By requiring owners and operators to ensure that these conditions do not occur, the alternative standard to allow owners and operators to account for situations where there are relatively small variations in groundwater levels and a buffer of five feet is not necessary. This will also ensure that a CCR unit need not address situations where an infrequent, unexpected event (*e.g.,* hurricane) could cause a brief, temporary condition where the uppermost aquifer rises to less than the prescribed five feet but which would not in and of itself constitute a long-term threat to the aquifer. However, where normal fluctuations in groundwater elevation (including, but not limited to, seasonal or temporal variations, groundwater withdrawal, mounding effects,[49] etc.) will result in the failure of the unit to meet the performance standard (*i.e.,* no intermittent, recurring, or sustained hydraulic connection between the base of the CCR unit and the uppermost aquifer), the unit must close.

In some recent damage cases, placement of large volumes of CCR into highly permeable strata in the disposal area promoted CCR-water interactions. For example, from 1995 to 2006 in Anne Arundel County, Maryland 4.6 million tons of CCR were placed directly in two sand and gravel quarries without a geomembrane liner or leachate collection system. Rainwater infiltration into exposed CCR coupled with groundwater-CCR interactions and the transmissivity characteristics of local strata contributed to rapid migration of heavy metals, including antimony, arsenic, cadmium, nickel, and thallium to residential drinking water wells located near the mine pits and significant deterioration of water quality as a result of placement of CCR. Similarly, from 1980 to 1997 in Lansing, Michigan, around 0.5 million tons of coal ash was dumped for disposal into a gravel pit with an elevated water table. A remedial investigation has established that groundwater mounding has immersed the CCR into the upper aquifer resulting in on-site exceedances of groundwater quality protection standards for sulfate, manganese, lead, selenium, lithium, and boron. Placement of CCR into un-engineered, unlined units in permeable strata has plainly led to adverse impacts to groundwater. The phrase ''normal fluctuations'' has been used to clarify that EPA does not intend for the facility to account for extraordinary or highly aberrant conditions (*e.g.,* one-in-a million or ''freak'' events). Normal fluctuation can include those resulting from natural as well as anthropogenic sources. Natural sources that could affect groundwater levels include, but are not limited to precipitation, run-off, and high river levels. Anthropogenic sources that could affect groundwater levels include groundwater withdrawal, pumping, well(s) abandonment, and groundwater mounding. In satisfying this location restriction, it may be necessary for a professional engineer to model these effects before he can make the necessary certifications.[50] EPA also

[49] A phenomenon usually created by the recharge of groundwater from a manmade structure, such as a surface impoundment, into a permeable geologic material, resulting in outward and upward expansion of the free water table. Mounding can alter groundwater flow rates and direction; however, the effects are usually localized and may be temporary, depending upon the frequency and duration of the surface recharge events.

[50] For example, evaluations can be done to estimate groundwater mounding such as *pubs.usgs.gov/sir/2010/5102/*, *www.groundwatersoftware.com/calculator_9_*

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notes that this modeling may include the same considerations already evaluated under some state programs.[51] EPA expects that owners and operators will have sufficient information to determine whether their CCR unit meets either performance standard. Most, if not all, of this information would be information a facility would typically have as part of normal operations (*e.g.,* the depth of the CCR unit itself), or that will be developed as part of implementing other rule requirements. For example, through the groundwater monitoring system required under §§ 257.90–257.98, the facility can obtain water level measurements in a sufficient number of locations (*e.g.,* monitoring wells, piezometers) to use in determining whether they satisfy either performance standard. Similarly, under § 257.91 a thorough characterization of the geology and hydrogeology of the site must be conducted. Finally, EPA notes that available technology and guidance are available for using existing groundwater monitoring wells, like those required under this final rule, to measure groundwater levels.[52]

3. Wetlands

In § 257.61 of this rule, EPA is finalizing the regulatory text essentially as proposed. Specifically, EPA is adopting a prohibition on locating all CCR surface impoundments and new CCR landfills, as well as lateral expansions of existing CCR units, in wetlands as defined in 40 CFR 232.2, absent specific demonstrations made by the owner or operator that ensure the CCR unit will not degrade sensitive wetland ecosystems. These provisions place the burden of proof for these demonstrations directly on the owner or operator (the discharger). The owner or operator must make the results of these demonstrations available in the facility record. Failure to make any of the demonstrations will bar siting of the CCR unit in a wetland.

In 2003, disposal of CCR in natural or man-made aquatic basins accounted for nearly one-third of all CCR land disposal. Historically, aquatic disposal of CCR has been attractive economically to facilities because of its lower overall cost relative to dry management and the ease of handling of residuals. During aquatic disposal, CCR is commonly piped as a slurried mixture to surface impoundments designed to retain the solids in contact with water for the life of the unit. Particulate solids from the waste stream gravitationally settle while clarified waters ultimately discharge into nearby streams and wetlands.

The term 'wetlands' refers to those areas inundated or saturated by surface or groundwater at a frequency and over a duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands include marshes, swamps, bogs and similar areas that are commonly located between open water and dry land. Under the CWA, wetlands are considered 'special aquatic sites' deserving of special protection because of their ecologic significance. Wetlands are very important, fragile ecosystems that must be protected, and EPA has long identified wetlands protection as a high priority.

Undisturbed, natural wetlands provide many benefits to society by improving water quality, providing essential breeding, rearing, and feeding grounds for fish and wildlife, reducing shoreline erosion, and absorbing flooding waters and pollution. Wetlands are also commercial source areas of products for human use such as timber, fish, and shellfish. Recreational hunters harvest wetland-dependent waterfowl. Wetland environments, however, may be adversely impacted by releases of wastes from co-located industrial facilities. Wetland ecosystems can be degraded by accidental discharges that can change the habitat value for fish and wildlife by obstructing surface water circulation patterns, altering substrate elevation, dewatering, or permanent flooding.

In support of the provisions finalized in this rule, EPA is citing several damage cases, including 30 cases of ''proven'' damage to the environment that involve aquatic disposal of CCR, 14 of which involve impacts to wetlands from release of CCR. For example, at the Hyco Reservoir in Roxboro, North Carolina from 1966 to 1990 the lake received contaminated effluent from coal ash disposal basins that were authorized by National Pollutant Discharge Elimination System (NPDES) permits under the CWA. High levels of the trace element selenium bioaccumulated in aquatic food chains (phytoplankton), poisoning invertebrates and fish in the lake, particularly species of sport fish (bluegill, largemouth bass), causing reproductive failure and severe declines in fish populations in the late 1970's and early 1980's. Consequently, from 1988–2001 the North Carolina Department of Health and Human Services (NCDHHS) issued a consumption restriction advisory for selenium contamination in fish from the reservoir. In 1990, a dry ash handling system was implemented resulting in lower selenium discharge and reduced mean selenium concentration in reservoir waters. As of 2005, concentrations of selenium in fish tissues remained above a toxic threshold even with reduced influx of selenium, due to migration of the element from contaminated sediments to benthic food chains. The total monetized value of damage can be divided among ecologic factors (*e.g.,* major impacts on fish), recreational factors (*e.g.,* fishing trips not taken), depreciated real estate values, aesthetic factors, and human health damages (*e.g.,* losses due to stress and anxiety from knowing ecosystem is poisoned) and is estimated at $877 million.[53]

Although this consideration is not relevant for purposes of establishing the minimum national criteria under RCRA sections 1008(a) and 4004(a), the rulemaking record demonstrates that the monetary cost of environmental damage from releases of CCR at surface impoundments could be considerable. A report on the environmental damage caused by releases of CCR at 22 sites estimates the total cost of poisoned fish and wildlife at the surface impoundment sites at $2.32 billion. At twelve of these sites the releases were legally permitted under the CWA. Five of the 22 cases were caused by structural failures, two resulted from an unpermitted discharge, and one was from a landfill.[54] Effluent contaminated with coal combustion residues is directly linked with high loadings of toxic metals in the discharge areas of aquatic basins, where some metals (primarily arsenic, cadmium, chromium, copper, lead, and selenium) have accumulated in aquatic food chains.[55] In a research overview (literature synthesis) on the environmental effects of disposal of CCR, Rowe et al. (2002) listed adverse biological responses, including histopathological, behavioral, and physiological (reproductive, energetic, and endocrinological) effects, that have been observed in some vertebrates and invertebrates following exposure to and bioaccumulation of CCR-related contaminants.

Under the criteria finalized in this rule, in order to locate a CCR unit or

hantush_mounding.htm, and *www.ndwrcdp.org/documents/wu-ht-02-45/wuht0245_electronic.pdf*.

[51] See, *e.g., dnr.wi.gov/topic/stormwater/standards/gw_mounding.html*.

[52] See, *e.g.,* U.S. EPA (Environmental Protection Agency). 2013. Groundwater Level and Well Depth Measurement. SESDPROC–105–R2. Region 4. Athens, GA. Available online at: *www.epa.gov/region4/sesd/fbqstp/Groundwater-Level-Measurement.pdf*.

[53] Lemly, A.D. 2010. Op.cit.

[54] Lemly, A.D.2010. Op. cit.

[55] Rowe, C.L. et. al. 2002. Op. cit.

lateral expansion in a wetland, the owner or operator must: (1) Successfully rebut the presumption that an alternative site (*i.e.,* one that does not involve a wetland) is reasonably available for the CCR unit or lateral expansion; (2) show that the construction or operation of the unit will not cause or contribute to violations of any applicable state water quality standard, violate any applicable toxic effluent standard or prohibition, jeopardize the continued existence of endangered or threatened species or critical habitats, or violate any requirement for protection of a marine sanctuary; (3) show that the CCR unit or lateral expansion will not cause or contribute to significant degradation of wetlands; and (4) demonstrate that steps have been taken to attempt to achieve no net loss of wetlands.

In addition to these requirements, other federal laws may be applicable in siting a CCR unit in a wetland. These include: Sections 401, 402, and 404 of the CWA; the Rivers and Harbors Act of 1989; the National Environmental Policy Act; the Migratory Bird Conservation Act; the Fish and Wildlife Coordination Act; the Coastal Zone Management Act; the Wild and Scenic Rivers Act; and the National Historic Preservation Act. In addition, the use of a wetlands location for a CCR unit may require a permit from the U.S. Army Corps of Engineers. To the extent these are applicable, compliance with these RCRA criteria does not alleviate the need to comply with these other federal requirements, and the owner or operator of the facility remains responsible for ensuring compliance with all applicable federal and state requirements.

The rule adopts a regulatory presumption that a less damaging alternative to locating a disposal unit in a wetland exists, unless the owner or operator can demonstrate otherwise. Thus, when proposing to locate a new facility or lateral expansion in a wetland, owners and operators must be able to demonstrate that alternative sites are not available and that the impact to wetlands is unavoidable. If this presumption is not clearly rebutted, then the CCR unit may not be sited in a wetland location. Such an analysis necessarily includes a review of reasonable alternatives to locating or laterally expanding CCR units in wetlands. As part of the evaluation of reasonable (that is, available and feasible) alternatives the owner or operator must show, and a qualified professional engineer must verify, that operation or construction of the CCR unit will not: (1) Violate any applicable state water quality standards; (2) cause or contribute to the violation of any applicable toxic effluent standard or prohibition; (3) cause or contribute to violation of any requirement for the protection of a marine sanctuary; and jeopardize the continued existence of endangered or threatened species or critical habitats.

When evaluating the impacts of a CCR unit on a wetland, the owner or operator must ensure that the unit cannot cause or contribute to significant wetland degradation. Therefore, the owner or operator and the qualified professional engineer must: (1) Verify the integrity of the CCR unit, and its ability to protect ecological resources by addressing the erosion, stability, and migration potential of native wetland soils, and dredged and fill materials used to support the unit; (2) verify that the design and operation of the CCR unit minimizes impacts on fish, wildlife, and other aquatic resources and their habitat(s) from any release of coal combustion residuals; (3) evaluate the effects of catastrophic release of CCR to the wetland and the resulting impacts on the environment; and (4) verify that ecological resources in the wetland are sufficiently protected, including consideration of the volume and chemistry of the CCR managed in the unit; and any additional factors, as necessary.

When a wetland functions properly, it provides water quality protection, fish and wildlife habitat, natural floodwater storage, and reduction in the erosive potential of surface water. A degraded wetland is less able to effectively perform these functions. For this reason, wetland degradation is as big a problem as outright wetland loss, though often more difficult to identify and quantify. Any change in hydrology can significantly alter the soil chemistry and plant and animal communities. The common hydrologic alterations that can lead to significant degradation in wetland areas include: (1) Deposition of fill material, including CCR; (2) drainage for development; (3) dredging and stream channelization for development; (4) diking and damming to form ponds or impoundments; (5) diversion of CCR-bearing waters or other flows to or from wetlands; (6) addition of impervious surfaces in the watershed, thereby increasing water and CCR-bearing run-off into wetlands. These activities can mobilize CCR-bearing sediment; and once the sediment is discharged into the environment, toxic metals in CCR can become available to organisms within the wetland. Consequently, while the mere presence of one or more of these activities does not necessarily demonstrate that the CCR unit causes or contributes to significant degradation, the fact that they may do so means these activities need to be carefully evaluated.

In determining what constitutes ''significant'' degradation, it is important to understand that although wetlands are capable of absorbing pollutants from the surface water, there is a limit to their capacity to do so. For the purposes of this rule, the primary pollutants of concern are CCR-bearing sediment and toxic metals. Although the risk assessment did not assess the exposure and hazard to wetlands, these can originate from uncontrolled run-off from the facility, fugitive dust from uncovered CCR landfills and piles, and uncontrolled discharge from CCR units (landfills, waste piles, surface impoundments). A clear example of biologically significant degradation in wetlands is when these toxic metals accumulate in benthic and aquatic food chains as a result of uncontrolled runoff. Another is obrution (smothering) of benthic organisms from discharge(s) of CCR to surface water, thereby jeopardizing the continued existence of organisms or critical habitats within the wetland. EPA notes that there are other requirements established under this rule that can also be relevant in this context, as they have the potential to reduce the likelihood that facility operations will cause or contribute to significant wetland degradation. EPA anticipates that as the facility begins to implement all of the requirements under this rule, the facility will consider how modifications to facility operations to address one requirement can affect compliance with other requirements.

After consideration of these factors, if an existing CCR unit cannot meet all of the requirements in paragraphs (1)–(3) (*i.e.,* if it causes or contributes to significant degradation, or if no reasonable alternative to locating a new CCR unit in wetlands is available), the facility can comply with the location criterion by compensatory steps that must be taken to achieve no net loss of wetlands (as defined by acreage and function). Owners or operators must first take measures to avoid impacts to wetlands. If potential impacts cannot be avoided, all reasonable steps are to be taken to minimize such impacts to the extent feasible. Appropriate measures (for example, engineered containment systems to control discharge of leachate or surface water run-off to wetlands) will likely be site-specific and should be incorporated into the design and operation of the CCR unit. Any remaining unavoidable impacts must be offset, or compensated for through all appropriate and feasible compensatory mitigation actions. This compensatory mitigation may take the form of restoration (re-establishment or rehabilitation of a wetland), establishment (creation of a man-made wetland where one did not previously exist), enhancement (improving one or more wetland functions), and preservation (permanent protection of important wetlands through implementation of appropriate legal and physical mechanisms). The functions and values of a wetland will vary based on any number of site specific characteristics, including location, wetland type, hydrology, degradation, and whether it is natural or constructed to treat waste. Strictly limited to the application of the wetlands location requirements under this rule, any assessment of the nature and extent of mitigation required under the CCR rule shall consider these kinds of characteristics, including wetlands designed for the treatment of CCR. The Agency recognizes that the function and value of a particular man-made wetland constructed to perform a wastewater treatment function may present a unique situation that may affect both the determination of whether the wetland is significantly degraded, and the nature and extent of any required compensatory mitigation. This discussion refers only to the wetlands-related requirements of this rule and does not affect any requirements or obligations under the Federal Water Pollution Control Act (33 U.S.C. 1251, *et seq.*) and its implementing regulations.

Although EPA is not finalizing an outright ban on siting of existing or new CCR units in wetlands, the Agency continues to believe that discharges to wetlands of pollutants that can be reasonably avoided should be avoided. Therefore, the amount and quality of compensatory mitigation may not substitute for avoiding and minimizing impacts. For purposes of this rule, EPA assumes CCR units that are designed to avoid discharge of CCR into wetlands have less adverse impact to the aquatic environment than CCR units that ultimately discharge such residuals in wetlands.

4. Fault Areas

In § 257.62 of this rule, EPA is banning the location of new CCR landfills, existing and new CCR surface impoundments, and all new lateral expansions within 60 meters (200 feet) of a fault that has had displacement in Holocene time, unless the owner or operator demonstrates that an alternative setback distance of less than 60 meters (200 feet) will prevent damage to the structural integrity of the unit. For existing surface impoundments, the demonstration is required only if the unit is located closer than 60 meters (200 feet) to an active Holocene fault. If a demonstration cannot be made, the existing surface impoundment must close. These requirements have been adopted with only minor changes from the proposal, and will minimize the risks associated with CCR units located in fault areas.

Stresses produced during earthquake motion can cause serious damage to landfill integrity via seismically induced ground failure and associated rupture of liner systems and subsequent damage to leachate collection systems. Or if the unit is unlined, seismic motion could disrupt landfill caps and foundation soils that impede migration of percolating water. Potential damage to CCR units resulting from structures located across a fault include surface breakage, cracks and fissures between fill and confining slopes, slope failure via landslides, liquefaction-induced lateral spreading and settlement of the pile, disruption of surface water and drainage control systems, and rupture of leachate collection systems. In impoundments, for example, interior dike failure and leakage, and rupture of multilayer liner systems would also be of concern. Failure of the leachate collection system may prevent removal of generated leachate, allowing it to pond on the liner. If the liner system is ruptured, this may create a pathway for leachate to migrate into and contaminate the uppermost aquifer. In addition to the potential damage to leachate collection and liner systems, the integrity of the landfill slopes could also be impaired by fault rupture, potentially exposing coal combustion residuals to surface run-off.

The best protection is to avoid locating new CCR landfills and all CCR surface impoundments across faults and fault zones subject to displacement. For new units or lateral expansions there is no need to construct units in these areas. For existing surface impoundments, the Agency has been unable to find any way to retrofit or engineer the unit to be protective. A setback distance of 60 meters (200 feet) from the outermost damage zone of a Holocene fault will provide an adequate margin of safety to protect the facility from displacements due to surface faulting and any associated damage because 60 meters typically covers the zone of deformation where the ground may be bent or warped as a consequence of fault movement. By including this as a siting requirement for new units the risk of rupture of the unit, including any liner and leachate collection systems, due to surface faulting will be minimized.

Observations of engineered landfill response during earthquake motion come primarily from California where field data have been reported from MSWLFs (including some meeting the current part 258 standards) affected by strong shaking from six major nearby earthquakes. In these large magnitude events ($M \geq 6.7$), bedrock peak horizontal ground accelerations, an index of the intensity of earthquake motion, endured by the landfills were in excess of 0.3g. Engineered dry MSWLFs in California are reported to have performed well after strong earthquake motion (no documented incidence of an earthquake-induced release of contaminants harmful to human health or to the environment). Minor cracking of cover soils and breaking of vertical wells and headers were among the most common types of damage reported at MSWLFs subject to strong ground shaking. In the 1994 Northridge earthquake, only one landfill compliant with RCRA Part 258 standards experienced tears in a liner (a geomembrane liquid barrier): One tear 23 meters in length. However, there is little data on seismic stability and performance from industrial solid waste landfills with geosynthetic liners or units with water-saturated CCR waste. The Agency, therefore, remains concerned over the potential instability of engineered disposal units, and particularly CCR surface impoundments, under seismic loadings. Accordingly, EPA is prohibiting new CCR landfills, CCR surface impoundments, and any new extensions from sites located within an active fault zone, unless the owner or operator makes a demonstration, certified by a qualified professional engineer, that an alternative setback distance of less than 60 meters will prevent damage to the structural integrity of the unit.

EPA is clarifying its definition of fault to incorporate updated technical information.[56] Although a fault can be thought of as a simple planar surface across which there has been measurable displacement of one side relative to the other, field-based observations show fault architecture to often be complex. In the geologic literature faults developed in the upper crust are characterized as zones of brittle deformation composed of linked fault segments, with each segment composed of one or more subparallel, curved, or anastomosing fault cores nested within

[56] Sibson, R.H. 2003. Thickness of the Seismic Slip Zone. Bulletin of the Seismological Society of America, Vol. 93, No. 3, pp. 1169–1178.

a damage zone. Some fault zones may contain broad deformational features such as pressure ridges and sags rather than clearly defined fault scarps or shear zones.[57] Fault cores are regions of high strain slip that have accommodated most of the displacement and are marked by mylonites, cataclastites, and gouge, whereas the damage zone is characterized by low strain structures mechanically related to the growth of the fault zone such as small faults, fractures, veins and folds. To avoid displacement that would damage unit integrity, it is best to restrict new CCR landfills and surface impoundments, and all new extensions, to locations no less than 60 meters from the outermost damage zone created by an active fault. Fault zones can range from one meter to several kilometers in width.

For purposes of this section, a fault is considered active if it has moved during Holocene time. Holocene time is defined as the geological epoch which began at the end of the Pleistocene, at 11,700 years BP (before present), and continues to the present. In the field, evidence for Holocene activity may be hard to obtain. Therefore, the Agency cautions that faults which show no evidence for Holocene activity may not necessarily be inactive.

To investigate active faults, EPA expects owners and operators of CCR units to follow standard engineering and geologic practices. Technical considerations include: (1) A geologic reconnaissance of the site to determine the location of active faults. Such a reconnaissance would include utilizing the seismic analysis maps and tools (Quaternary fault maps, earthquake probability maps) of the United States Geological Survey (USGS) Earthquake Hazards Program (*http://earthquake.usgs.gov/hazards/apps/*); and (2) a site fault characterization within 1000 meters of a site to determine whether it is within 60 meters of an active fault. Such characterizations would include subsurface exploration, including drilling or trenching, to locate any fault zones and evidence of faulting, trenching perpendicular to any faults or lineaments found within 60 meters of the site, and determination of the age of any displacements. Based on this information, the qualified professional engineer would prepare a report that delineates the location of any active (Holocene) fault, including any damage zones, and the associated 60 meter setback. To take advantage of an alternative setback distance of less than 60 meters, the owner or operator must make a demonstration, certified by a qualified professional engineer, that the CCR landfill, surface impoundment, or lateral expansion has a foundation or base capable of providing support for the structure, and capable of withstanding hydraulic pressure gradients to prevent failure due to settlement, compression, or uplift, and all effects of ground motions resulting from at least the maximum surface acceleration expected from a probable earthquake.

5. Seismic Impact Zones

In § 257.63, EPA is adopting the provisions applicable to seismic impact zones, as proposed. The rule prohibits new CCR landfills, existing and new CCR surface impoundments and all lateral extensions from being located in seismic impact zones unless the owner or operator makes a demonstration, certified by a qualified professional engineer, that all containment structures, including liners, leachate collection systems, and surface water control systems, are designed to resist the maximum horizontal acceleration in lithified earth material from a probable earthquake. A *Seismic impact zone* means an area having a 2% or greater probability that the maximum expected horizontal acceleration, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10 g in 50 years. Seismic zones, which represent areas of the United States with the greatest seismic risk, are mapped by the U.S. Geological Survey and readily available for all the U.S. (*http://earthquake.usgs.gov/hazards/apps/*).

Maximum Horizontal Acceleration in lithified earth material means the maximum expected horizontal acceleration at the ground surface as depicted on a seismic hazard map, with a 98% or greater probability that the acceleration will not be exceeded in 50 years, or the maximum expected horizontal acceleration based on a site-specific seismic risk assessment. This requirement translates to a 10% probability of exceeding the maximum horizontal acceleration in 250 years.

For units located in seismic impact zones, as part of any demonstration, owners and operators should include: (1) A determination of the expected peak ground acceleration from a maximum strength earthquake that could occur in the area; (2) a determination of the site-specific seismic hazards such as soil settlement; and (3) a facility design that is capable of withstanding the peak ground acceleration. Seismic designs broadly should include a response analysis to quantify the demands of earthquake motion on facility structures (*i.e.,* landfills, surface impoundments, liners, covers, leachate collection systems, surface water handling systems), liquefaction analyses of both waste and foundation soils to evaluate stability under seismic loading, and a slope stability and deformation analyses. Design modifications to accommodate seismic risks should include use of conservative design factors, use of ductile materials, built-in redundancy for critical system components, and other measures capable of mitigating the potential for seismic upset.[58]

Following trends in earthquake engineering, seismic design criteria for new CCR landfills, new CCR surface impoundment and all lateral expansions should be based on a ''withstand without discharge'' standard.[59] EPA interprets the performance standard in this criterion (''designed to resist the maximum horizontal acceleration in lithified earth material from a probable earthquake'') to require any new CCR unit located in a seismic impact zone to be designed to withstand seismic motion from a credible earthquake without damage to the foundation or to the structures that control leachate, surface drainage, or erosion. In other words, the CCR unit must be able to withstand an expected earthquake without discharging waste or contaminants. The owner or operator must make a demonstration, certified by a qualified professional engineer, that the CCR unit has a foundation or base capable of providing support for the structure, and capable of withstanding hydraulic pressure gradients to prevent failure due to settlement, compression, or uplift and all effects of ground motions resulting from at least the maximum surface acceleration expected from a probable earthquake. In practice, the Agency recognizes that the CCR unit may sustain some limited damage during an earthquake, but ultimately, the CCR unit design must remain

[57] Bryant, W.A. and Hart, E.W., 2007. Fault-Rupture Zones in California. Special Publication 42 (Interim Revision), California Division of Mines and Geology, Sacramento, California.

[58] The *seismic location standard* requires a demonstration that a CCR disposal unit can withstand the stresses imposed by peak ground acceleration during earthquake motion. The *seismic factor of safety* is a unitless measure of strength calculated for fill material assuming earthquake conditions. It is the ratio of material shear strength relative to the magnitude of shear forces acting on the material. For a CCR disposal unit, the *seismic location demonstration* could be composed of numerous *factor of safety* calculations showing that the structural components of the unit have factors of safety greater than or equal to 1.00.

[59] Kavazanjian, E., 1999. Seismic Design of Solid Waste Containment Facilities. Proceedings of the Eight Canadian Conference on Earthquake Engineering Vancouver, BC, pp. 51–89.

capable of preventing harmful release of CCR, leachate, and contaminants both during and after the seismic event.

6. Unstable Areas

EPA laid out its rationale for these requirements in the proposal at 75 FR 35201. No significant comments were received on either this rationale or the specific regulatory provisions. Consequently, EPA is adopting the regulatory text as proposed. Specifically, under § 257.64(a) new and existing CCR landfills, new and existing CCR surface impoundments and all lateral expansions are prohibited from sites classified as unstable areas unless the owner or operator makes a demonstration, certified by a qualified professional engineer, that engineering measures have been incorporated into the CCR unit's design to ensure that the structural components will not be disrupted. EPA considers a structural component to include any component used in the construction and operation of CCR landfill or CCR surface impoundment that is necessary to ensure the integrity of the unit and to ensure that the contents will not be released to the environment, including liners, leachate collection system, embankments, spillways, outlets, final covers, inflow design flood controls systems. Liners and leachate collection systems require a firm, secure foundation to maintain their integrity, and may be disrupted as a result of uneven settlement induced by hydrocompaction. Similarly, sudden differential movement resulting from CCR placement and the consequent exceedance of the weight-bearing strength of subsurface materials in unstable areas can destroy liners and damage the unit's structural integrity, resulting in catastrophic release of CCR. It is essential for the owner or operator of any CCR unit to extensively evaluate the adequacy of the subsurface foundation support for the structural components of the unit. Therefore, the Agency is making this demonstration mandatory for all CCR units; existing CCR units for which a demonstration cannot be made must be closed.

EPA has adopted the following definitions without material change from the proposal: *Unstable area* means a location that is susceptible to natural or human-induced events or forces capable of impairing the integrity of some or all of the structural components responsible for preventing releases from a CCR unit. Natural unstable areas include those areas that have poor soils for foundations, areas susceptible to mass movements, and karst terrains. *Structural components* mean liners, leachate collection systems, final covers, run-on/run-off systems, and any other component used in the construction and operation of a CCR unit. *Poor foundation conditions* means those areas where features exist which may result in inadequate foundation support for the structural components of a CCR unit. *Areas susceptible to mass movement* means those areas of influence (*i.e.,* areas characterized as having an active or substantial possibility of mass movement) where the movement of earth material at, beneath, or adjacent to the CCR unit, because of natural or man-induced events, results in the downslope transport of soil and rock material by means of gravitational influence. Areas of mass movement include, but are not limited to, landslides, avalanches, debris slides and flows, solifluction, block sliding, and rock fall. *Karst terrain* means an area where karst topography, with its characteristic erosional surface and subterranean features, is developed as the result of dissolution of limestone, dolomite, or other soluble rock. Characteristic physiographic features present in karst terrains include, but are not limited to, dolines (sinkholes), vertical shafts, sinking streams, caves, seeps, large springs, and blind valleys.

The owner or operator must consider at a minimum, the following factors when determining whether an area is unstable: (1) On-site or local soil conditions that may result in significant differential settling; (2) on-site or local geologic or geomorphologic features; and (3) on-site or local human-made features or events (both surface and subsurface). To evaluate subsurface conditions for purposes of § 257.64(c)(3), EPA considers it essential that the owner or operator conduct a geotechnical site investigation, certified by a qualified professional engineer, to identify any potential thick layers of soil that are soft and compressible (*e.g.,* loess, unconsolidated clays, wetland soils), which could cause a significant amount of post-construction differential settlement of foundation soils, adjacent embankments, and slopes unless improved. In addition, it is essential that the investigation identify on-site or local soil conditions that are conducive to downslope movement of soil, rock, and/or debris (alone or mixed with water) under the influence of gravity. Local topography, surface and subsurface soils, surface slope angles, surface drainage and run-off patterns, seepage patterns, rock mass orientations, joint patterns, fissures, and any other landscape factors that could influence downslope movement should be identified. Anthropogenic activities that could induce instability include mining, cut and fill activities during construction, excessive drawdown of groundwater, which may cause excessive settlement or bearing capacity failure of foundation soils, and use of an old landfill as the foundation for a new landfill without verification of complete settlement of the underlying wastes.

In designing a new CCR unit located in an unstable area, recognized and generally accepted good engineering practices dictate that a stability assessment should be conducted to prevent a destabilizing event from damaging the structural integrity of the component systems. For CCR units this involves three components: (1) An evaluation of subsurface conditions, (2) an analysis of slope stability, and (3) an examination of related design needs. In addition to explaining site constraints, identifying any soft soils, and recommending any appropriate ground improvement techniques, the assessment report should include a description of: The site, site geology; and investigative methodology; the results from all site investigations including subsurface exploration, field and laboratory tests, and test results; the subsurface profile, recommended foundation types, depths, and bearing capacities; the water content, grain-size distribution, shear strength, plasticity, and liquefaction potential of foundation soils and subsoils; and other foundation consolidation and settlement issues relevant to site development.

In addition to assessing the ability of soils and rocks to serve as a foundation, it is essential that the report also include a stability assessment of excavated sideslopes, aboveground embankments or dikes, and retaining structures. The slope stability analyses are performed as part of an evaluation of the design configuration under all potential hydraulic and loading conditions, including conditions that may exist during construction of a lateral or vertical expansion. As part of any demonstration, owners and operators should make an assessment, certified by a qualified professional engineer, that finalized site embankments and slopes are able to maintain a stable condition. In addition to evaluating the potential for post-construction differential settlement, the stability assessment should also consider seepage-induced saturation and softening of soils, particularly at CCR surface impoundments and CCR landfill sites that manage effluent.

Engineering considerations for CCR landfills and lateral expansions located in unstable areas are expected to be

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similar to those for MSWLFs, which can be found in EPA's 1993 Technical Manual on Solid Waste Disposal Facility Criteria (EPA530–R–93–017). For surface impoundments the relevant design criteria are found in the Agency's 1991 Technical Resource Document on Design, Construction and Operation of Hazardous and Non-Hazardous Waste Surface Impoundments (EPA/530/SW–91/054). Any stability assessment should consider the following: (1) The adequacy of the subsurface exploration program; (2) the liquefaction potential of the embankment, slopes and foundation soils; (3) the expected behavior of the embankment slopes, and foundation soils when they are subjected to seismic activity; (4) the potential for seepage-induced failure; and (5) the potential for differential settlement.

For facilities in areas of karst, to support the demonstration required under the regulations, the owner or operator would need to evaluate the subsurface conditions to ensure that the unit is located away from the influence of potential sinkholes. For areas where the solution-weathered limestone is close to the surface (*e.g.,* Florida) recognized and generally accepted good engineering practices dictate that there must be no conduits beneath the CCR unit that allow piping of groundwater into the karst aquifer, or shallow caves that could cause sudden collapse of the unit foundation. Where unconsolidated sediments cover underlying limestone, piping is commonly marked by paleosinks where sands and clays from the overburden have filled solution cavities in the underlying limestone.[60] Local hydraulic gradients in paleosinks typically point downward. EPA generally expects the potential for sinkhole development to be minimal at locations in karst areas where there are no paleosinks, or historical record of sinkhole development, and where there are no local hydraulic gradients that point downward.

In making a demonstration, it is important for owners and operators of CCR landfills and surface impoundments in karst areas to adequately characterize subsurface conditions. Karst hydrogeology is complex, since contaminant flows can occur along paths and networks that are discreet and tortuous, and groundwater monitoring wells must be capable of detecting any contaminants released from the CCR unit into the karst aquifer. Therefore, the owner or operator will need to ensure, with verification by a qualified professional engineer, that monitoring wells installed in accordance with § 257.91 will intercept these pathways. Verification will usually necessitate the use of tracers to track groundwater flow towards offsite seeps or springs from the uppermost aquifer beneath the facility.

Any engineered solution employed to mitigate weak ground strength in karst areas must be able to prevent the kind of foundation collapse and settlement that could lead to sudden release to the environment of CCR with its toxic constituents and associated leachate. Solution cavities present at the site should be filled with grout or other suitable stiff material to avoid further crumbling and erosion. Where necessary, CCR unit foundations could be reinforced with engineered ground supports such as concrete footings that bridge voids. Larger caverns could be filled with concrete to underpin the CCR unit foundation by transferring load to the cavern floor. However, such engineered solutions are complex and costly, and the best protection is not to site CCR landfills and surface impoundments in karst areas. Nevertheless, this rule does not ban the location of CCR landfills, surface impoundments, or lateral extensions in karst areas.

7. Closure of Existing CCR Landfills and Existing CCR Surface Impoundments

The final provisions of § 257.60 require owners or operators of an existing CCR surface impoundment to demonstrate that the unit meets the minimum requirements for placement above the uppermost aquifer (*i.e.,* constructed with a base located no less than 1.52 meters (five feet) above the upper limit of the uppermost aquifer) no later than 42 months after the date of publication of this rule in the **Federal Register**.

Owners and operators of existing CCR surface impoundments subject to §§ 257.61–257.64 of this rule and existing CCR landfills subject to § 257.64, must complete demonstrations by the date corresponding to 42 months from publication of this rule. The Agency is setting the compliance deadline at 42 months to allow owners and operators time to complete the requisite studies (*e.g.,* to adequately characterize seasonal variations in the elevation of the top of the uppermost aquifer) and to complete any engineering measures necessary to allow the CCR unit to meet the performance standards. If closure is warranted, it must be initiated no later than 48 months from publication of this rule. Closure and post-closure care must be done in accordance with §§ 257.100–103; which allow certain regulatory flexibilities provided specific conditions are met.

D. Design Criteria—Liner Design

EPA proposed that existing CCR landfills without a composite liner could continue to operate and receive CCR without violating the open dumping prohibition. Conversely, EPA proposed that existing CCR surface impoundments would be required to retrofit with a composite liner system, as defined in the proposed rule, within five years of the effective date of the rule or to close. EPA also proposed that all new CCR units must be constructed with a composite liner and leachate collection and removal system.

In the proposal, EPA defined a *composite liner* to mean a liner system consisting of two components; the upper component consisting of a minimum 30-mil flexible membrane liner (FML), and the lower component consisting of at least a two-foot layer of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} cm/sec.[61] FML components consisting of high density polyethylene (HDPE) were required to be at least 60-mil thick; and the FML component was required to be installed in direct and uniform contact with the compacted soil component.

EPA solicited comment on a number of issues, including: (1) Whether EPA should allow facilities to use an alternative design for new CCR units; (2) whether clay liners designed to meet a 1×10^{-7} cm/sec hydraulic conductivity might perform differently in practice than modeled in the risk assessment, including a request for specific data on the hydraulic conductivity of clay liners associated with CCR units; and (3) whether the effectiveness of such additives as organosilanes, would allow the use of these additives in lieu of composite liners. (See 75 FR 35203 and 35222.)[62] With respect to the last two issues, the Agency received little comment. However, in response to the use of alternative liner designs in lieu of a composite liner (as defined in the rule), significant comment was received. Commenters advocated for a number of alternative composite liner designs, with a majority recommending that a

[60] For examples, see Garlanger, J.E., Foundation Design in Florida Karst. Online presentation by Ardaman & Associates. *http://www.ardaman.com/foundation_design.htm.*

[61] The definition of *hydraulic conductivity* is being promulgated as proposed, and will mean the rate at which water can move through a permeable medium (*i.e.,* the coefficient of permeability).

[62] The terms compacted soil and compacted clay are used interchangeably, *i.e.,* when referring to a compacted soil liner this is the same as referring to a compacted clay liner (CCL).

geosynthetic clay liner (GCL) be allowed as an alternative to the lower component of the composite liner. Other commenters stated that GCLs alone should be allowed as an alternative to the proposed composite liner. Still others argued that alternative liner designs, such as an FML/FML [63] provided a level of performance similar to the proposed composite liner system and should be allowed. Conversely, there were also comments opposing the use of any alternative liners, claiming that alternatives have not been proven to be effective.

EPA also received significant comment on the actual design of the composite liner system proposed by the Agency as it pertained to CCR surface impoundments (see 75 FR 35202–35203).[64] Commenters argued that the proposed requirement for a leachate collection and removal system in a CCR surface impoundment was illogical since it would have to be constructed between the lower component (two feet of compacted soil) and upper component (flexible membrane liner) and the proposed rule specifically states that the flexible membrane liner component must be installed in direct and uniform contact with the compacted soil component. Commenters reasoned that the inclusion of a leachate collection and removal system between the upper and lower components precluded direct and uniform contact between the two components and that placing a leachate collection and removal system between the lower and upper components of a composite liner would compromise the integrity of the composite liner. With regard to this last point, the Agency has reviewed the requirements for a proposed composite liner system as it would pertain to CCR surface impoundments and agrees that the leachate collection and removal system requirements proposed for CCR surface impoundments would be counterproductive; EPA proposed this requirement in error. The integrity of the composite liner system is indeed dependent upon the direct and uniform contact of the upper GM component with the lower soil component. The proposed requirement for CCR surface impoundments to construct a leachate collection system between the FML and soil components would prevent the direct and uniform contact of the upper and lower components and, therefore, compromise the integrity of the composite liner. For this reason, EPA is not requiring a leachate collection and removal system for new surface impoundments or any lateral expansion of a CCR surface impoundment.

While EPA agrees with those commenters arguing that new CCR units should only be installed with a composite liner system of some kind, the Agency has concluded that not all alternative designs for a composite liner system should necessarily be rejected as insufficiently protective. Many commenters provided strong and compelling evidence that the specific composite liner system described in the proposed rule was not always feasible or necessary to protect groundwater resources and that alternate composite liner designs could be equally protective, and may be a necessity in many areas of the country where soil with the appropriate hydraulic conductivity may not be available (*e.g.,* Alaska).[65]

In re-evaluating the proposed requirement for a composite liner system, EPA was influenced by a number of factors.[66] First, the data provided by commenters showing the performance of a GM/GCL design. Second, EPA's own studies showing that a GM/GCL liner can be constructed to achieve hydraulic efficiencies in the range of 99 to 99.9% which meets or exceeds the hydraulic performance of a GM/compacted clay liner (CCL) design.[67] In addition, these high efficiencies demonstrate that the GCL component of a GM/GCL composite liner is at least as effective in impeding leakage through holes in the GM component of the composite liner system as a CCL with a hydraulic conductivity no more than 1×10^{-7} cm/sec.[68] In fact, EPA has developed guidance for the selection and installation of various types of liners including a GM/GCL.[69] And third, EPA was influenced by the many comments arguing that a ''one-size-fits all'' approach to liner design stifles design innovation and regulatory flexibility in addressing site specific factors such as geologic or climatic conditions. These commenters reasoned that if EPA established some type of performance standard for composite liners, it would mitigate the negative impacts of a ''one-size fits all'' regulatory framework.

1. Development of Composite Liner Design Criteria

In this final rule EPA is requiring all new CCR units to be designed and constructed with a composite liner as specified in § 257.70. EPA is also providing the owner or operator with an option to install an alternative composite liner provided it meets the required performance standard and it is certified by a qualified professional engineer. EPA has concluded, consistent with many of the comments received and its own analysis, that an alternative composite liner for new CCR units is warranted if it can be shown to be equivalent to the performance of a composite liner and affords the same protections to groundwater resources as a composite liner. The Agency is promulgating this alternative option to provide flexibility in designing and constructing a protective composite liner system that addresses site specific conditions and situations. The Agency acknowledges that it was overly prescriptive by requiring one particular type of liner rather than relying on a performance standard to define the lower component of the composite liner. The overwhelming amount of data supporting the effectiveness of a GC/GCL liner has convinced the Agency that the final rule should allow for some flexibility in composite liner designs. As such, the Agency is allowing new CCR units to be designed and constructed

[63] Current terminology favors the use of geomembrane liner or GM when referring to flexible membrane liners or FMLs. Hereafter in the preamble, except when referring to specific comments or the proposed rule, and in the final rule, the Agency will use the term geomembrane liner or GM in place of flexible membrane liner or FML.

[64] See proposed § 257.71 which states that an existing CCR surface impoundment shall be constructed with a composite liner and a leachate collection system between the upper and lower components of the composite liner; where a composite liner means a system consisting of two components; the upper component consisting of a minimum 30-mil flexible membrane liner (FML) and a lower component consisting of at least a two-foot layer of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} cm/sec. The FML component would be required to be installed in direct and uniform contact with the compacted soil component (see 75 FR 35243).

[65] See for example comments from the states of Alaska (EPA–HQ–RCRA–2009–0640–06409); Florida (EPA–HQ–RCRA–2009–0640–06846); and North Carolina (EPA–HQ–RCRA–2009–0640–09282) available at *www.regulations.gov*.

[66] Geomembranes (GMs), which are flexible membrane liners (FMLs), are thin materials manufactured from polymers and reinforced with woven fabric or fibers which are used as hydraulic barriers. Resins used to manufacture geomembrane liners typically include high density polyethylene (HDPE), linear low density polyethylene (LLDPE), low density linear polyethlene (LDLPE), very low density polyethylene (VLDPE) and polyvinyl chloride (PVC). Geomembranes manufactured using HDPE are the least flexible of the geomembranes.

[67] USEPA, ''Assessment and Recommendations for Improving the Performance of Waste Containment Systems,'' EPA 600/R–02/029, December 2002. *http://nepis.epa.gov/Adobe/PDF/P1001O83.pdf*.

[68] USEPA, ''Assessment and Recommendations for Improving the Performance of Waste Containment Systems,'' EPA 600/R–02/029, December 2002.

[69] USEPA, ''Guide for Industrial Waste Management,'' Chapter 7 (*http://www.epa.gov/osw/nonhaz/industrial/guide/pdf/chap7b.pdf*).

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with an alternative composite liner, as described below, provided the lower component of the composite liner meets a specified performance standard that ensures it functions in a manner equivalent to the composite liner system defined in the rule.

Composite liner systems installed in either a CCR landfill or CCR surface impoundment provide an effective hydraulic barrier by combining the complementary properties of the two different liner components. The geomembrane provides a highly impermeable layer that can maximize leachate collection and removal in a CCR landfill or minimize infiltration of leachate in a CCR surface impoundment, while the soil component (*e.g.,* CCL) serves as a backup in the event of any leakage/infiltration from the geomembrane occurs. Data indicate that alternatives to the lower component of the composite liner system (*e.g.,* GCLs) are available and can perform at a level equivalent to a compacted soil liner, based on a comparison of their flow rates with two feet of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} cm/sec.

2. Liner Designs That Would Not Meet the Requirements of a Composite Liner or Alternative Liner

Contrary to the arguments made by several commenters, EPA has concluded that a composite liner consisting of two 30-mil GMs (GM/GM) will not provide an equivalent degree of protection as a composite liner consisting of a GM and two feet of compacted soil, or an alternative composite liner such as a GM/GCL. While GMs have the advantages of extremely low rates of water permeation, the disadvantages of a composite liner consisting of two GMs include leakage through occasional GM imperfections and punctures, potential for slippage along the interface between the GMs, and GM embrittlement over time. Furthermore, a critical component of a composite liner is the compacted soil or GCL component beneath the GM layer that will impede the flow of liquid that may leak through a hole or defect in the GM. This added protection cannot be achieved using two GMs for the composite liner. Additionally, the potential exists for liquid transport through the GMs through holes caused by punctures, tears, flawed seams, etc. If a puncture occurs, the puncture could compromise both GMs and create a conduit for liquid flow to underlying permeable soil. Moreover, a liner system consisting of two GMs in contact with each other poses the risk of creating a slip plane that may compromise the stability of the disposal unit (although EPA acknowledges that using textured GMs would reduce or eliminate this particular risk). These data are documented in EPA research.[70]

Consistent with the previous determination, EPA has also determined that the double liner system set forth in Florida regulations (see Florida Rules 62–701.400(3)(c), F.A.C) also does not meet the level of performance achieved by EPA's composite liner system or the alternative liner system. While this double liner system provides the advantage of a leak detection system between the two GMLs, the lower composite liner, consisting of a 60-mil HDPE over six inches of soil with a saturated hydraulic conductivity of less than or equal to 1×10^{-5} cm/sec, is not equivalent to a GM over two feet of compacted soil with a hydraulic conductivity of less than or equal to 1×10^{-7} cm/sec. To be hydraulically equivalent, soil with a hydraulic conductivity of 1×10^{-5} cm/sec would need to be on the order of 100 times thicker than soil with a hydraulic conductivity of less than or equal to 1×10^{-7} cm/sec. Similarly, a lower composite liner consisting of a 60-mil HDPE over a GCL with a hydraulic conductivity not greater than 1×10^{-7} cm/sec would require a GCL thickness of 24 inches to be equivalent to a GM over two feet of compacted soil with a hydraulic conductivity of less than or equal to 1×10^{-7} cm/sec.

EPA has also examined the performance of GCLs approved for use as alternatives to composite liners in MSWLFs.[71] The EPA report titled ''Assessment and Recommendations for Improving the Performance of Waste Containment Systems,''[72] concluded that if a CCL or GCL is used alone, liquid migration can occur over the entire area of the liner that is subject to a hydraulic head. The report also concluded that in a composite liner, leakage will only occur at the location of the geomembrane penetration (*e.g.,* hole, tear), and will be much slower than flow through an orifice due to the hydraulic impedance provided by the CCL or GCL alone. The report also evaluated, among other characteristics, the hydraulic efficiencies of a GM/GCL composite liner system for 28 cells at seven landfills. Liner hydraulic efficiencies were reported between 97% and 100%. However, potential stability problems were reported with GCLs constructed on slopes greater than 10 H:1 V (5.7°), and GCLs may not be appropriate for the disposal of liquid wastes or sludges. The Agency is also concerned that GCLs, being much thinner than the two feet of compacted soil required for composite liners, may allow for the flow of liquids through the GCL at a faster rate than through two feet of compacted soil. Taking all of this information into account, the Agency remains unconvinced that a GCL alone is a viable alternative to a composite liner.

3. Design Requirements

a. Existing CCR Landfills

As proposed, the final rule allows existing CCR landfills as defined in § 257.54, to continue to operate without retrofitting with a composite liner and leachate collection and removal system. As previously discussed, given the volume of the material currently managed in CCR landfills, the potential for disruption in CCR disposal capacity if existing CCR landfills were required to retrofit would be significant. Significant disruptions in the state-wide solid waste management (and possibly power generation) are associated with significant risks to public health and the environment in their own right. EPA has concluded that these risks are greater than the risks associated with allowing unlined CCR landfills to continue to operate. Further, existing CCR landfills will be required to comply with the extensive groundwater monitoring and corrective action requirements, among others, to ensure that any groundwater releases from the CCR unit are identified and promptly remediated, which will significantly mitigate the risks from these existing units. By themselves, the risk assessment results and the risk migration from the other regulatory requirements in this rule would not support a decision to allow these CCR units to continue to operate on a national basis. But when the risks associated with the level of disruption EPA estimates to be possible from requiring existing CCR landfills to retrofit are also included, the totality of the evidence supports a determination that allowing these units to continue operating meets the section 4004(a) standard.

[70] ''Assessment and Recommendations for Improving the Performance of Waste Containment Systems.''

[71] ''Geosynthetic Clay Liners Used in Municipal Solid Waste Landfills,'' *http://www.epa.gov/wastes/nonhaz/municipal/landfill/geosyn.pdf*; ''Geosynthetic Clay Liners in Waste Containment,'' *http://www.epa.gov/superfund/remedytech/tsp/download/2001_meet/prez/carson.pdf*; and ''Assessment and Recommendations for Improving the Performance of Waste Containment Systems,'' *http://nepis.epa.gov/Adobe/PDF/P1001O83.pdf.*

[72] ''Assessment and Recommendations for Improving the Performance of Waste Containment Systems.''

b. Existing CCR Surface Impoundments

In a departure from the proposed rule and after considerable evaluation and analysis, the Agency is finalizing a provision to allow all existing CCR surface impoundments to remain in operation provided certain conditions are met.[73] Owners or operators of existing CCR surface impoundments are required, within one year of the effective date of the rule, to document, certified by a qualified professional engineer, whether the unit is constructed with any one of the three liner types: (1) A liner consisting of a minimum of two feet of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} cm/sec; (2) a composite liner that meets the requirements of § 257.70(b); or (3) an alternative liner that meets the requirements of § 257.70(c). In some instances, owners or operators may have information readily available to determine if an existing CCR surface impoundment is constructed with one of the three liner types listed above. On the other hand, this information may not be readily available and may require an owner or operator to conduct an engineering evaluation to determine if the unit was constructed with any of the three liner type. Factors such as the availability of engineering personnel and weather may impede the engineering evaluation. Therefore, EPA believes that 12 months from the effective date, or 18 months from publication of the rule, is a reasonable amount of time to make the determination of whether the existing CCR surface impoundment was constructed with one of the three liner types described above. Existing surface impoundments with liners that meet the criteria established for any of the three specified liner types are considered to be an ''existing lined CCR surface impoundments.'' These existing lined surface impoundments can continue to operate until the owner or operator decides to initiate closure, provided the unit does not meet other requirements of the rule that independently mandate closure of the unit (*e.g.,* location criteria (§§ 257.60–257.64) or structural integrity factors of safety (§ 257.73)). Existing unlined CCR surface impoundments must also cease receiving CCR and initiate closure if an owner or operator determines, at any point in time, as part of its groundwater monitoring program that the concentrations of one or more constituents listed in appendix IV to part 257 are detected at a statistically significant level above the groundwater protection standard established for that unit. EPA agrees with the many commenters who argued that existing unlined CCR surface impoundments should not be required to close prematurely if they are operating as designed and are complying with all of the requirements of the rule, including all groundwater protection standards. Taking into account the additional protections required under this rule (*e.g.,* location restrictions, groundwater monitoring, corrective action, structural integrity criteria, inspections and fugitive dust controls), the Agency has concluded that the risks posed by unlined CCR surface impoundments that are not ''leaking'' (*i.e.,* exceeding any groundwater protection standard) are not sufficient to warrant requiring these units to close. However, once a groundwater protection standard is exceeded (*i.e.,* the unit is leaking), without any type of liner system in place, leachate will flow through the unit and into the environment unrestrained and the only corrective action strategy that EPA can determine will be effective at all sites nation-wide requires as its foundation the closure of the unit.

EPA acknowledges that it may be possible at certain sites to engineer an alternative to closure of the unit that would adequately control the source of the contamination and would otherwise protect human health and the environment. However, the efficacy of those engineering solutions will necessarily be determined by individual site conditions. As previously discussed, the regulatory structure under which this rule is issued effectively limits the Agency's ability to develop the type of requirements that can be individually tailored to accommodate particular site conditions. Under sections 1008(a) and 4004(a), EPA must establish national criteria that will operate effectively in the absence of any guaranteed regulatory oversight (*i.e.,* a permitting program), to achieve the statutory standard of ''no reasonable probability of adverse effects on health or the environment'' at all sites subject to the standards. EPA was unable to develop a performance standard that would allow for alternatives to closure, but would also be sufficiently objective and precise to minimize the potential for abuse. There are too many factors that determine whether a particular engineering solution will meet the section 4004(a) standard at a particular site. And the risks of these units are simply too high.

Conversely, existing lined surface impoundments that exceed their groundwater protection standard are in a better position to manage the leak because it is usually caused by some localized or specific defect in the liner system that can more readily be identified and corrected. Consequently, this rule is not requiring existing lined CCR surface impoundment to close if an exceedance of a groundwater protection standard is detected; rather the Agency is affording the owner or operator with the opportunity to rely on corrective action measures to bring the risks back to acceptable levels (*i.e.,* control the source of the release and remediate the contamination), without mandating closure of the unit.

c. New CCR Landfills and New CCR Surface Impoundments and All Lateral Expansions

Both the CCR damage case history and the risk assessment clearly show the need for and the effectiveness of appropriate liners in reducing the potential for groundwater contamination at CCR landfills and CCR surface impoundments. Accordingly, EPA is finalizing liner and leachate collection and removal system requirements for new CCR landfills and all lateral expansions of these units. Similarly, EPA is finalizing liner requirements for new CCR surface impoundments and all lateral expansions of these units.

Specifically, EPA is requiring new CCR landfills, new CCR surface impoundments, and all lateral expansions be constructed with a composite liner (see § 257.70). The composite liner must consist of two components; an upper component consisting of a minimum 30-mil geomembrane liner (GM), and a lower component consisting of at least a two-foot layer of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} centimeters per second (cm/sec). GM components consisting of high density polyethylene (HDPE) must be at least 60-mil thick and the GM or upper liner component must be installed in direct and uniform contact with the compacted soil or lower liner component

New CCR landfills or lateral expansions of these units are also required to be constructed with a leachate collection and removal system designed to maintain less than a 30-centimeter depth of leachate over the composite liner. A leachate collection and removal system is not required for new CCR surface impoundments

[73] Existing CCR surface impoundments will not be required, as was proposed, to retrofit to a composite liner or close within five years of the effective date of the rule (see 57 FR 35202).

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because, as previously discussed, a leachate collection system installed between a single composite liner system is not practicable and would compromise the integrity of the composite liner system.

In addition, in response to comments on the proposed rule, EPA is allowing alternatives to the lower component of the composite liner system provided the flow rate through the lower component is no greater than the flow rate through two feet of compacted soil with a hydraulic conductivity of 1×10^{-7} cm/sec. The lower component must also be a recognized liner material; *e.g.,* soil, clay, or GCL. Alternative composite liners using compacted soil or clay as the lower component must be constructed with the upper component in intimate contact with the lower component; *i.e.,* the geomembrane must be installed to ensure good and uniform contact with the lower component. The hydraulic conductivity for the two feet of compacted soil used in the flow rate comparison must be no greater than 1×10^{-7} cm/sec. The hydraulic conductivity of the lower component must be determined using recognized and generally accepted engineering methods, for example, ASTM D5084–10, ''Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter,'' ASTM International, West Conshohocken, PA, 2012, DOI: 10.1520/D5084–10, *www.astm.org* for compacted soils or clays, or ASTM Standard D6766–12, ''Standard Test Method for Evaluation of Hydraulic Properties of Geosynthetic Clay Liners Permeated with Potentially Incompatible Aqueous Solutions,'' ASTM International, West Conshohocken, PA, 2012, DOI: 10.1520/D6766–12, *www.astm.org* for GCLs. The flow rate comparison for the lower component must be made using Darcy's Law for gravity flow through porous media, which is an empirical law which states that the velocity of flow through porous media is directly proportional to the hydraulic gradient. The use of Darcy's Law to calculate fluid flow through porous media is a well-established and generally accepted engineering methodology, and is the foundation for EPA's Composite Model for Leachate Migration with Transformation Products (EPACMTP) and is generally recognized to evaluate steady state flow of liquids through soils and GCLs.[74] EPACMTP is a subsurface fate and transport model EPA uses to simulate the impact of the release of constituents present in waste that is managed in land disposal units. Accordingly, the flow rate comparison for the lower component of alternative composite liner must be made using the following equation which is derived from Darcy's Law.

$$\frac{Q}{A} = q = k\left(\frac{h}{t} + 1\right)$$

where:

Q = flow rate,
A = surface area of the liner,
q = flow rate per unit area,
k = hydraulic conductivity of the liner,
h = hydraulic head above the liner, and
t = thickness of the liner.

A qualified professional engineer must certify that the design and construction of either the composite liner or the alternative composite liner meets the requirements of §§ 257.70(b) or (c).

EPA has also supplemented the composite liner criteria for landfills with performance standards that provide more precise direction to the professional engineer regarding the ''recognized and generally accepted good engineering practices'' that need to be used in the design and construction of composite liner systems to ensure that the liner system will continue to perform as designed. These criteria, which have been codified at §§ 257.70(b) and 257.70(c), have been adopted in response to comments requesting that EPA provide the professional engineers that will be required to certify that CCR units meet the requirements of the rule, with more precise and objective criteria. These criteria reflect the engineering specifications necessary to prevent liner failures resulting from improper design and construction and to ensure that the liner will continue to perform correctly. These provisions will ensure not only that the liner is properly designed and constructed, but also that the system will continue to safely perform throughout the landfill's active life and through post closure care. The criteria have been adopted from the technical provisions proposed under the subtitle C provisions for CCR landfills, and are consistent with design requirements set forth for hazardous waste landfills regulated under part 265 of RCRA, as well as existing guidance and recognized good engineering practices for the design and construction of MSWLFs.[75]

Specifically, the Agency is modifying the composite and alternative liner design requirements by requiring the composite or alternative liner to be chemically compatible with the CCR and of adequate strength and thickness to prevent failure. The liner system must also provide appropriate shear strength between the two components to prevent sliding of the upper component. In addition, the Agency is requiring that liners be placed on an adequate foundation and installed to cover all areas that might come into contact with the CCR.

For new CCR landfills, which are required to have a leachate collection and removal system designed and operated to maintain less than a 30 centimeter depth of leachate, the Agency is also requiring, that the leachate collection and removal system be constructed of sufficient strength and thickness to prevent collapse from the pressure of the CCR and to minimize clogging during the active life and post closure care period.[76]

4. Vertical Expansions of New and Existing CCR Landfills and All Lateral Expansions

In the proposed rule, EPA stated that CCR landfills could vertically expand without retrofitting, in order to alleviate concerns with regard to CCR disposal capacity in the short term. In the few comments to the proposed rule which mentioned vertical expansions of landfills, commenters requested that the Agency clarify the design standards that vertical expansions would have to meet. Information collected to date, which is included in the docket supporting the final rule, leads the Agency to conclude there are no issues unique to vertical expansions of CCR landfills that warrant modifications to the technical standards

[74] See for example EPA's Composite Model for Leachate Migration with Transformation Products (EPACMTP) at *http://www.epa.gov/epawaste/nonhaz/industrial/tools/cmtp/*, ''Assessment and Recommendations for Improving the Performance of Waste Containment Systems.'' Giroud, J.P., Badu-Tweneboah, K. and Soderman, K.L., 1997, ''Comparison of Leachate Flow Through Compacted Clay Liners and Geosynthetic Clay Liners in Landfill Liner Systems,'' Geosynthetics International, Vol. 4, Nos. 3–4, pp. 391–431 (*http://www.geosyntheticssociety.org/Resources/Archive/GI/src/V4I34/GI-V4-N3&4-Paper7.pdf*), and ''Design Considerations for Geosynthetic Clay Liners (GCLs) in Various Applications,'' Geosynthetic Research Institute, January 9, 2013 (*http://www.geosynthetic-institute.org/grispecs/gcl5.pdf*).

[75] ''Technical Guidance Document: Quality Assurance and Quality Control for Waste Containment Systems.'' U.S. Environmental Protection Agency. Risk Reduction Engineering Laboratory, Office of Research and Development, Cincinnati, OH 45268. EPA/600/R–93/182. September 1993.

[76] Hardin, PE, Christopher D, and Perotta, PE Nick L. ''Operations and Maintenance Guidelines for Coal Ash Landfills—Coal Ash Landfill are NOT the Same as Subtitle D Solid Waste Landfills''. Presented at the 2011 World of Coal Ash Conference; May 9–12, 2011 in Denver, Colorado. *http://www.flyash.info/2011/127-Hardin-2011.pdf.*

being promulgated in this rule. Therefore, vertical expansions of existing CCR landfills are not subject to the provisions governing new units, but are subject to all applicable requirements for existing CCR landfills. To be clear however, while the location requirements relating to the placement above the water table, wetlands, fault areas, and seismic impact zones do not apply to existing CCR landfills, all of these restrictions apply to lateral expansions of existing CCR units, as well as new CCR units. Consequently, under this rule, owners or operators of existing CCR landfills can continue to vertically expand their existing facilities in these locations, but must comply with the provisions governing new units if they wish to laterally expand.

5. Construction of New CCR Landfills or Any Lateral Expansion Over an Existing CCR Unit

On August 2, 2013, EPA published a NODA that among other things, solicited comment regarding a particular type of CCR management unit described by some commenters in the proposed rule as ''overfills'' (see 78 FR 46940). Overfills are CCR landfills constructed over a closed CCR surface impoundment. As discussed in the NODA, in developing the proposed rule, EPA was not aware that CCR was managed in this fashion and so did not either evaluate this specific management scenario or propose technical requirements specifically tailored to this type of unit. Under the proposed rule, these types of units would need to comply with both the requirements applicable to the closure of surface impoundments or landfills, and with all of the technical requirements applicable to new landfills. Information collected since the proposal confirmed that the practice of constructing overfills for the disposal of CCR is conducted with some regularity, and raised questions as to whether overfills would be effectively regulated under the proposed technical requirements of the rule. In the NODA, to aid in the development of final technical requirements, EPA solicited data and information that directly addressed existing engineering guidelines or practices applicable to this units, as well as any regulatory requirements governing the siting, design, construction, and long-term protectiveness of these units for the disposal of CCR.

The Agency received numerous comments on the NODA. The majority of commenters agreed that overfills are commonly employed to allow continuing use of CCR disposal sites and to avoid the need to develop CCR management units at other sites. Some commenters added that: (1) The engineering design of an overfill can increase the stability of the underlying surface impoundment or landfill; (2) the use of an overfill facility reduces the need for new infrastructure construction; and (3) an overfill avoids having to transport CCR significant distances for off-site disposal.

Other commenters mentioned that several states had experience with overfills and have applied requirements such as liner systems, monitoring wells, and stormwater modeling on a case-by-case basis using best engineering practices. They added that overfills pose unique construction and operational issues depending on the site and the characteristics of the underlying unit, and that the construction of these units will therefore vary to account for these conditions. Commenters identified several issues requiring additional attention during design and construction of overfills including seismic and static liquefaction, settlement, foundation improvement, partial overfills, groundwater upwelling, groundwater monitoring, and wastewater infrastructure.

Upon review of these comments and further evaluation, the Agency has concluded that while there may be technical issues relating to the design, construction, and maintenance of overfills, the technical standards for CCR landfills are sufficiently flexible that no modifications are necessary to accommodate such units. For example, while the design and construction of groundwater monitoring systems may be technically more challenging, the final standards already allow for the construction of a multi-unit system. The performance standards and technical specifications laid out in the technical criteria developed for this rule are equally as applicable to overfills (and as protective) as to other new units. In essence, EPA is retaining the approach from the proposal that overfills will need to comply with both the requirements applicable to the closure of surface impoundments or landfills, and with all of the technical requirements applicable to new landfills. Thus, overfills cannot be constructed unless the underlying foundation—*i.e.,* the existing CCR surface impoundment has first been dewatered, capped, and completely closed. And because overfills are considered to be ''new CCR landfills,'' the design and construction of such units must comply with the technical requirements that address foundation settlement, overall and side slope stability, side slope and subgrade reinforcement, and leachate collection and groundwater monitoring system requirements, which will all need to be evaluated independent of the underlying CCR unit to ensure that the overfill design is environmentally protective. This evaluation must also be certified by a qualified professional engineer.

Under the location standards applicable to new CCR units, subgrade soils must be capable of providing stable structural support to the new liner system. A foundation composed of unconsolidated materials, such as CCR that is susceptible to slip-plane failure, is an unstable area (man-made) and, under provisions of this rule, is therefore a prohibited location for new CCR units. The TVA Kingston ash fill failure was at least partly attributable to slip-plane failure of saturated CCR that made up the subgrade and foundation beneath the unit.

Similarly, prudent and standard engineering practice for new CCR landfills requires that the base and side slopes of the overlying CCR landfill be able to maintain the structural integrity of the unit. If necessary, the subgrade should be reinforced with a geotextile fabric, or otherwise improved, to stabilize existing CCR in the underlying unit and to minimize tensile strain in the liner system. Slopes should be reinforced to prevent downhill sliding and to protect the leachate drainage system.

EPA is aware from comments that at least one facility is consolidating wet CCR in an active CCR surface impoundment through placement of dry ash over the wet CCR, and thereby converting the impoundment to a dry landfill, without stabilizing the CCR in the unit or capping the unit. This practice will no longer be permitted under the final rule criteria. Although no modifications were determined to be necessary to the individual technical criteria, EPA has added specific provisions that clarify the status of overfills, and clearly prohibit construction of a CCR landfill over a CCR surface impoundment unless the CCR in the underlying unit has first been dewatered and the unit is capped and completely closed. Dewatering, capping and closure of the underlying CCR unit prior to construction of the overlying CCR landfill renders the CCR overfill less susceptible to slip-plane failure. Conversion of an impoundment to a landfill without these measures involves a complex construction process that is highly site specific; EPA was unable to develop sufficiently objective performance standards that could be independently verified outside of a supervised permit program. Because this rule is self-implementing EPA is, therefore, prohibiting construction of new CCR landfills over operational CCR surface impoundments to prevent the creation of structurally unstable units that could lead to catastrophic failures.

E. Design Criteria—Structural Integrity

Under the design criteria requirements, EPA proposed to establish structural stability standards for existing and new CCR surface impoundments and lateral expansions of these units based on a combination of existing federal programs and requirements applicable to dam safety. The proposed rule was largely based on the requirements promulgated for coal slurry impoundments regulated by the MSHA at 30 CFR 77.216. (See 75 FR 35176.) EPA also developed aspects of the proposal based on the USACE and FEMA's dam safety programs. Consistent with the MSHA requirements, EPA proposed that existing and new CCR surface impoundments that could impound CCR to an elevation of five feet or more above the upstream toe of the structure and have a storage volume of 20 acre feet or more, or that impound CCR to an elevation of 20 feet or more above the upstream toe of the structure would be required to provide detailed information on the history of construction of the existing CCR surface impoundment and to meet certain performance standards. Specifically, facilities would need to (1) develop plans for the design, construction, and maintenance of existing impoundments, (2) conduct periodic inspections by trained personnel knowledgeable in impoundment design and safety, and (3) 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.

EPA also proposed to require the facility to obtain certification from a professional engineer that the ''design of the CCR surface impoundment is in accordance with current, prudent engineering practices for the maximum volume of CCR slurry and CCR wastewater which can be impounded therein and for the passage of run-off from the design storm which exceeds the capacity of the CCR surface impoundment. To support this performance standard, EPA proposed to require the facility to conduct specific analyses, and to provide information on critical structures. This includes the proposed requirements to compute the minimum factor of safety for slope stability of the retaining structures of the unit, including the methods and calculations used to determine each factor of safety, and to provide information on the physical and engineering properties of the foundations of the CCR surface impoundment, any foundation improvements, drainage provisions, spillways, diversion ditches, outlet instrument locations and slope protections, and area capacity curves. EPA proposed to require more extensive information from new CCR surface impoundments addressing the design, construction, and maintenance of the new CCR unit, recognizing that such information may not be available for existing units.[77] In addition, EPA proposed to require existing and new CCR surface impoundments of a specified size to calculate and report the hazard potential classification of the unit. Finally, EPA proposed that any CCR surface impoundments classified as having a high or significant hazard potential, as certified by an independent registered professional engineer, be required to develop and maintain an Emergency Action Plan defining the responsible persons and actions to be taken in the event of a dam safety emergency.

The Agency solicited comment on a number of issues relating to the proposed structural stability requirements. In particular, the Agency solicited comment on the scope of these requirements and whether they should apply to all CCR surface impoundments regardless of height and/or storage volume or whether EPA should adopt, as proposed and consistent with the MSHA requirements, the size cut-off described in the proposed rule; *i.e.,* impounding CCR to an elevation of five feet or more above the upstream toe of the structure and have a storage volume of 20 acre feet or more, or impounding CCR to an elevation of 20 feet or more above the upstream toe of the structure.

EPA also solicited comment on several alternative strategies for regulating the structural stability of CCR surface impoundments in lieu of regulation under RCRA subtitle D. The first alternative involved using NPDES permits rather than RCRA regulations to address dam safety and structural integrity. The second strategy would eliminate the structural integrity requirements from the RCRA subtitle D rule and, instead, have EPA establish and fund a program for conducting annual (or at some other frequency) structural stability assessments of CCR surface impoundments having a ''high'' or ''significant'' hazard potential rating as defined by criteria developed by the USACE for the NID. EPA would conduct these assessments and, using appropriate authorities already available under RCRA, CERCLA, and/or the Clean Water Act, would require facilities to respond to issues identified with their CCR surface impoundments. The rationale behind this suggested approach was that annual inspections would be far more cost effective than the phase-out of CCR surface impoundments—approximately $3.4 million annually for annual assessments, as compared to the $876 million annual cost of a rule that also phased out CCR. EPA also solicited comments on the effectiveness of this approach in ensuring the structural integrity of CCR surface impoundments. (See for example: 75 FR at 35176, 35223.)

On October 21, 2010, EPA published a NODA announcing that EPA intended to consider the information that had been developed through the Agency's Assessment Program as part of the CCR rulemaking. The NODA described the Assessment Program, and solicited comment on ''the extent to which both the CCR surface impoundment information collection request responses and assessment materials on the structural integrity of these impoundments should be factored into EPA's final rule on the Disposal of Coal Combustion Residuals from Electric Utilities.'' (See 75 FR 35128.) This included the responses to information requests that EPA originally sent to electric utilities, as well as reports and materials related to the site assessments developed through the Assessment Program. At that time, EPA had completed the assessments and the final reports for 53 units. On August 2, 2013, EPA published another NODA soliciting public comment on the additional assessments that had been completed since the 2010 NODA. In all, this included draft and final reports for a total of 522 units and 209 facilities. EPA again solicited comment on the extent to which this information should be taken into account as part of this rulemaking.

EPA received numerous comments on the proposed structural stability requirements. Many of these fell within two general areas: (1) EPA's approach of

[77] In the proposed rule under proposed § 257.71—Design criteria for existing CCR surface impoundments, the Agency only required the hazard potential classification for which the facility is designed and a detailed explanation of the basis for the classification (§ 257.71(d)(1)) ''as may be available'' (§ 257.71(d)). Similarly the computed minimum factor of safety for slope stability of the CCR retaining structure(s) and the analyses used in the determination (§ 257.71(d)(11) ''as may be available'' (§ 257.71(d)).

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establishing the structural stability requirements, along with EPA's proposed reliance on MSHA's size thresholds to determine the applicability for the majority of structural stability requirements; and (2) the level of detail laid out in the technical criteria themselves.

With respect to the overall regulatory approach, the majority supported both the concept of structural stability requirements for existing and new CCR surface impoundments, and the adoption of the MSHA size threshold for complying with the majority of the structural stability requirements. EPA received comments from a number of state entities (the Association of State Dam Safety Officials (ASDSO) and the Association of State and Territorial Solid Waste Management Officials (ASTSWMO)) suggesting that EPA incorporate federal dam safety guidelines rather than rely solely on MSHA's dam safety guidelines. Commenters were concerned that the MSHA regulations ''only exist to protect miners on mine property, and not the downstream public.'' They urged that any EPA regulation also include consideration of hazards to the downstream public. These commenters also requested that EPA ''incorporate specific safety standards consistent with the Federal Guidelines for Dam Safety,'' referencing standards contained in FEMA documents 93, 333, 64, 94 and 65.

Little support was expressed for the alternative strategies presented in the proposal for addressing structural stability. Some comments were received suggesting additional alternatives. One commenter suggested that EPA consider limiting the volume of ''primary containment ponds'' to 10 acre-feet, reasoning that this provision would likely eliminate much of the concern regarding catastrophic failures, like TVA, and actually reduce the amount of slurry released in the event of a structural failure. Other commenters argued that EPA should limit the structural requirements to CCR surface impoundments both meeting the proposed size threshold and having a hazard potential classification of ''high'' or ''significant'' hazard potential rating based on FEMA's criteria for dam safety.[78] Commenters argued that a failure of a CCR surface impoundment with a ''low hazard potential classification'' posed only a low risk for on-site economic or environmental losses and would avoid the imposition of costly, arbitrary and unnecessary regulatory burdens on the owner or operator. In addition, commenters contended that this regulatory approach would be consistent with many state dam regulatory programs that apply dam integrity standards only to ''high'' or ''significant'' potential hazard facilities and would promote consistency with existing state controls.[79] Several commenters also suggested that EPA consider adding regulatory language or preamble discussion to assist owners or operators of CCR surface impoundments in interpreting the specific technical requirements in the regulation.

EPA disagrees with the suggestion that the Agency finalize a mandatory size limitation for operating CCR surface impoundments. While limiting the volume of CCR surface impoundments to ten acre-feet would limit the volume of CCR released in the event of a structural failure, limiting the size of CCR surface impoundments to 10 acre-feet may not always be practicable; nor does EPA believe that such a restriction is truly necessary to ensure that the section 4004(a) standard will be met. Many CCR surface impoundments are much larger than ten acre-feet and have been operating for many years without a structural failure. While EPA acknowledges that this fact in no way guarantees that a failure will not occur, the Agency is convinced that the implementation of all of the combined regulatory requirements in this rule (*e.g.,* location criteria, structural integrity, inflow design flood controls and inspection requirements) provides the necessary safeguards that will ensure that CCR surface impoundments are designed, constructed, operated, and maintained to minimize the risks associated with a catastrophic release of impounded CCR due to structural failure. While limiting the size of CCR surface impoundments will reduce risks because there will be a lower volume of waste in the unit, the Agency is not convinced that, in practice, such a requirement would meaningfully reduce the risks at many facilities. EPA expects that such a restriction would only cause facilities to construct either several small units or a multi-unit system. Failure of one unit can lead to progressive failure of other units in the system, and thus, ultimately this may not reduce the total volume of waste that could be released into the environment. EPA also disagrees that structural stability requirements should only apply to ''high'' or ''significant'' potential hazard facilities. Similarly, EPA disagrees with commenters that structural integrity requirements should only apply to owners or operators of CCR surface impoundments that both meet the specified size criteria and have either a high hazard or significant hazard potential classification. Even for CCR units with a low hazard potential classification, EPA is still concerned with the risk to human health and the environment from any structural failure of a CCR unit. As discussed previously in Unit VI.C of this document, the environmental effects of the failure of even a low hazard potential impoundment can still be significant, given the size of these units, the nature of the material in the unit, and the potential volumes that could be released. Contamination of surface waters and groundwater resources is still a significant threat when CCR units of this size fail, irrespective of the lower likelihood that a release will affect human health, as reflected in the low hazard potential classification. Consequently, one focus of this rule is preventing any release, catastrophic or otherwise, of CCR to the environment, and limiting all structural stability requirements commenters suggested would be inconsistent with this goal.

The Agency agrees that the final regulation should incorporate provisions that address the hazards to the downstream public. Accordingly, the final rule incorporates a number of provisions consistent with the FEMA Guidelines, including a requirement that owners and operators know each CCR unit's hazard potential classification, as this is part of owners and operators' responsibility to actively ensure the integrity of their CCR unit(s) and that their operations do not endanger human health or the environment. EPA also agrees that the requirements should be differentiated based on the potential severity of the consequence posed by the unit's failure, and therefore the hazard potential can be relevant in determining the stringency of particular requirements. However, the hazard potential is, at best, only an indicator of the potential damage that may be incurred from the

[78] See: *Federal Guidelines for Dam Safety: Hazard Potential Classification for Dams,* Federal Emergency Management Agency (''FEMA'') (reprinted January 2004). Under the FEMA dam safety classification system, a ''low hazard potential classification'' means that failure or mis-operation of the impoundment ''results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to owner's property.''

[79] See *e.g.,* New Mexico Rules and Regulations Governing Dam Design, Construction and Dam Safety (*e.g.,* requiring dam site security, an instrumentation plan for monitoring and evaluating dam performance, and an operation and maintenance manual and emergency action plan only for dams with a high or significant hazard potential); see also NMAC sections 19.25.12.11(G)–(J).

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structural failure of the unit, and so EPA has generally not relied on hazard potential as the sole basis for determining the structural integrity requirements that are necessary for a CCR unit.[80] Although the hazard potential classification can serve as a proxy for the amount of water and CCR that could potentially be released to the environment in the event of a CCR surface impoundment failure, the amount of water and CCR potentially released is more directly correlated to the actual height and storage volume of the CCR surface impoundment. In addition, it is widely recognized that the hazard potential classification of an individual unit can often fail to encompass the overall magnitude of a release on human health and the environment. CCR surface impoundments can frequently be part of a facility's run-off system that is responsible for routing surface waters to a drainage basin or watershed. As previously discussed, the failure of a CCR unit that is part of such a system has the potential to inundate downstream surface water units and water bodies, resulting in progressive failures of other units, including other CCR surface impoundments at the facility, which in turn can have a much greater environmental impact than the failure of just the one unit for which a hazard potential classification was made. Using a ''height and/or volume'' threshold to determine the applicability of the structural integrity criteria ensures that CCR units with the potential to cause these progressive failures in downstream surface water management units are appropriately overseen and regulated. CCR surface impoundments exceeding a specified height and/or capacity threshold also pose a higher degree of risk of release of CCR to the environment than other types of CCR surface impoundments (*e.g.,* incised or ''small'' CCR units). For all of these reasons, the size of the CCR unit, rather than the hazard potential classification, is the best indicator of potential severity of release of CCR to the environment and should therefore be the primary basis on which structural integrity criteria are applied. As such, EPA is promulgating, as proposed, a regulatory strategy that establishes some requirements for all CCR surface impoundments, but relies primarily on size as the basis for determining the majority of the specific technical criteria for minimizing risk from structural failure.

Regarding the second major issue presented in the comments, as noted previously, EPA received comments requesting the Agency to provide either more specific regulatory language or further guidance in the preamble, so that parties could certify that the CCR surface impoundment met the rule's overall performance standard. Commenters contended that guidance would be particularly critical if EPA did not establish more specific technical criteria, as owners or operators will be vulnerable to lawsuits for non-compliance. In addition, state officials requested that EPA adopt more specific standards consistent with those adopted under FEMA's Federal Guidelines for Dam Safety. As discussed throughout this section in more detail, EPA has adopted clarifications to the regulation, particularly in the sections on structural stability and safety factors, to more precisely lay out the specific technical standards that are considered to be the ''generally accepted and recognized good engineering practices'' that must be met. EPA relied extensively on existing MSHA requirements, FEMA's Federal Guidelines for Dam Safety, and guidance issued by the U.S. Army Corps of Engineers, as they were applied throughout EPA's Assessment Program, to supplement the technical detail originally contained in the proposed rule. EPA has also modified the criteria, where necessary, so they better reflect the information and experience developed through the Assessment Program, *e.g.,* the engineering criteria used to evaluate the CCR surface impoundments and to make recommendations to improve the structural stability of the units.

In this rule, the Agency is finalizing structural integrity criteria to ensure that CCR surface impoundments are designed, constructed, operated, and maintained in a manner that ensures the structural integrity of the CCR surface impoundment throughout its active life (*i.e.,* through closure of the CCR unit), detects actual or potential releases of CCR as early as practicable, and prevents catastrophic failures. Many of the requirements have been adopted without revision from the proposed rule for some requirements, however, as noted EPA has provided additional language to clarify the final regulation. These clarifications have been made in response to comments urging EPA to finalize regulatory requirements that were more precise or sufficiently objective (*i.e.,* a specific standard of performance) to allow a qualified professional engineer to reasonably certify that the requirements of the rule have been met. These specific regulatory clarifications are discussed throughout this section.

A further change is that the final rule requires facilities to periodically reassess several elements of the structural integrity performance standards (*i.e.,* re-assess every five years). Finally, in contrast to the programs established by MSHA and FEMA, the final rule establishes certain minimum requirements for all CCR surface impoundments. This is based on the fact that, unlike the dams regulated under other federal programs, the material in all CCR units is harmful, so even small releases can present environmental and human health concerns. But the majority of the structural integrity requirements vary depending on whether the CCR surface impoundment or lateral expansion exceeds particular size thresholds. The rulemaking record clearly demonstrates that these larger CCR surface impoundments present a greater risk of catastrophic failure, and therefore require a more robust set of regulatory requirements to ensure their continued structural integrity. The final rule's implementation of a size threshold for structural integrity requirements is consistent with the approach taken by the majority of dam safety programs and regulation.

These modifications are being made to better reflect the protections necessary to ensure that: (1) Structural integrity is maintained throughout the operational life of a CCR unit; and (2) the risk of catastrophic failure is minimized. The changes being made in this rule have been directly influenced by comments received, the observations and the conclusions drawn from EPA's Assessment Program, and the recommendations made by both MSHA and FEMA regarding dam safety. They are also generally consistent with the regulatory requirements of many other state and other federal agencies regulating dam safety.

1. Overview of Technical Criteria

Except for incised units, owners or operators of all existing and new CCR surface impoundments and any lateral expansion of these CCR units are required to: (1) Place a permanent identification marker on or immediately adjacent to the CCR units with the name associated with the CCR unit and the name of the owner or operator of the CCR unit; (2) conduct an initial hazard potential assessment to determine the current hazard potential classification of

[80] For example, EPA relied on hazard potential to trigger the requirement for an Emergency Action Plan, which will identify the actions necessary to minimize damage to life and property. As damage to life and property are the factors directly addressed in hazard potential classification, reliance on the classification is an appropriate determinant for this requirement.

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the CCR unit; (3) conduct periodic (*i.e.,* every five years) hazard potential re-assessments; (4) develop an Emergency Action Plan (EAP) if the hazard potential classification of the CCR unit is classified as either a high- or significant hazard potential; and (5) maintain the CCR unit with vegetated slopes or other forms of slope protection.

Owners or operators of CCR surface impoundments that either have a height of five feet or more and a storage volume of 20 acre feet or more, or a height of 20 feet or more are required to comply with the following additional structural integrity criteria: (1) Document the design and construction of the CCR surface impoundment; (2) conduct an initial structural stability assessment; (3) conduct an initial safety factor assessment; and (4) conduct periodic (not to exceed five years) structural stability and safety factor assessments.[81] Owners and operators of CCR units that fail to make the safety factor assessment or fail to meet the factors of safety specified in the rule must stop placing CCR in the unit and initiate closure.

The structural integrity requirements of the final rule require the compilation of construction history of the existing CCR surface impoundment within one year of the effective date of the rule.

Within two months of the effective date of the rule, the structural integrity requirements (§ 257.73) state that the owner or operator must install a permanent marker on the existing CCR surface impoundment. This timeframe is being promulgated as proposed, as EPA did not receive comments on the timeframe for installation of a permanent marker.

2. Structural Integrity Requirements Applicable to All CCR Surface Impoundments

a. Hazard Potential Classification Assessments

A hazard potential classification provides an indication of the potential for danger to life, development, or the environment in the event of a release of CCR from a surface impoundment. In this rule, an owner or operator of any existing or new CCR surface impoundment or any lateral expansion of a CCR surface impoundment must determine which of the following hazard potential classifications characterizes their particular CCR unit.[82] These classifications are: a high hazard potential CCR surface impoundment, a significant hazard potential CCR surface impoundment; and a low hazard potential CCR surface impoundment and are defined as follows:

- *High hazard potential CCR surface impoundment* means a diked surface impoundment where failure or mis-operation will probably cause loss of human life.
- *Significant hazard potential CCR surface impoundment* means a diked surface impoundment where failure or mis-operation results in no probable loss of human life, but can cause economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns.
- *Low hazard potential CCR surface impoundment* means a diked surface impoundment where failure or mis-operation results in no probable loss of life and low economic and/or environmental losses. Losses are principally limited to the surface impoundment's owner's property.

Owners and operators of all CCR surface impoundments must determine each unit's hazard potential classification through a hazard potential classification assessment. Hazard potential classification assessments must be certified by a qualified professional engineer and documentation must be provided that supports the basis for the current hazard potential rating. An initial hazard potential assessment must be conducted within one year of the effective date of the rule for existing units and prior to the initial receipt of CCR in the unit for new units or lateral expansions. Hazard potential classifications, structural stability assessments, and safety factor assessments require significant planning and coordination, such as detailed site-work and investigations, modeling and analysis, design and construction planning and implementation, and post-construction investigation. Many of these efforts take several months to complete, compounded by the fact that much of the work cannot be completed in cold-weather or heavy-rain seasons.

As commenters noted, it is imperative that the owner or operator maintain a current assessment of a unit's hazard potential classification, rather than develop a single one-time classification ''for which the facility was designed.'' (See proposed § 257.71(d)(10).) Moreover, FEMA recommends that a unit's hazard potential classification should be reviewed no less frequently than every five years in order to take into account changes in the factors that are the basis for which a hazard potential classification is made (*e.g.,* changed reservoir or downstream development).[83] Based on this information, EPA determined that a periodic reassessment of a CCR surface impoundment's hazard potential classification is a necessary component in maintaining the accuracy of the unit's hazard potential classification, as well as the overall safety of the unit. Consequently, EPA is requiring the owner or operator of a CCR surface impoundment to reassess the hazard potential classifications of their CCR unit and to have that classification, certified by a qualified professional engineer, at least every five years.

EPA has continued to rely on FEMA requirements as the basis for general CCR surface impoundment safety requirements, *e.g.,* inflow design flood selection, inspection criteria, earthquake analyses and design for several reasons: (1) Structural failure risks for CCR surface impoundments are similar to the risks from the larger dam universe for which FEMA intends its guidance; and (2) risks to downstream development from CCR surface impoundment failures are equal or similar to those presented by other types of dams' failures.

In this rule, hazard potential classifications define the consequences in the event of a failure of a CCR surface impoundment. The classification is separate from the structural stability of a CCR unit or the likelihood of the impoundment failing. A surface impoundment that meets or exceeds all of the structural stability criteria and safety factors of this rule would still be classified as ''high hazard potential'' if, in the event of failure, loss of life would be likely to occur.

[81] *Height* means the vertical measurement from the downstream toe of the CCR surface impoundment at its lowest point to the lowest elevation of the crest of the CCR surface impoundment.

[82] Incised CCR surface impoundments are not required to perform a hazard potential classification assessment because hazard potential classifications are based on the failure of a dam, diked surface impoundment, or other water-retaining structure and the adverse incremental impacts that may result from the failure. Because incised CCR surface impoundments, as defined in this rule, do not have a diked portion which may fail, the incised CCR surface impoundment cannot have a hazard potential classification. This final rule covers CCR surface impoundment failures and releases due to other potential failure modes (*i.e.,* which do not pose an immediate catastrophic threat to human health or the environment), such as a release through the liner of the unit or through failure of underlying structures, in the location restrictions, design criteria, and operating criteria of the rule.

[83] See: *Federal Guidelines for Dam Safety: Hazard Potential Classification for Dams,* Federal Emergency Management Agency (''FEMA'') (reprinted January 2004). Under the FEMA dam safety classification system, a ''low hazard potential classification'' means that failure or mis-operation of the impoundment ''results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to owner's property.''

The hazard potential classification of the CCR surface impoundments is an essential element in determining how to properly design, construct, operate, and maintain a CCR surface impoundment. As such, the final rule bases the stringency of some technical requirements, in part, on the potential for adverse impacts on the failure of the CCR unit, as quantified by the hazard potential classification of this rule. Specifically, the requirements become more stringent as the potential for loss of life and/or property damage increases. This is reflected in both the criteria established under the structural stability assessments, *.e.g.,* where the combined capacity of all spillways must adequately manage flow during and following peak discharge from the specified inflow design flood based on the hazard potential classification of the unit—and in the hydrologic and hydraulic capacity requirements, which are similarly specified based on the hazard potential classification of the CCR unit (see §§ 257.73(d)(2)(v); 257.74(d)(2)(v) and 257.82 respectively).[84] Additionally, high and significant hazard potential CCR surface impoundments must develop a written Emergency Action Plan which establishes emergency action procedures in the event of a previously defined emergency.

b. Emergency Action Plan

An Emergency Action Plan (EAP) is a document that identifies potential emergency conditions at a CCR surface impoundment and specifies actions to be followed to minimize loss of life and property damage. Typically an EAP includes: (1) Actions the owner or operator will take to moderate or alleviate a problem at the CCR unit; (2) actions the owner or operator will take, in coordination with emergency management authorities, to respond to incidents or emergencies related to the CCR surface impoundment; (3) procedures owner or operators will follow to issue early warning and notification message to responsible downstream emergency management authorities; (4) inundation maps to allow owners and operators of the CCR unit and emergency management authorities to identify critical infrastructure and population-at-risk sites that may require protective measures, warning and evacuation planning; and (5) delineation of the responsibilities of all those involved in managing an incident or emergency and how the responsibilities should be coordinated and implemented.[85] As FEMA guidance suggests, and EPA reiterates here, the level of detail in the EAP should be commensurate with the potential impact of a surface impoundment failure or other operational incident (*e.g.,* its hazard potential classification). A surface impoundment with low potential hazard impact should not require an extensive evaluation or be subject to an extensive planning process, while high-hazard and significant hazard surface impoundments would typically require a much larger emergency planning effort. In addition, high hazard and significant hazard surface impoundments tend to involve more entities that must coordinate responsibilities and greater efforts would generally be necessary to effectively respond to an incident with such a surface impoundment than to a similar incident involving a low-hazard surface impoundment. As such, every EAP must be tailored to specific site conditions.

EPA is promulgating, as proposed, a provision that requires any CCR surface impoundment that is determined by the owner or operator, through the certification by a qualified professional engineer, to be either a high hazard potential CCR surface impoundment or a significant hazard potential CCR surface impoundment to prepare and maintain a written EAP. While EPA agrees that the level of detail contained in an EAP should be commensurate with its hazard potential rating, EPA has concluded that at a minimum, the EAP must: (1) Define responsible persons and the actions to be taken in the event of a CCR surface impoundment-safety emergency; (2) provide contact information for emergency responders, including a map which delineates the downstream area which would be affected in the event of a failure and a physical description of the CCR surface impoundment; (3) include provisions for an annual face-to-face meeting or exercise between representatives of the owner or operator of the CCR unit and the local emergency responders; and (4) define conditions that initiate implementation of the EAP and define emergency response actions which must be implemented upon the detection of these conditions, including all persons responsible for the implementation of the emergency response actions. The first three of these four requirements were proposed as part of the EAP and are being promulgated without revision. The fourth requirement, which requires facilities to explicitly define the conditions by which the EAP is activated, was inadvertently omitted from the proposal, and is being added to the final rule to ensure that the EAP includes at least the basic requirements necessary to function effectively.

The owner or operator must amend the written EAP whenever there is a change in conditions that would substantially affect the written EAP in effect, *e.g.,* change in personnel, change in emergency responder contact information, a change in the CCR surface impoundments' designation from a significant-hazard potential classification to a high-hazard potential classification, or the vertical expansion of the CCR unit (*i.e.,* increase in the amount of CCR that potentially could be released.) Consistent with the requirements for hazard potential classification reassessments, the Agency is requiring, at a minimum that the EAP be reassessed at least every five years. If an owner or operator determines that, as part of it periodic hazard potential re-assessment that the unit no longer is classified as a high-hazard or a significant-hazard potential classification, but is now classified as a low hazard potential CCR surface impoundment, then the owner or operator of the CCR unit is no longer subject to the requirement to prepare and maintain an EAP, effective when such documentation is placed into the facility's operating record. If, however, during the reassessment effort it is determined that an existing CCR unit classified as a low hazard potential has been re-classified as either a significant-hazard or high-hazard potential, the owner or operation must prepare an EAP for the CCR unit within six months of completing such a periodic hazard potential re-assessment.

Although the owner or operator is responsible for developing and maintaining the EAP, which must be certified by a qualified professional engineer, the plan should be developed and implemented in close coordination with all applicable emergency management authorities, including the appropriate local, state, and federal authorities. Generally, these coordination efforts, along with the EAP, provide emergency management authorities with the necessary information to facilitate the implementation of their responsibilities, and so, it is vital that the development of the EAP be coordinated with emergency responders and other entities, agencies, and jurisdictions, as

[84] A high-hazard potential impoundment, for example, must be designed with sufficient spillway capacity to manage flow from the probable maximum flood, whereas a low hazard potential unit need only account for a 100 year flood.

[85] See: ''Federal Guidelines for Dam Safety: Emergency Action Planning for Dams,'' FEMA 64/ July 2013.A.

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appropriate. After the initial EAP has been developed and placed in the operating record and on the owner or operator's internet site, it should be periodically reviewed and updated on a regular basis, as it can become outdated and ineffective. While the Agency is only requiring the EAP to be re-assessed every five years, it is recommended that the EAP be reviewed at least annually for appropriateness, accuracy, and adequacy so as to remain current. EPA recommends that the EAP be promptly updated to address changes in personnel, contact information and/or significant changes to the facility or emergency procedures. Even if no revisions are necessary, the review should be documented.

The initial EAP must be prepared within 18 months from the effective date of the rule. In order to prepare an EAP, the owner or operator must accurately and comprehensively identify potential failure modes and at-risk development, and therefore completion of the emergency action plan needs to follow the completion of the initial hazard potential classification, structural stability assessment, and safety factor assessments, during which this information will be generated.

c. Vegetated Slopes of Dikes and Surrounding Areas

EPA proposed to require both new and existing CCR surface impoundments that exceed the MSHA size thresholds to document the slope protection measures that have been adopted and to compute the minimum factors of safety for slope stability, in order to support the certification from an independent professional engineer that the unit has been designed in accordance with ''generally accepted engineering standards.'' EPA is promulgating the requirement that all CCR surface impoundments have adequate slope protection because EPA determined through the Assessment Program that slope protection is an essential element in preventing slope erosion and subsequent deterioration of CCR unit slopes. EPA is requiring slope protection for all units, not just units exceeding the size threshold of the final rule, because EPA has identified that slope protection on CCR units is a generally accepted good practice which reduces the occurrence of erosion, degradation of surface waters due to run-off from the CCR unit, enhances slope stability, and that vegetated cover is an easily accomplished practice in the vast majority of climates where CCR surface impoundments are located. In conducting the Assessment Program, the protective cover of slopes of the CCR surface impoundment was determined to be relevant to the overall condition rating of all units, irrespective of size. This is consistent with FEMA guidance, which also lays out specifications for the ideal vegetative cover for a dam. EPA has adopted this requirement to be consistent with its findings from the Assessment Program, and in response to comments, and has elaborated on the slope protection measures necessary to achieve the factors of safety. The final rule provides performance standards drawn primarily from FEMA guidance, as applied during the Assessment Program.

All CCR surface impoundments are required to be designed, constructed, operated, and maintained with adequate slope protection to protect against surface erosion at the site. Slope protection is necessary to ensure that dike or embankment erosion does not occur. Additionally, slope protection is required of all CCR surface impoundments to maintain the stability of the CCR surface impoundment slope under rapid drawdown events [86] and low pool conditions of water bodies that may abut the CCR surface impoundment and are outside the control of the owner or operator, *e.g.,* a natural river which the slopes of the CCR surface impoundment run down to and abut. The slope protection can act as a stabilizer in the slope of the embankment during rapid drawdown events. Adequate slope protection can be achieved in most climates through simple vegetation, typically a healthy, dense stand of low-growing grass, or other similar vegetative cover. In arid climates where the upkeep of vegetation is inhibited, alternate forms of slope protection, including rip-rap, or rock-armor is typically used. Additional slope protective measures are available and effective in certain circumstances, including but not limited to rock, wooden pile, or concrete revetments, vegetated wave berms, concrete facing, gabions, geotextiles, or fascines.

The owner or operator must ensure that the slopes of the CCR surface impoundment are protected from erosion by appropriate engineering slope protection measures. It is recommended throughout embankment technical literature that vegetative cover not be permitted to root too deeply, precipitating internal embankment issues. The rule requires a vegetative cover limit to prevent the establishment of rooted vegetation, such as a tree or a bush on the CCR surface impoundment slope. EPA has concluded that a vegetative cover of no more than six inches above the face of the embankment is adequate and is the uppermost limit for vegetative cover height for this final rule. In developing this requirement, EPA was strongly influenced by information contained in the FEMA document entitled, ''Technical Manual for Dam Owners: Impacts of Plants on Earthen Dams'' [87] in determining an appropriate vegetative cover height for CCR surface impoundments. Six inches represents a vegetative height which prevents any trees, bushes, or shrubbery from rooting deeply enough to warrant additional removal measures outside of simple mowing. Furthermore, the height prescribed by the final rule represents a maximum height of vegetative cover to allow for adequate observation of the slope of the CCR unit during inspection. Vegetative cover in excess of six inches above the slope of the dike would prevent the adequate observation of the slope of the CCR unit and detection of structural concerns such as animal burrows and minor sloughs, amongst others concerns. Consistent with FEMA guidance, as applied during the Assessment Program, other slope protection, such as rock armoring or vegetated berms, would also be considered adequate.[88]

3. Structural Integrity Criteria Applicable to CCR Surface Impoundments Exceeding a Specific Size Threshold

The structural integrity criteria discussed in this section of the preamble apply to existing and new CCR surface impoundments and any lateral expansion with: (1) A height of five feet or more and a storage volume of 20 acre-feet or more; or (2) a height of 20 feet or more. The rule defines *height* as the vertical measurement from the downstream toe of the CCR surface impoundment at its lowest point to the lowest elevation of the crest of the CCR surface impoundment. The *downstream toe* is defined as the junction of the downstream slope or face of the CCR surface impoundment with the ground surface. This final rule considers the lowest elevation of the crest of the CCR

[86] This rapid drawdown is not included in the rule's factors of safety assessments. The protection against rapid drawdown requirement of this provision is concerned with the rapid drawdown of adjacent water bodies acting upon the downstream slope of the CCR surface impoundment rather than the rapid drawdown of the impounded reservoir of the CCR surface impoundment acting upon the upstream slope of the CCR surface impoundment.

[87] *http://www.fema.gov/media-library-data/20130726-1446-20490-2338/fema-534.pdf.*

[88] *http://www.fema.gov/media-library-data/20130726-1446-20490-2338/fema-534.pdf.*

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surface impoundment to be the maximum storage elevation of the reservoir or pool of the CCR unit, *e.g.,* the invert of the lowest-elevation spillway. EPA is implementing this size threshold because it comports with thresholds established by other federal and state agencies regulating dam integrity and/or safety. Specifically, for the implementation of the size threshold of this final rule, EPA relied on the identical size parameters, *i.e.,* height of five feet and capacity of 20 acre-feet, which is promulgated in MSHA coal slurry impoundment regulations in 30 CFR 77.216.

In the proposed rule, EPA used the size cut-off promulgated by MSHA in their dam safety requirements for coal slurry impoundments at 30 CFR part 77. In proposing this cut-off, EPA reasoned that the MSHA requirements affecting coal slurry impoundments were directly applicable and relevant to CCR surface impoundments and provided a size threshold that, when applied to the rule's structural integrity criteria, would generally meet RCRA's mandate to ensure protection of human health and the environment by minimizing the potential for catastrophic failure. Specifically, EPA proposed that surface impoundments: (1) Impounding CCR to an elevation of five feet or more above the upstream toe of the structure and can have a storage volume of 20 acre-feet or more; or (2) impounding CCR to an elevation of 20 feet or more above the upstream toe of the structure would be subject to the structural stability criteria. EPA also proposed to define *upstream toe* as the junction of the upstream slope of the dam with the ground surface, with the height of the CCR unit measured from the upstream toe or water-borne toe of the CCR unit.

While little comment was received on adopting this size threshold or the accompanying definition of *upstream toe,* the Agency was concerned that the size threshold presented in the proposed rule did not reflect standard measuring protocols used by other federal agencies and the dam sector in determining the size of a dam or, in the case of this rule, surface impoundment. Of particular concern to the Agency was the fact that EPA's own Assessment Program was measuring the height of a CCR unit from the downstream toe rather than the upstream toe, which was specified in the MSHA regulatory requirement and the subsequent CCR proposed rule.

A review of MSHA, FEMA and the USACE regulations and guidance, as well as the guidance of several state agencies that oversee dam safety, revealed that dam or surface impoundment height is more appropriately measured from the downstream and not the upstream toe of the unit. EPA based this conclusion on the near-universal position of dam safety guidance that the downstream slope height of the dike is of primary concern in the design, construction, operation, and maintenance of the dam or surface impoundment. Virtually all of the dam safety regulations, including state and federal guidance and regulations, that EPA reviewed considered measured dam height to be taken from the downstream slope of the dike. Some of these guidance and regulations include FEMA ''Federal Guidelines for Dam Safety,'' U.S. Army Corps ''National Inventory of Dams,'' and MSHA Metal and Nonmetal Tailings and Water Impoundment Inspection requirements in 30 CFR part 56 and § 57.20010.[89] This information, coupled with the information on the methodology used in the Assessments Program, convinced the Agency that a revised description of the CCR surface impoundment size cutoff was necessary, specifically requiring the height of the CCR unit to be measured from the downstream toe.

a. Design and Construction Information

The first element of the structural integrity criteria applicable to CCR units exceeding the specified size threshold requires the owner or operator to compile and place in the operating record design and construction information pertaining to the CCR unit. Among other things, this provision requires the following documentation to be provided by the owner or operator: (1) The name of the owner or operator of the unit; (2) the name of the unit; and (3) any identification number assigned by the state. In addition, it requires that the owner or operator identify: (5) The location of the CCR unit on a U.S. Geological Survey Map or a topographic map of equivalent scale; (6) provide dimensional drawings of the CCR unit with pertinent engineering structures and appurtenances identified; (7) describe the purpose of the CCR unit; and (8) identify the name and size of the watershed affecting the CCR unit, if any. Detailed information is also required documenting: (9) The design and construction of the unit including dates and descriptions of each zone or stage constructed; (10) instrumentation used to monitor the operation of the CCR unit, (11) spillway and diversion design descriptions and construction specifications; and (12) provisions for surveillance, maintenance and repair of the CCR unit.

While these requirements apply to both existing and new CCR surface impoundments, existing CCR surface impoundments are required to compile this information only ''to the extent available,'' within one year of the effective date of the rule. Conversely, new CCR surface impoundments or any lateral expansion must compile all of the information listed prior to the initial receipt of CCR. For existing CCR surface impoundments, EPA acknowledges that much of the construction history of the surface impoundment maybe unknown or lost. EPA's Assessment Program confirmed that many owners or operators of CCR units did not possess documentation on the construction history or operation of the CCR unit. Information regarding construction materials, expansions or contractions of units, operational history, and history of events was frequently difficult for the owners or operators to obtain. The Assessment Program also confirmed the Agency's initial assumption that this information, in many instances, will be difficult to compile. Therefore, in this rule, EPA is using the phrase ''to the extent available'' and clarifying that the term requires the owner or operator to provide information on the history of construction only to the extent that such information is reasonably and readily available. EPA intends facilities to provide relevant design and construction information only if factual documentation exists. EPA does not expect owners or operators to generate new information or provide anecdotal or speculative information regarding the CCR surface impoundment's design and construction history.

There are several other requirements under the design and construction criteria requiring clarification. First, the Agency is amending the requirement that all dimensional drawings of the CCR unit (see § 257.73(b)(vii) and § 257.74(b)(vii)) use a uniform scale of one inch equals 100 feet. After further consideration, EPA has deleted this requirement and has replaced the proposed scale of 1 inch equals 100 feet with the phrase ''at a scale that details engineering structures and appurtenances relevant to the design, construction, operation, and maintenance of the CCR unit.'' EPA made this change in response to comments arguing that this level of detail was unnecessary. EPA agrees that, given the extremely large variety in the size of CCR units, a prescriptive scale for all drawings of all CCR units is not necessary in many cases; this level of detail would be excessive for most

[89] *http://www.msha.gov/regs/complian/PILS/2013/PIL13-IV-01.asp.*

units. The Agency is also clarifying, (see § 257.73(b)(2) and § 257.74(b)(2)) that if an owner or operator determines that a significant change has occurred in the information/documentation previously compiled under this provision, the owner or operator must update the relevant information and place it in the operating record.

b. Types of Assessments

A second element of the structural integrity criteria is the requirement for specific technical assessments of the CCR unit. Consistent with the requirements outlined in the proposed rule, two technical assessments are required for all CCR units exceeding the specified size threshold: (1) A structural stability assessment; and (2) a safety factor assessment. The owner or operator of an existing CCR surface impoundment is required to conduct an initial assessment addressing both structural stability and safety factors within one year of the effective date of the rule. New CCR surface impoundments or any lateral expansion of a CCR unit are required to complete the initial assessment prior to placing CCR into the unit. Following the initial assessments, EPA is also requiring periodic re-assessments of both a CCR surface impoundment's structural stability and factors of safety. EPA proposed to require an annual recertification, but in a departure from the proposed rule, EPA is only requiring these re-assessments to be conducted on a regular basis, not to exceed once every five years. In making this regulatory change, the Agency has relied heavily on the dam safety guidance established by FEMA in the document titled, *Federal Guidelines for Dam Safety* that a formal inspection, including ''. . . a review to determine if the structures (*i.e.,* CCR surface impoundments) meet current accepted design criteria and practices . . .'' be taken at an interval not to exceed five years. EPA has interpreted this guidance to be applicable to both the structural stability assessment and the safety factor assessment.

A demonstration must be completed within the assessment period for the specific type of assessment. This means that, within this timeframe the owner or operator must demonstrate that the CCR unit meets all of the requirements of each type of assessment, as certified by a qualified professional engineer. It also means that the owner or operator must have taken all measures necessary to bring the unit into compliance with all of the requirements for assessments of this final rule within the assessment period. If the owner or operator cannot demonstrate that the unit meets these factors of safety (or otherwise fails to comply with the structural stability requirements) within the appropriate timeframe, the unit must initiate closure.

i. Periodic Structural Stability Assessments

In order to ensure the proper upkeep and operation of the CCR unit, the owner or operator must demonstrate that the CCR surface impoundment has been designed, constructed, operated and maintained to provide structural stability. Specifically, consistent with the proposal, the final rule requires the owner or operator to demonstrate that the design, construction, operation, and maintenance of the CCR surface impoundment is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and water that can be impounded therein. As discussed previously, EPA has elaborated on this overall performance standard in response to comments from the engineers who would be required to make these certifications, urging EPA to specify more precisely the standards that must be met. Specifically the final rule focuses on the critical structural aspects of the CCR surface impoundment that EPA identified in the proposed rule, and identifies the minimum elements that a professional engineer must provide engineering details on or otherwise address. In certain cases, the final criteria identify specific engineering performance standards. EPA relied on existing MSHA requirements, FEMA dam safety guidance, and guidance issued by the USACE, as applied throughout EPA's Assessment Program to develop these criteria. Consistent with the proposal, these demonstrations must be certified by a qualified professional engineer. Each of these criteria is discussed in more detail below.

In addition to implementing adequate slope protection against erosion, which is a structural stability requirement applicable to all CCR units, the owner or operator of a CCR surface impoundment exceeding the specified size threshold must demonstrate that the unit, including any vertical and lateral expansions, is constructed with ''stable foundations and abutments.'' A stable foundation is an essential element of surface impoundment construction and prevents differential settlement of the embankment which can result in adverse internal stresses with the embankment cross-section. Soils tend to consolidate when subjected to loadings for extended periods, which can lead to strain incompatibility, a phenomena which prevents the full development of peak strength of the foundation. The stability of foundations and abutments can be determined by engineering monitoring, representative soil sampling, and modeling. Similarly, cohesion between the abutments of the CCR surface impoundment and the embankment of the CCR surface impoundment is critical. Frequently, CCR surface impoundments are subject to cracking and excessive seepage and piping in the groins where the abutment and embankment meet. These adverse conditions may lead to further structural deficiencies which threaten the safety of the CCR surface impoundment.

Consistent with general engineering construction methodologies, the structural stability assessment also requires the owner or operator to determine whether the CCR surface impoundment has been mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit.[90] Compaction of a dike or embankment is considered essential, as the compaction of soils leads to an increase in density and subsequently strength. Soil mechanics theory has established that the density of a soil corresponds to the moisture content and strength of the soil. The rule requires the owner or operator make this determination for all dikes of a CCR surface impoundment.

EPA notes that a number of existing voluntary consensus standards are available that can be useful in making this determination. For example, ASTM D 698 establishes a performance standard of 95% of the maximum standard Proctor density. Similarly, ASTM D 1557 establishes a standard of 90% of the maximum modified Proctor density. Alternatively, in certain instances, such as soils consisting of more than 30% material retained on the ¾ in. sieve, Proctor testing is not appropriate and the relative density criteria can be met. In such cases, EPA recommends a 70% relative density. These specific soil compaction criteria are ubiquitous throughout engineering construction as sufficient to support engineered works based on the requirements. They are also consistent with the standards promulgated by the state of New Mexico's dam safety program in order to ensure proper compaction during construction of new CCR surface impoundments.

EPA recognizes that it would be highly difficult for owners or operators

[90] *http://www.publications.usace.army.mil/Portals/76/Publications/EngineerManuals/EM_1110-2-2300.pdf.*

of older units to certify with any certainty that the unit's construction meets the specific numeric compaction criteria found in the ASTM standards. New units, however, can easily meet these standards, and should therefore be designed and constructed to meet the numeric compaction criteria.

The owner or operator must also design, construct, operate, and maintain the CCR surface impoundment spillway or spillways with appropriate material so as to prevent the degradation of the spillway, as well as to ensure that the CCR surface impoundment has adequate spillway capacity to manage the outflow from a specific inflow design flood. In addition, a demonstration must be made that the CCR surface impoundment has been designed, constructed, operated, and maintained with inflow design flood controls and/or spillway capacity to manage peak discharge during and following inflow design floods. This demonstration is required to ensure the CCR surface impoundments will have adequate hydrologic and hydraulic capacity to prevent such failures as overtopping and excessive internal seepage and erosion. Spillways must be designed to withstand discharge from the inflow design flood without losing their structural form and leading to discharge issues, such as erosion or overtopping of the embankment. This requirement is covered in more detail in the hydrologic and hydraulic capacity requirements for CCR surface impoundments section of this rule.

EPA is not requiring a facility to include any demonstration relating to the potential for rapid, or sudden, drawdown loading condition. Rapid or sudden drawdown is a condition in earthen embankments in which the embankment becomes saturated through seepage in an extended high pool elevation in the reservoir. A threat to the embankment emerges when the reservoir pool is drawn down or lowered at a rate significantly higher than the excess poor water pressure within the embankment can diminish. Typically, rapid drawdown scenarios are considered for embankments with reservoirs used for water supply and management, emergency reservoirs, or agricultural supply, in which the reservoir is rapidly discharged from the structure. In these scenarios, a high pool elevation is maintained in the reservoir in storage months. Subsequently, the water supply is drawn on in months where there is a high demand for the reservoir's contents. This drawing down of the pool can affect the structural stability of the unit. However, the management of CCR surface impoundments differs from that of conventional water supply, emergency, and agricultural reservoirs. The only instance of a rapid drawdown of a CCR surface impoundment which EPA has identified is in the event of a massive release of the reservoir of the CCR surface impoundment due to a failure of the dike of the CCR surface impoundment. In this instance, a massive release has occurred or is occurring. A subsequent failure of the upstream or internal embankment due to this rapid drawdown would only precipitate further embankment failure and not any further release of the contents of the impoundment, as the contents of the surface impoundment would have already been released. In these instances, remediation of a failure in a rapidly drawn-down section would be necessary prior to filling of the unit, but is not a concern precipitating a release of impounded contents.

A second consideration regarding rapid drawdown, however, is the rapid drawdown of a water body adjacent to the slope of the CCR surface impoundment which may periodically inundate the slope. Many CCR surface impoundments are located in areas in which the downstream slope of the CCR surface impoundment runs down to a lake, stream, or river. In such instances, rapid drawdown must be considered for the stability of the downstream slope of the embankment in the event of a rapid drawdown in the lake, stream, or river pool elevation or stage. Because the water ponded against the downstream slope of the CCR surface impoundment provides a stabilizing load on the slope of the CCR surface impoundment, the rapid or gradual loss of this stabilizing force must be considered in the analysis of the CCR surface impoundment. The rule, therefore, requires that existing and new CCR surface impoundments and any lateral expansions of such units with a downstream slope that can be inundated by an adjacent water body, such as rivers, streams, or lakes, be constructed with downstream slopes that will maintain structural integrity in events of low pool or rapid drawdown of the adjacent water body. This ensures that the structural integrity of the downstream slope of the CCR surface impoundment will be maintained, even though the conditions of an adjacent surface water body may be outside the owner or operator's control.

ii. Periodic Safety Factor Assessments

As previously discussed, EPA received comment requesting the Agency to supplement the proposed technical criteria to assist owners or operators of CCR surface impoundments in interpreting the factor of safety determination required by proposed § 257.71(d)(12). EPA proposed that facilities compute ''a minimum factor of safety for slope stability of the CCR retaining structure(s),'' and to provide the methods and calculations used to determine each factor of safety. In reviewing the proposed requirement, the Agency agrees that further elaboration on the requirement is necessary to ensure that engineers can accurately assess a CCR unit's structural stability using factor of safety calculations, and would be valuable to ensure a consistent national standard. EPA has therefore revised the criteria to be consistent with the criteria developed and used to assess these impoundments as part of the Assessment Program.

Accordingly, the final rule requires demonstrations of structural integrity using accepted engineering methodologies under specific loading conditions. Owners or operators must conduct and have certified by a qualified professional engineer, an initial assessment, supported by the appropriate engineering calculations, documenting whether the CCR unit achieves the following minimum factors of safety: (1) The calculated static factor of safety under the long-term, maximum storage pool loading condition, which must equal or exceed 1.50; (2) the calculated static factor of safety under the maximum surcharge pool loading condition, which must equal or exceed 1.40; (3) the calculated seismic factor of safety, which must equal or exceed 1.00; and (4) the calculated liquefaction factor of safety, which must equal or exceed 1.20. In addition to the safety factors specified for existing CCR surface impoundments, new CCR surface impoundments and any lateral expansion must also comply with a fifth safety factor, the calculated static factor of safety under the end-of-construction loading condition, which must equal or exceed 1.30.

The minimum static factors of safety are adopted directly from the USACE's Engineer Manual EM 1110–2–1902 entitled, ''Slope Stability.'' As discussed in more detail in Unit III of this document, EPA relied heavily on this manual and applied these specific factors of safety during its Assessment Program, and it is widely considered the benchmark in the dam engineering community for slope stability and methodology and analysis.

The seismic factor of safety is adopted from review of several dam safety guidance documents, including USACE guidance Engineer Circular 1110–2–6061: Safety of Dams-Policy and Procedures 2204, Engineer Circular

1110–2–6000: Selection of Design Earthquakes and Associated Ground Motions 2008, and Engineer Circular 1110–2–6001: Dynamic Stability of Embankment Dams 2004. EPA also reviewed MSHA's 2009 Engineering and Design Manual for Coal Refuse Disposal Facilities, in particular Chapter 7, ''Seismic Design: Stability and Deformation Analyses.'' These documents are viewed by ASDSO, FEMA and MSHA as generally accepted guidance on how to conduct seismic stability analyses. EPA chose the factor of safety of 1.00 because the 1.00 quantity represents the condition of the slope in which the strength of resistance to loading is equal to the anticipated loading stress acting upon the embankment, or the value which represents stability under the appropriate loading condition.

The liquefaction factor of safety is adopted from review of several dam safety guidance and liquefaction guidance, including ''Soil Liquefaction During Earthquakes,'' Idriss and Boulanger, Earthquake Engineering Research Institute, 2008,[91] ''Geotechnical and Stability Analyses for Ohio Waste Containment Facilities,'' Ohio EPA, Sept. 14, 2004, Chapter 5,[92] and *Federal Guidelines for Dam Safety: Earthquake Analyses and Design of Dams,* Document 65, FEMA May 2005.[93] EPA also reviewed several technical resources regarding soil liquefaction, including ''Ground Motions and Soil Liquefaction During Earthquakes,'' Seed and Idriss, 1982,[94] ''Liquefaction Resistance of Soils: Summary report from the 1996 and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils,'' Youd and Idriss, 2001,[95] and *Seismic Design Guidance for Municipal Solid Waste Landfill Facilities,* US EPA, Office of Research and Development, 1995. EPA chose a liquefaction factor of safety of 1.20, identifying that consideration of liquefaction potential and post-liquefaction residual strength slope stability included several uncertainties in assumptions and analysis which must be accounted for in a factor of safety above unity (*i.e.,* 1.00). FEMA guidance explicitly states that ''post-liquefaction factors of safety are generally required to be a minimum of 1.2 to 1.3.''

In conjunction with this requirement, EPA continues to require periodic re-assessments of the safety factor calculations, but as discussed, has modified the frequency to be no less than once every five years for all affected CCR units. Periodic reassessments are necessary to account for factors that are subject to change and can adversely affect the structural stability of a CCR unit, *e.g.,* age, use, volume of material contained within, and to reflect the dynamic nature of a CCR surface impoundment and the loads to which the dikes of the CCR surface impoundment may reasonably be expected to become subject to both the requirement to periodically reassess safety factor calculations and the five-year timeframes are consistent with the guidance set forth by other federal agencies in assessing dam safety, including MSHA, FEMA, and the USACE. For example, FEMA's Federal *Guidelines for Dam Safety* explicitly recommends that a dam be formally reassessed at an interval not to exceed every five years, and EPA has adopted this minimum frequency of assessment in this final rule.

(a) General Safety Factor Assessment Considerations

Generally accepted engineering methodologies specify that the determination of the structural stability factors of safety specified above is to be calculated by the qualified professional engineer using conventional analysis procedures or, if necessary, special analysis procedures. Conventional analysis procedures include, but are not limited to, limit equilibrium methods of slope stability analysis, whereas, special analysis procedures include, but are not limited to, finite element methods, finite difference methods, three-dimensional methods, or probabilistic methods. Whichever methodology is used to determine the factors of safety of the CCR surface impoundment, the qualified professional engineer must document the methodology used, as well as the basis for using that methodology, and the analysis must be supported by appropriate engineering calculations.

Limit equilibrium methods compare forces, moments, and stresses which cause instability of the mass of the embankment to those which resist that instability. The principle of the limit equilibrium method is to assume that if the slope under consideration were about to fail, or at the structural limit of failure, then one must determine the resulting shear stresses along the expected failure surface. These determined shear stresses are then compared with the shear strength of the soils along the expected failure surface to determine the factor of safety. Limit equilibrium methods include, but are not limited to, methods of slices. The most commonly applicable method of slices are the ordinary method of slices or Modified Swedish Method, Bishop's Modified Method, force equilibrium methods, Janbu's method, Morgenstern and Price's method, or Spencer's Method.

If conventional analysis procedures yield results that indicate complex failure mechanisms or the need for estimation of displacements, such as the need to determine internal stresses or displacements in an embankment or account for 3-dimensional effects in an embankment, special analysis procedures may be necessary to calculate factors of safety. Special analysis procedures include, but are not limited to: (1) The finite element method; (2) the finite difference method; (3) the three-dimensional limit equilibrium analysis method; or (4) the probabilistic method.[96]

Structural stability factors of safety need to be met in all cross-sections of the CCR surface impoundment since the failure of any cross-section of the CCR surface impoundment can result in the loss of the reservoir and stored CCR material in the CCR surface impoundment. However, it is not necessary to require the facility to fully analyze and calculate factors of safety for all cross sections under the specific loading conditions identified above. Rather, it is sufficient to calculate the factors of safety under both static, seismic, and liquefaction loading conditions only for the critical cross section of the CCR surface impoundment embankment, provided the facility carefully analyzes each cross section to properly identify the critical cross section. EPA has adopted this approach because the critical cross-section(s) represents a ''most-severe'' case and it is reasonably anticipated that all other cross-sections of the embankment will exceed the calculated factors of safety of the critical cross-section(s). The final rule therefore adopts this approach. The final rule

[91] *https://www.eeri.org/products-page/monographs/soil-liquefaction-during-earthquakes-3/.*

[92] *http://epa.ohio.gov/portals/34/document/guidance/gd_660.pdf.*

[93] *http://www.ferc.gov/industries/hydropower/safety/guidelines/fema-65.pdf.*

[94] Seed, H.B., and Idriss, I.M., 1982, ''Ground Motions and Soil Liquefaction During Earthquakes,'' Monograph No. 5, Earthquake Engineering Research Institute, Berkeley, California, pp. 134.

[95] Youd, T.L., Idriss, I.M., 2001, ''Liquefaction Resistance of Soils: Summary report from the 1996 and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils.'' Journal of Geotechnical and Geoenvironmental Engineering, ASCE.

[96] Additional information regarding special analysis methodologies can be found in publications from the U.S. Army Corps of Engineers Engineering Publications or geotechnical journals and scholarly articles.

defines the critical cross section of the embankment of a CCR surface impoundment to be that which is anticipated to be most susceptible amongst all cross sections of the embankment to structural failure based on several engineering considerations for the given loading condition, such as soil composition of the cross-section, phreatic surface level within the cross section, grade of the upstream and downstream slopes of the cross section, and presence or lack of reinforcing measures in the cross-section as opposed to other cross-sections, such as buttressing or slope protection on the slopes of the cross section. Due to the variance of qualitative and quantitative properties of embankment structural strength, EPA expects that a prudent engineering analysis will need to consider multiple cross sections to ensure proper selection of a critical cross section.

(b) The Calculated Static Factor of Safety Under the Long-Term, Maximum Storage Pool Loading Condition

It is generally accepted practice to analyze the stability of the downstream slope of the dam embankment for steady-state seepage (or steady seepage) conditions with the reservoir at its normal operating pool elevation (usually the spillway crest elevation) since this is the loading condition the embankment will experience most. This condition is called steady seepage with maximum storage pool. The maximum storage pool loading is the maximum water level that can be maintained that will result in the full development of a steady-state seepage condition. Maximum storage pool loading conditions need to be calculated to ensure that the CCR surface impoundment can withstand a maximum expected pool elevation with full development of saturation in the embankment under long-term loading. The final rule requires that the calculated static factor of safety for the critical cross section of the CCR surface impoundment under the long-term maximum storage pool loading condition meet or exceed 1.5. The generally accepted methodology for determining the long-term, maximum storage pool loading condition considers conditions at the CCR surface impoundment that exist for a length of time sufficient for steady-state seepage or hydrostatic conditions to fully develop within the embankment of the CCR unit.[97] The maximum storage pool loading needs to consider a pool elevation in the CCR unit that is equivalent to the lowest elevation of the invert of the spillway, *i.e.,* the lowest overflow point of the perimeter of the embankment. The generally accepted methodology for the calculation of the factors of safety uses shear strengths expressed as effective stress and with pore water pressures that correspond to the long-term condition. Pore-water pressures should be estimated from the most reliable of the following sources: (1) Field measurements of pore pressures in existing slopes; (2) past experience and judgment of the qualified professional engineer; (3) hydrostatic pressure computation for conditions of no flow; or (4) steady-state seepage analysis using flow nets or finite element analyses.

(c) The Calculated Static Factor of Safety Under the Maximum Surcharge Pool Loading Condition

The maximum surcharge pool loading condition is calculated to evaluate the effect of a raised level (*e.g.,* flood surcharge) on the stability of the downstream slope. This ensures that the CCR surface impoundment can withstand a temporary rise in pool elevation above the maximum storage pool elevation for which the CCR surface impoundment may normally be subject under inflow design flood stage, for a short-term until the inflow design flood is passed through the CCR surface impoundment. The final rule requires that the calculated static factor of safety for the critical cross section of the CCR surface impoundment under the long-term maximum surcharge pool loading condition meet or exceed 1.4.

Similar to the long-term, maximum loading condition, a prudent evaluation of the maximum surcharge pool loading condition needs to consider conditions at the CCR unit to exist for a length of time sufficient for steady-state seepage or hydrostatic conditions to fully develop within the embankment of the CCR surface impoundment. The maximum surcharge pool is considered a temporary pool that is higher than the maximum storage pool; the maximum surcharge loading condition should therefore consider a temporary condition in the pool at which the pool exists temporarily above the maximum storage pool elevation in the event of an inflow design flood and spillway discharge condition in the reservoir, *i.e.,* above the lowest invert of the spillway during the anticipated inflow design flood.

(d) The Calculated Seismic Factor of Safety

All CCR surface impoundments, including any lateral expansions that exceed the size threshold must meet a seismic factor of safety equal to or greater than 1.0. EPA has included this requirement because the mechanics and response phenomena of geotechnical structures vary radically under dynamic loading from those under static loading. Consequently, reliance on the factors of safety under static loading is not sufficient to evaluate the structural stability of a CCR surface impoundment. Standard engineering methodology and guidance support EPA's conclusion that adequate seismic analysis of embanked structures is essential to ensure the continued structural stability of a geotechnical structure under dynamic, or seismic, loading is warranted.[98]

As discussed in the section of this preamble addressing the location criteria, all CCR surface impoundments must also be capable of withstanding a design earthquake without damage to the foundation or embankment that would cause a discharge of its contents. To further support the location criteria established in this rule, CCR surface impoundments and any lateral expansion exceeding a specific height and/or volume threshold must be assessed under seismic loading conditions for a seismic loading event with a 2% probability of exceedance in 50 years, equivalent to a return period of approximately 2,500 years, based on the USGS seismic hazard maps for seismic events with this return period for the region where the CCR unit is located. EPA chose the 2% exceedance probability in 50 years event based on its common use in seismic design criteria throughout engineering. See for example, ASCE 7 *Minimum Design Loads for Buildings and Other Structures, International Building Code.* Moreover, USGS seismic hazard maps, dictate that the life of a structure and the realistic probability of event occurrence be considered in the design of lateral force resisting systems for structures. As discussed in the Regulatory Impact Assessment, the expected life of a CCR surface impoundment can exceed 50 years. Consistent with the location criteria for seismic impact zones, EPA adopted 2% as a reasonable probability of occurrence.

Under standard engineering methodologies, seismic analysis includes several procedures to adequately analyze the structural

[97] U.S. Army Corps of Engineers ''Slope Stability'' manual.

[98] *E.g.,* FEMA's *Federal Guidelines for Dam Safety: Earthquake Analyses and Design of Dams.*

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strength of a CCR surface impoundment during dynamic, *i.e.,* seismic, loading. Such analyses would typically need to include the appropriate characterization of ground motions at the site of the CCR surface impoundment for the 2% probability in 50 years seismic event.[99] In addition, the peak ground acceleration (PGA), velocity, and displacement should be selected using historic records, site-specific observations, or magnitude-distance attenuation relations. Additionally, the analysis would need to include an appropriate duration of earthquake, considering accelorograms for the anticipated event. Appropriate elastic response spectra should be selected using engineering methodology for selection, such as the Newmark-Hall Spectrum or other appropriate published spectra, USGS Probabilistic Maps, or site-specific response spectra.

(e) The Calculated Liquefaction Factor of Safety

All CCR surface impoundments, including any lateral expansions that exceed the size threshold and have been determined to contain soils susceptible to liquefaction must meet a liquefaction factor of safety equal to or greater than 1.20. A prudent engineering analysis of structural stability also includes a liquefaction potential analysis and analysis of post-liquefaction static factors of safety. As discussed previously, liquefaction is a phenomenon which typically occurs in loose, saturated or partially-saturated soils in which the effective stress of the soils reduces to zero, corresponding to a total loss of shear strength of the soil. The most common occurrence of liquefaction is in loose soils, typically sands. The liquefaction FOS determination in the final rule is used to determine if a CCR unit would remain stable if the soils of the embankment of the CCR unit were to experience liquefaction. Liquefaction analysis is only necessary in instances where CCR surface impoundments show, through representative soil sampling, construction documentation, or anecdotal evidence from personnel with knowledge of the CCR unit's construction, that soils of the embankment are susceptible to liquefaction.

EPA has included this requirement because the mechanics and response phenomena of geotechnical structures vary radically following induced liquefaction, *i.e.,* post-liquefaction. Similar to the requirement for seismic factors of safety, liquefaction factors of safety are necessary because reliance on static loading is not sufficient to evaluate the structural stability of a CCR surface impoundment. Standard engineering methodology and guidance support EPA's conclusion that adequate liquefaction potential analyses and post-liquefaction residual strength slope stability analyses of embanked structures is essential to ensure the continued structural stability of a geotechnical structure following dynamic loading.

Under standard engineering methodologies, liquefaction potential analysis and post-liquefaction stability analysis includes several procedures to adequately analyze the structural strength of a CCR surface impoundment. Because only certain soils, such as loose sands, are susceptible to liquefaction, the rule requires only embankments constructed of such soils identified through liquefaction potential analysis to meet liquefaction factors of safety. Such liquefaction potential analysis would need to include proper soil characterization of the embankment soils for soil age and origin, fines content and plasticity index, water content, saturation, and maximum current, past, and anticipated future phreatic surface levels within the embankment, foundation, or abutments, location beneath the natural ground surface, and penetration resistance whether through standard penetration testing (SPT) or, ideally, cone penetration testing (CPT). Post-liquefaction stability analysis would need to include detailed characterization of the site conditions, identification of the minimum liquefaction-inducing forces based on soil characterization, determination of seismic effect on liquefied layers of the embankment, and calculation of factors of safety against each liquefied layer of the embankment.

(f) The Calculated Static Factor of Safety Under the End-of-Construction Loading Condition

The End-of-Construction loading condition must be calculated for new CCR surface impoundments to ensure that the CCR surface impoundment can withstand a ''first-filling'' of the embankment, during which time the embankment first become saturated and is subject to phreatic flow through the cross-section.

Embankments are typically constructed in layers with soils at or above their optimum moisture content that undergo internal consolidation because of the weight of the overlying layers. Embankment layers may become saturated during construction as a result of consolidation of the layers or by rainfall. Because of the low permeability of fine-grained soils of which many embankments are constructed and the relatively short time for construction of the embankment, there can be little drainage of the water from the soil during construction: resulting in the development of significant pore pressures. Soils with above optimum moisture content will develop pore pressures more readily when compacted than soils with moisture contents below optimum. In general, the most severe construction loading condition is at the end of construction.

The final rule requires that the calculated static factor of safety for the critical cross section of the CCR surface impoundment under end of construction loading conditions meet or exceed 1.30. The End-of-Construction loading condition is analyzed for new construction under their initial filling condition, following the completion of construction. Undrained shear strength conditions are typically assumed for the End-of-Construction loading condition. Both the upstream and downstream slopes of the embankment are analyzed for this condition

(g) Failure To Demonstrate Minimum Safety Factors or Failure To Complete a Timely Safety Factor Assessment

As previously discussed, the rule requires an owner or operator to document that the calculated factors of safety for each CCR surface impoundment achieve the minimum safety factors specified in the rule. For any CCR surface impoundment that does not meet these requirements, the owner or operator must either take any engineering measure necessary to ensure that the unit meets the requirements by the rule's deadlines, or cease placement of CCR and non-CCR waste into the unit and initiate closure of such CCR unit as provided in section 257.102 within six months. Similarly, if an owner or operator fails to complete the initial safety factor assessment or any subsequent periodic factor safety assessment by the deadlines established in the rule, the owner or operator must cease placing CCR and non-CCR waste into the unit and initiate closure within six months.

(h) Vertical Expansions of CCR Surface Impoundments and Structural Integrity Criteria

It is not uncommon for the owner or operator to raise the crest of a CCR surface impoundment to accommodate the additional capacity needs of the

[99] FEMA Doc. 65 ''Earthquake Analyses and Design of Dams;'' *http://www.ferc.gov/industries/hydropower/safety/guidelines/fema-65.pdf*.

facility. The record documents that CCR surface impoundments are commonly expanded from the original design or as-built construction, through such ''vertical expansions,'' including where a CCR surface impoundment changes from a ''small'' CCR unit (*i.e.,* below the height and/or volume threshold) to a ''large'' CCR unit (*i.e.,* exceeding the height and/or volume threshold). In these situations, the owner or operator of the CCR unit becomes subject to additional structural integrity requirements as a result of the vertical expansion. Realizing that these newly created CCR units will require some time to meet the structural integrity requirements, the Agency is allowing one year from the completion of the vertical expansion for the owner or operator to comply with the requirements of §§ 257.73 or 257.74, as applicable.

F. Operating Criteria—Air Criteria

EPA proposed to require CCR landfills, CCR surface impoundments and any lateral expansion to control the creation of fugitive dust. Specifically, EPA proposed that facilities must ensure that fugitive dust either not exceed the standard of 35 μg/m^3, established as the level of the 24-hour National Ambient Air Quality Standards (NAAQS) for fine particulate matter (PM–2.5), or any alternative standard established pursuant to applicable requirements developed under a State Implementation Plan (SIP) approved or promulgated by the Administrator pursuant to section 110 of the CAA (see 75 FR 55175). Consistent with the numerical standard, EPA proposed to require that CCR units be managed to control the wind dispersal of dust, and that CCR landfills also be required to emplace wet conditioned CCR (*i.e.,* wetting CCR with water to a moisture-content that prevents wind dispersal and facilitates compaction, but does not result in free liquids) into the unit. EPA also required that documentation of the measures taken to comply with the requirements be certified by an independent registered professional engineer. EPA proposed these requirements based on the results of a screening level analysis of the risks posed by fugitive dust from CCR landfills, which showed that without fugitive dust controls, levels at nearby locations could exceed 35 μg/m^3, established as the level of the 24-hour PM 2.5 NAAQS for fine particulate. These measures were also intended to reduce the excessive cancer risks associated with the inhalation of hexavalent chromium. This potential risk would apply to over six million people who live within the census population data ''zip code tabulation areas'' for the 495 rule-affected electric utility plant locations. (See 75 FR 35215.) [100]

As part of the proposal, EPA solicited comments on the following fugitive dust issues: (1) The location of air monitoring stations near CCR landfills or CCR surface impoundments; and (2) information on any techniques, such as wetting, compaction, or daily cover that are or can be employed to reduce exposures to fugitive dust. The Agency received no information from commenters on either of these issues.

The majority of comments received, however, took issue with the proposed technical standard of 35 ug/m^3. Commenters argued that, as proposed, the standard would be impossible to implement because the Agency provided no information on particle size, form of the standards, whether an averaging period is available, point of compliance or how one considers upwind sources. More generally, however, commenters argued that the proposed provisions were unnecessary because fugitive dust issues were adequately addressed by existing air rules through the development and implementation of NAAQS, such as PM_{10} and $PM_{2.5}$. These same commenters acknowledged, however, that if the Agency established a criterion to control fugitive dusts, a more appropriate and reasonable standard could be based on best management practices or BMPs. To that end, commenters offered information suggesting that CCR landfills typically used compaction, regular wetting and temporary covers in conjunction with visual air monitoring to effectively control fugitive dust at their facilities, and that these practices were included in facility operating plans.

As discussed in the proposed rule, EPA's decision to address fugitive dust was based on a peer review of the 2010 draft Risk Assessment, 2007 NODA stakeholder comments, photographic documentation of fugitive dust associated with the management of CCR, Agency actions to control fugitive emissions during the clean-up of the December 2008 TVA Kingston spill, and OSHA's Material Safety Data Sheets (now *Safety Data Sheets* (*SDS*)) requirements for coal ash. These lines of evidence have been bolstered since the proposal, by evidence collected during the eight 2010 CCR public hearings, where stakeholders provided extensive feedback about fugitive dust impacts associated with CCR management at facilities adjacent to their residences, and by documented reports on fugitive dust issues provided by citizen groups.[101] The stakeholders called for federal oversight to address those instances where complaints were seemingly ignored by state regulators and/or where state administrative enforcement measures failed to compel the utilities to effectively amend their dust emission control management practices. The Agency followed up on the complaints with state agencies and compiled a preliminary database on documented and alleged fugitive dust damage cases.[102]

In support of this rule, EPA compiled records of over 20 documented fugitive dust cases, in addition to several alleged cases that could not be verified. The documented cases indicate that fugitive dust concerns arise in all phases of the CCR life cycle—from conveyor belt transfer at the coal-fired power plant, through stockpiling and transport for disposal/beneficial use, and up to final disposition. Fugitive dust also is a potential concern associated with both—landfills and surface impoundments. Whereas a nexus between fugitive dust impacts and CCR landfill operations was to be expected, EPA discovered that fugitive dust was also of concern at CCR surface impoundments, either under conditions of windy winter spells affecting CCR exposed above or next to the CCR surface impoundment boundary, or due to the total CCR surface impoundment evaporation in arid areas.

Very few studies have been undertaken to test the health impacts caused by fugitive dust emissions, and of those few, due to inherent limitations, all failed to prove that fugitive dust was the cause of the documented health concerns. For example, in the wake of the January

[100] As evidenced in 42 U.S.C. 6971(f), Congress intended that the Occupational Safety and Health Administration (OSHA) be able to enforce its regulations to protect workers exposed to hazardous waste and that EPA and OSHA would work together to ensure that. EPA is clarifying that it intends that the CCR disposal rule not preempt applicable OSHA standards designed to protect workers exposed to CCRs; thus EPA's final rule on CCR disposal will apply in addition to any applicable OSHA standards. The Agency has added specific regulatory language in this section to address this intent.

[101] For instance, photographic evidence provided by Susan Holmes, the Bokoshe Environmental Cause Group (B.E. Cause), Bokoshe, Oklahoma. See Earthjustice's brief background coverage at: *http://earthjustice.org/blog/2011-april/not-having-fun-in-bokoshe-ok*, and ABC News' *Oklahoma Town Fears Cancer, Asthma May Be Linked to Dump Site,* March 29, 2011: *http://abcnews.go.com/US/oklahoma-town-fears-cancer-asthma-linked-dump-site/story?id=13240312*.

[102] A compilation of damage cases can be found in the docket supporting this rule.

2005 coal ash pile collapse at the Rostosky Ridge Road, in Allegheny County, Pennsylvania, both the federal and county studies[103] failed to test during this period and missed the narrow exposure window that would have possibly demonstrated a link between the event and the short-term health symptoms (*e.g.,* sore throat, cough, fever, nausea, fatigue, diarrhea, and headaches) contracted by residents who ultimately removed approximately 1,500 tons of fly ash from their properties immediately after the incident without the benefit of any protective respiratory gear. The federal and county studies also found no evidence of long-term arsenic poisoning of the tested individuals. For recurring instances of CCR dispersion in the air at the Indian River Power Plant, Millsboro, Delaware, three consecutive state studies tentatively established other risk factors as the probable cause for a lung cancer cluster in a down-wind location of the presumable source term (CCR fugitive dust blowing of a landfill and stack emissions).[104] Critics claim that these studies used too small of a sample, and were not designed to capture the impact of long-term exposure to pollution.[105]

Nevertheless, in eleven other cases, states adopted measures to address concerns from fugitive dust emissions; these included conducting lung-cancer cluster and other health studies, conducting particle dispersion studies, issuing Notices of Violation and Consent Orders to the responsible facilities, waiving landfill cover exemptions, and requiring dust management plans for newly permitted CCR landfills. In addition, in several instances, citizens filed lawsuits or reached an out-of-court settlement with the primary responsible party; and in one case, OSHA imposed a steep fine on the owners of a facility manufacturing abrasive blasting and roofing materials from slag produced at a nearby coal-fired power plant, for willfully exposing their workers to dangerously high levels of hazardous dust, and for failing to provide adequate breathing protection and training for workers at the facility. According to stakeholder allegations, fugitive dusts generated by these same materials also adversely impacted residents in the facility's immediate vicinity.

As previously stated, many commenters argued that the proposed numeric particulates standard was incompatible with the air quality requirements established under the States' Implementation Plans (SIPs) or with provisions set up by the states in their Title V Clean Air Permits to the power producers. In addition, the commenters argued that the proposed standard lacked technical details to facilitate effective implementation, and that implementation of the standard required specialized equipment and advanced training to carry out a judicious reading and interpretation of opacity, a proxy measure for the level of fugitive dust emissions. In light of these comments, EPA re-evaluated the existing CAA standards applicable to these units; 40 CFR 70.2 identifies fossil-fuel-fired steam electric plants of more than 250 million BTU/hour heat input as potential sources of fugitive dust (PM sources) that must be covered by state permitting, and 40 CFR 70.3 stipulates that fugitive emissions from a part 70 source shall be included in the permit application and the part 70 permit in the same manner as stack emissions, regardless of whether the source category is included in the list of sources contained in the definition of major source. Based on these applicable CAA requirements, the Agency agrees that the adoption of a PM standard under the final rule would entail a potential for duplication or inconsistency with applicable state-established standards in SIP permits.

EPA also acknowledges the challenges involved in measuring the proposed compliance standard. Because fugitive dust is emitted from non-point sources, it cannot be easily measured by conventional methods. Usually, regulations developed by the states to control fugitive dust stipulate that no person or source shall cause or allow, from any activity, any emissions of fugitive particulate matter that are visible to an observer who looks horizontally along the source's property line. A quantitative measurement of fugitive dust levels (EPA's Reference Method 9) would require measuring opacity, which, as the commenters noted, necessitates specialized technical training, trainee certification, and judicious application of instrumentation.

Therefore, rather than requiring a potentially redundant and challenging-to-implement quantitative standard, EPA is substituting a performance standard for fugitive dust control. This standard requires owners or operators of a CCR unit to adopt measures that will effectively minimize CCR from becoming airborne at the facility, including CCR fugitive dust originating from CCR units, CCR piles, roads, and other CCR management activities. The Agency considers this standard to be consistent with the intent of the proposed rule, with the added advantage of allowing facilities the flexibility to determine the appropriate measures to achieve regulatory compliance at their individual site. This standard and the accompanying regulatory requirements supporting its implementation, will achieve the statutory obligation of "*no reasonable probability of adverse effects on human health and the environment.*"

As in the proposal, the Agency is also requiring documentation of the measures taken to comply with the technical standard in a "CCR fugitive dust control plan" (herein referred to as "plan"). Consistent with the proposal, the plan must be certified by a qualified professional engineer and placed in the operating record and on the owner or operators publicly accessible internet site. The plan requires owners or operators to elaborate on the types of activities applicable and appropriate for the conditions at the facility that will be employed to minimize CCR from becoming airborne at the facility. Examples of control measures that may be appropriate include: Locating CCR inside an enclosure or partial enclosure; operating a water spray or fogging system; reducing fall distances at material drop points; using wind barriers, compaction, or vegetative covers; establishing and enforcing reduced vehicle speed limits; paving and sweeping roads; covering trucks transporting CCR; reducing or halting operations during high wind events; or applying a daily cover.

The initial plan must be completed by the effective date of the rule (*i.e.,* within six months of publication). Because this is an initial plan, and because it must be completed within a short timeframe, EPA acknowledges that the facility may only be able to present its initial judgment of the measures that it anticipates are likely to be effective based on the information that is readily available within this six month

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[103] (i) *Coal Fly Ash Landslide, Forward Township, Allegheny County, Pennsylvania,* ASTDR Health Consultation June 1, 2006: *http://www.atsdr.cdc.gov/HAC/pha/CoalFlyAsh Landslide/CoalFlyAshLandslideHC060106.pdf* (ii) *Results of the Health Investigation Following Fly Ash Contamination in Forward Township, Allegheny County, Pennsylvania,* Allegheny County Health Department, July 2005: *http://www.achd.net/air/pubs/pdf/Forward%20Fly%20Ash%20Study%202005.pdf.*

[104] *Millsboro Inhalation Exposure and Biomonitoring Study.* State of Delaware Department of Natural Resources and Environmental Control, Department of Health and Social Services, Dover (RTI Project 0213061), DE, May 2013: *http://www.dnrec.delaware.gov/Admin/Documents/Millsboro_Inhalation_Exposure_and_Biomonitoring_Study_Final_Repor_05282013.pdf.*

[105] *Critic chides cancer study: Indian River plant results called lame.* Delawareonline, May 28, 2013: *http://www.delawareonline.com/article/20130528/NEWS/305280081/.*

timeframe. EPA anticipates that owners or operators may need to revise the plan as they gain additional information and experience implementing the regulations. In recognition of this, the final rule also requires that the CCR fugitive dust control plan include a description of the procedures the owner or operator will follow to periodically assess the effectiveness of the control plan. Consistent with other plans required in this rule, the owner or operator may amend the written CCR fugitive dust control plan at any time. However, the owner or operator must amend the written plan whenever there is a change in conditions that would substantially affect the written plan in effect, such as the construction and operation of a new CCR unit. The plan and any subsequent amendments must be certified by a qualified professional engineer.

In addition, the Agency is promulgating with a slight modification the requirement for owners and operators of all CCR landfills and any lateral expansion to emplace CCR as conditioned CCR, as well as the definition of conditioned CCR. *Conditioned CCR* has been defined to mean CCR wetted with water to a moisture content that will prevent wind dispersal, but will not result in free liquids, consistent with the definition in the proposed rule. In response to several commenters' requests, and upon further evaluation the Agency is allowing that in lieu of water, CCR conditioning may be accomplished with an appropriate chemical dust suppression agent.[106] As with other requirements of this rule, in order to ensure that the provisions of the fugitive dust criteria are maintained throughout the operating life of the CCR unit, the Agency is requiring that the owner or operator prepare an annual CCR fugitive dust control report, describing the actions taken to control CCR fugitive dust, a record of all citizen complaints, and a summary of any corrective measures taken. The first annual report must be completed no later than 14 months after placing the initial CCR fugitive dust control plan in the facility's operating record. The owner or operator has completed the annual CCR fugitive dust control report when the plan has been placed in the facility's operating record.

The general public, as well as the Agency, is highly concerned with potential risks associated with CCR fugitive dusts. This was readily apparent during the public hearings and from the many comments received on this issue. The Agency continues to receive information regarding this human health and environmental concern. While the subtitle D provisions of this rule lack permitting oversight mechanisms to control fugitive dust from CCR units, it is clear to the Agency that additional substantive actions was needed to facilitate citizen suit enforcement of this criteria. Consequently, the Agency are adding a specific requirement to the CCR fugitive dust control plan to require owners and operators of all CCR units to develop and implement formal procedures to log citizen complaints involving CCR fugitive dust events. These complaints must, then, be included as part of the annual CCR fugitive dust control report. This report must be placed in the operating record and on the owner or operator's publicly accessible internet site. Promulgation of these measures will subject the owner or operator of the CCR disposal facility to public and state scrutiny, and create an incentive for the owner or operator of the CCR disposal facility to improve compliance with the fugitive dust control requirements.

G. Operating Criteria—Run-On and Run-Off Controls for CCR Landfills

EPA's proposal required owners or operators of CCR landfills and all lateral expansions to design, construct and maintain a run-on control system to prevent flow onto the active portion of these units during the peak discharge from a 24-hour, 25-year storm. As described in the proposed rule, run-on controls are designed to prevent erosion, which may damage the physical structure of the landfill, prevent the surface discharge of CCR in solution or suspension; and to minimize the downward percolation of run-on through wastes, creating leachate. Similarly, EPA proposed run-off controls in order to collect and control, at a minimum, the water volume resulting from a 24-hour, 25-year storm. This standard was proposed in order to protect surface waters from contamination. Under the existing 40 CFR part 257 requirements, to which CCR units are currently subject, run-off must not cause a discharge of pollutants into waters of the United States that is in violation of the National Pollutant Discharge Elimination System (NPDES) under section 402 of the Clean Water Act. EPA did not propose to revise the existing requirement, but merely incorporated it for ease of the regulated community.

The Agency proposed the 24-hour period because it was a timeframe that included storms of high intensity with short duration and storms of low intensity with long duration. EPA believed that this was a widely used standard that had been incorporated into the hazardous waste landfills and MSW landfills regulatory requirements. At the time, EPA had no information that warranted a more restrictive standard for CCR landfills. EPA received no significant comment on the proposed requirements, and for the most part, is adopting the proposed requirements without revision. However, in an effort to clarify and provide more direction to the owner or operator and the certifying qualified professional engineer, the Agency has added additional regulatory language that more specifically describes the technical criteria established under this section of the rule.

The run-on and run-off controls of the final rule require that the owner or operator prepare the initial run-on and run-off control system plan within 18 months of publication of the rule. Run-on and run-off control system plan reporting may require design, construction, and post-construction implementation. In instances where run-on and run-off capacity is insufficient, installing additional capacity may involve construction of diversion structures such as swales or ditches. Many of these efforts may require several months of design and construction, compounded by the fact that much of the work cannot be completed in cold-weather or heavy-rain seasons.

1. Run-On and Run-Off Controls for CCR Landfills and All Lateral Expansions[107]

All CCR landfills and all lateral expansions must be designed, constructed, operated, and maintained with a run-on control system to prevent flow onto the active portion of the CCR unit from the peak discharge from a 24-hour, 25-year storm and a run-off control system to collect and control at

[106] Spray-on adhesives, surfactants, aqueous foamers, humectants (calcium, magnesium, ad sodium chloride and their mixtures), and polymer solutions and emulsions. See, for instance "The Role of Chemicals in Controlling Coal Dust Emissions" Benetech, Inc. available at *http://pdf.ebooks6.com/download.php?id=139860* or Peterson, Edwin. "An Aid to Fugitive Materials Control in Coal Ash Applications" presented at the World of Coal Ash (WOCA) conference—May 9–12, 2011 in Denver, Colorado.

[107] In the proposed rule under the RCRA subtitle D option, EPA jointly proposed run-on and run-off requirements for CCR landfills and CCR surface impoundments under proposed § 257.81. In this final rule, EPA has modified the "run-on and run-off" requirements and is providing separate requirements for CCR landfills and CCR surface impoundments. CCR surface impoundments are now subject to the hydrologic and hydraulic capacity requirements at § 257.82. This new section of the rule more appropriately addresses flow management issues at CCR surface impoundments.

least the volume of water resulting from a 24-hour, 25-year storm from the active portion of the CCR unit.[108]

Consistent with the proposal, the rule requires the owner or operator of a CCR landfill or lateral expansion to prepare an initial run-on and run-off control system plan for the CCR unit. For existing CCR landfills, the plan must be prepared by the owner or operator no later than one year from the effective date of the rule. For new CCR landfills and any lateral expansion of a CCR landfill, the plan must be prepared no later than the date of initial placement of CCR in the landfill or lateral expansion. The plan must document how the run-on and run-off control systems have been designed and constructed to meet the requirements of rule and must be supported by appropriate engineering calculations. The run-on and run-off control system plan must be certified by a qualified professional engineer and is considered prepared when the owner or operator has placed the plan in the facility's operating record.

The rule also provides for the owner or operator to amend the plan at any time (*e.g.,* prior to receipt of CCR in the CCR unit, during the operating life of the CCR unit, during closure of the CCR unit, or following closure of the CCR unit) provided the revised plan is placed in the facility's operating record. The owner or operator must, however revise the plan whenever there is a change in the conditions that would substantially affect the written plan in effect (*e.g.,* closure of an existing portion or cell of the CCR landfill, resulting in a possible change in the size of the ''active portion'' of the CCR landfill).

In addition, consistent with other provisions in this rule, the Agency is requiring that the run-on and run-off control system plan be reviewed, and where necessary, revised or updated at least every five years. The Agency is specifying this periodic review in order to address factors having the potential to influence the run-on and run-off control system. Among other things, CCR landfills can be subject to build-out, operational changes, and surface cover changes, all of which have the potential to significantly alter run-on and run-off flows to and from the active portion of the CCR landfill. Changes in storm intensity and duration, as well as upstream catchment area characteristics, can alter flows that may significantly affect a previously adequate run-on and run-off control system. A mandated five year review of a control system plan is consistent with accepted good engineering practices and protocols for proper maintenance of operational systems supporting the overall performance of a CCR landfill. It is also consistent with the proposed requirement that an owner or operator ''maintain'' the run-on and run-off control system. EPA interprets this to require the owner or operator to ensure that the run-on and run-off control system is kept in a condition that meets the requirements of the rule, *i.e.,* that the run-on and run-off control system both prevents flow onto the active portion of the unit during the peak discharge from a 24-hour, 25-year storm and collects and controls at least the water volume resulting from a 24-hour, 25-year storm event for the duration of the CCR landfill's operational life. A requirement to conduct a review of the control plan at least once every five years merely provides an explicit mechanism to ensure this occurs in a manner that facilitates citizen and state oversight.

The date of preparing the initial plan is the basis for establishing the deadline to complete the first subsequent plan; *i.e.,* the subsequent plan must be completed within five years of the prior plan. The owner or operator may complete any required plan prior to the required deadline and must place the completed plan into the facility's operating record within the five year timeframe. A qualified professional engineer must certify that the run-on and run-off control system plan, including any subsequent amendments, meets the run-on and run-off control system requirements of this final rule.

a. Run-On Control

Consistent with the proposal, EPA is defining *run-on* to mean any liquid that drains over land onto any part of a CCR landfill or any lateral expansion of a CCR landfill. In surface water hydrology, run-on is a quantity of surface run-off, or excess rain, snowmelt, or other sources of water, which flows from an upstream catchment area onto a specific downstream location. This rule requires that the CCR landfill be designed, constructed, operated, and maintained to prevent flow onto the active portion of the CCR landfill during the peak discharge from a 24-hour, 25-year storm. EPA has adopted this requirement to minimize the amount of surface water entering the CCR landfill and to minimize disruption of the CCR landfills operation due to storm water inflow. Uncontrolled or undesirable storm water run-on may have significant impacts on the stability of the slopes of a CCR landfill and continued safe operation of the CCR landfill, due to such phenomena as erosion and infiltration.

b. Run-Off Control

EPA has adopted the definition of run-off from the proposal without revision. *Run-off* means any liquid that drains over land from any part of the CCR landfill. Effectively, run-off is the portion of rainwater, snowmelt, or other liquid which does not undergo abstraction, such as infiltration, and travels overland. Typically, run-off is the product of the inability of water to infiltrate into soil due to saturation or infiltration rate capacity being exceeded. The rule requires that the CCR landfill be designed, constructed, operated, and maintained to collect and control at least the water volume resulting from a 24-hour, 25-year storm. The owner or operator must design, construct, operate, and maintain the CCR landfill in such a way that any run-off generated from at least a 24-hour, 25-year storm must be collected through hydraulic structures, such as drainage ditches, toe drains, swales, or other means, and controlled so as to not adversely affect the condition of the CCR landfill. EPA has promulgated these requirements to minimize the detention time of run-off on the CCR landfill and minimize infiltration into the CCR landfill, to dissipate storm water run-off velocity, and to minimize erosion of CCR landfill slopes. An additional concern with run-off from CCR landfills is the water quality of the run-off, which may collect suspended solids from the landfill slopes. EPA acknowledges that the run-off requirements will also minimize the amount of run-off related pollution generated by the landfill run-off.

c. Run-On and Run-Off Control System Plan

The owner or operator of any CCR landfill must prepare an initial run-on and run-off control system plan documenting, with supporting engineering calculations, how the control systems have been designed and constructed to meet the requirements of the rule. This has been adopted without revision from the proposal. In most cases, EPA expects this documentation will include in addition to the supporting engineering calculations, references and drawings regarding the

[108] Under existing part 257 requirements, to which CCR units are currently subject, runoff must not cause a discharge of pollutants into waters of the United States that is in violation of the National Pollutant Discharge Elimination System (NPDES) under section 402 of the Clean Water Act (40 CFR 257.3–3). EPA did not propose to revise this requirement but is merely incorporating it here for ease of the regulated community.

identification of the 24-hour, 25-year storm for the location of the CCR landfill, a characterization of the rainfall abstractions, including but not limited to depression storage and infiltration, the selection and basis of an appropriate run-off model, the selection and basis of an appropriate run-on or run-off routing model, and the selection and design of an appropriate run-on and run-off management system (*e.g.,* swales, ditches, retention or detention ponds). Consideration of the above factors would generally constitute a comprehensive review of the hydraulic and hydrologic processes associated with the design of a run-on and run-off control system plan. EPA recognizes that over time, any number of factors, *e.g.,* expansion of the facility, could affect a change in the run-on and run-off control system plan. Consequently in the final rule EPA is providing for flexibility in this area by stating that the plan can be amended by the owner or operator at any time during the life of the CCR landfill, provided the amendments are placed in the operating record and on the facility's publicly accessible Internet site.

H. Operating Criteria—Hydrologic and Hydraulic Capacity Requirements for CCR Surface Impoundments

As discussed in the previous section, EPA proposed to require owners or operators of CCR landfills to design, construct, operate, and maintain: (1) A run-on control system to prevent flow onto the active portion of the unit during the peak discharge from a 24-hour, 25-year storm; and (2) a run-off control system to collect and control, at a minimum, the water volume resulting from the same 24-hour, 25-year storm. EPA also proposed to apply these same run-on and run-off requirements to all CCR surface impoundments and lateral expansions.

Commenters overwhelmingly disagreed with EPA's decision to apply the same run-on and run-off requirements to both CCR landfills and CCR surface impoundments, arguing that a ''control system to prevent flow onto the active portion of the surface impoundment'' was at odds with a commonly employed practice of using CCR surface impoundments to manage incoming storm water and other inflow. While some commenters reasoned that preventing run-on may be appropriate for CCR landfills and CCR surface impoundments surrounded by above-ground dikes, the proposed requirement was entirely inappropriate for units specifically designed to retain storm water from an adjoining watershed or to operate as part of a facility's overall storm water management system. Numerous commenters suggested that instead of the run-on prevention provision for CCR surface impoundments, EPA adopt a requirement specifying that CCR surface impoundments be designed to accommodate ''peak discharge events.'' Other commenters argued that storm water run-on controls were only appropriate during and after the closure of CCR surface impoundments; while still other commenters suggested that EPA remove entirely the run-on and run-off requirements because CCR surface impoundments were typically designed to impound and discharge storm water flow far in excess of a 25-year/24-hour storm event.

In evaluating the arguments against the requirements to prevent flow onto the CCR surface impoundment, the Agency was strongly influenced by guidance developed by FEMA for selecting and accommodating hydraulic and hydrologic inflow and outflow as well as the application of this guidance to the CCR surface impoundments evaluated as part of EPA's Assessment Program.[109] A review of FEMA guidance confirmed commenters' contentions that managing flow both to and from dams and impoundments was a widely used practice, and a preferable management strategy for accommodating storm water flows. This was further confirmed by observations made during EPA's Assessment Program; EPA frequently observed units designed to detain or retain storm water inflows of an upstream catchment area to manage CCR, and/or to receive storm water inflow as part of the facility's overall storm water management system. Moreover, EPA relied on the same FEMA guidance to assess the adequacy of the hydrologic and hydraulic capacity of the CCR surface impoundments. In conducting these assessments, EPA considered a number of factors including operating freeboard, catchment area, hydrologic structures' inflow and outflow ratings, design precipitation event, spillway presence and capacity, and unit operating procedures to make this determination. The adequacy of the capacity was determined using FEMA guidance for selecting and accommodating inflow design floods (IDF) for dams. (Note: The use of the terminology related to ''inflow design flood'' for CCR surface impoundments rather than ''run-on'' and ''run-off'' is more directly applicable to the hydraulic and hydrologic capacity of CCR surface impoundments to adequately manage both the inflow and outflow from a design flood.)

During its assessment effort, EPA also found that, contrary to commenter's arguments CCR surface impoundments were often not designed to address floods in excess of a 24-hour, 25-year storm event. Rather many CCR surface impoundments were deficient in their hydrologic and hydraulic capacity requirements due to factors such as lack of operating freeboard, misunderstanding of the actual contributory area, lack of documentation, undersized decant structures, undersized spillways, and lack of spillways.

EPA also disagrees with the comment asserting that storm water controls are only appropriate during and after closure of CCR surface impoundments. Hydrologic and hydraulic capacity, as determined by an effective design flood control system, is an essential element of the overall structural integrity and safety of a CCR surface impoundment. CCR surface impoundments are subject to any number of stresses throughout their operational life; one of the most common causes of a dike or embankment failure being the inability of the CCR unit to adequately pass or manage flood flows resultant from direct or indirect precipitation. These failures can occur at any point in the CCR unit's life, not solely during and after closure, and are usually due to inadequate hydrologic and hydraulic capacity, leading to internal erosion due to seepage and piping, erosion of spillways, overtopping erosion, and overstressing of the embankment. Furthermore, according to the U.S. Bureau of Reclamation, a common dam failure mode is due to overtopping, accounting for 30% of the failures in the U.S. over the last 75 years.[110] Overtopping is the direct result of lack of adequate hydrologic and hydraulic capacity of a dam or surface impoundment. Therefore, EPA is not modifying the regulation as suggested by the commenter.

In light of comments received, observations made during EPA's Assessment Program, and guidance developed by FEMA, EPA has concluded that it was inappropriate to propose to prohibit all run-on discharge or inflow from storm water to CCR surface impoundments. EPA has also

[109] EPA referred to FEMA's ''Federal Guidelines for Dam Safety: Selecting and Accommodating Inflow Design Floods for Dams'' in evaluating the adequacy of the CCR surface impoundment's hydrologic and hydraulic capacity during its assessment effort.

[110] *http://www.usbr.gov/ssle/damsafety/Risk/BestPractices/16-FloodOvertoppingPP20121126.pdf.*

concluded that run-on and run-off criteria are inappropriate for CCR surface impoundments, and that a more appropriate standard involves determining the hydrologic and hydraulic capacity of a unit, measured by its inflow design flood or IDF. Therefore, EPA is amending the proposed run-on and run-off requirements for CCR surface impoundments to require owners or operators of all CCR surface impoundments to design, construct, operate, and maintain hydraulic and hydrologic capacity to adequately manage flow both into and from a CCR surface impoundment during and after the peak discharge resulting from the inflow design flood, based on the Hazard Potential Classification of the CCR surface impoundment.

The final rule requires the preparation of the initial inflow design flood control system plan within 18 months of publication of the final rule. In many cases, inflow design flood control system plan reporting may require design, construction, and post-construction implementation in order to provide sufficient hydrologic and hydraulic (H/H) capacity for the CCR unit. In instances where H/H capacity is insufficient, installing additional capacity may involve spillway construction or decant structure construction or installation. Many of these efforts may require several months of design and construction, compounded by the fact that much of the work cannot be completed in cold-weather or heavy-rain seasons.

1. Inflow Design Flood Controls for CCR Surface Impoundments and All Expansions

The Agency has concluded that the proposed requirement preventing run-on to a CCR surface impoundment was both impractical and unwarranted and could possibly disrupt effective storm water management systems operating at CCR facilities. Therefore, consistent with FEMA guidance, the Agency is modifying this requirement to require an owner or operator of an existing or new CCR surface impoundment or any lateral expansion to design, construct, operate, and maintain H/H capacity of CCR surface impoundments to: (1) Adequately manage flow into the CCR surface impoundment during and following the peak discharge of the inflow design flood; and (2) adequately manage flow from the CCR unit to collect and control the peak discharge resulting from the inflow design flood. The inflow design flood is based on the hazard potential classification of the unit as required by § 257.73 and § 257.74 of this rule.[111] The inflow design floods for specific hazard potential classifications are as follows: (1) The probable maximum flood (PMF) for high hazard potential CCR surface impoundments; (2) the 1000-year flood for significant hazard potential CCR surface impoundments; (3) the 100-year flood for low hazard potential CCR surface impoundments; and (4) the 25-year flood for incised CCR surface impoundments.[112]

EPA has based this revised requirement on the FEMA's guidance entitled, ''Selecting and Accommodating Inflow Design Floods for Dams,'' which represents current and accepted practices in dam engineering and provides a consistent and uniform standard that has been adopted throughout dam engineering.

Incised CCR surface impoundments, as defined in this rule, are also required to meet inflow design flood requirements.[113] While incised units do not pose the same potential for release as a diked unit, *i.e.,* breach of dike and release of CCR, overtopping of an incised unit does represent a potential environmental hazard warranting control. EPA acknowledges, however, that overtopping of an incised unit would result in a release of CCR material through a surcharge flow, *i.e.,* flow of a temporary stage overtopping the ''crest'' of the incised CCR surface impoundment, and would not precipitate the degradation of a dike and potential subsequent breach of a dike and massive release of contents of the CCR surface impoundment. To reflect the lower risks associated with such releases, and because incised CCR surface impoundments are not required to determine their hazard potential classification, the Agency is requiring that incised CCR surface impoundments only must accommodate a 25-year flood for the hydrologic and hydraulic capacity requirements of the rule. EPA chose the 25-year flood for incised CCR surface impoundments to maintain consistency with the proposed rule, which required that all units accommodate a 25-year storm event. As part of these requirements, EPA is also finalizing a definition of *inflow design flood* and *flood hydrograph. Inflow design flood* has been defined to mean the flood hydrograph that is used to design or modify the CCR surface impoundment and its appurtenant works, and *flood hydrograph* has been defined to mean the temporal distribution of inflow into a CCR surface impoundment.

2. Inflow Design Flood Control Systems

Controlling the inflow and outflow of the CCR surface impoundment reduces the risks of hydrologic failure, which include overtopping erosion, internal excessive seepage and piping, erosion of spillways, and overstressing of the structural components of the CCR surface impoundment. The CCR surface impoundment's H/H capacity is to be designed based on the unit's hazard potential classification as determined by a qualified professional engineer. To meet the performance standard in the rule, the CCR surface impoundment must be designed to have adequate H/H capacity to ensure that rainfall and watershed characteristics have been accounted for, the hydraulic ratings of all intake structures are adequate and free of obstruction, operating freeboard is adequate, all spillways and decant structures have adequate capacity, and all downstream hydraulic structures have adequate capacity. While not required, an antecedent flood study may be necessary to characterize the condition of the CCR surface impoundment under normal operating conditions.

EPA recognizes that in many impoundment configurations, an inflow design flood may be limited to the direct precipitation that falls within the perimeter of the CCR surface impoundment during a storm event, due to the lack of storm water inflow routing from adjacent catchment areas. Other CCR surface impoundments may have storm water or other hydrologic contributions from various catchment areas or other sources. The final rule's hydraulic and hydrologic capacity standards require all CCR surface impoundments to have adequate hydraulic and hydrologic capacity to accommodate all contributory inflow to CCR surface impoundments, regardless of the inflow's origin.

The hydraulic and hydrologic capacity requirements will minimize the potential for overtopping to occur from normal or abnormal operations, overfilling, wind and wave action, rainfall, and run-on, and will ensure that the unit is operated with appropriate consideration of these potentially adverse conditions. The Agency notes, however, that the operating freeboard of a CCR surface

[111] *Federal Guidelines for Dam Safety: Selecting and Accommodating Inflow Design Floods for Dams.* August 1, 2013. FEMA P–94.

[112] All discharge from the CCR surface impoundment must be handled in accordance with the surface water requirements under § 257.3–3.

[113] *Incised CCR surface impoundment* means a CCR surface impoundment which is constructed by excavating entirely below the natural ground surface, holds an accumulation of CCR entirely below the adjacent natural ground surface, and does not consist of any constructed diked portion.

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impoundment is subject to fluctuations, deviating from original design assumptions and specifications. Additionally, EPA notes that routine maintenance and alterations of hydraulic structures associated with the CCR surface impoundments, *e.g.,* decant structures and spillways, can adversely impact the hydrologic and hydraulic capacity of the CCR surface impoundment. At no point should the inflow design flood exceed the capacity of the CCR surface impoundment, regardless of fluctuations in freeboard, maintenance of hydraulic structures, or other potential obstructions to the hydraulic and hydrologic capacity of the unit. The owner or operator must account for operational changes or diminished capacity in the calculation of hydraulic and hydrologic capacity of the CCR unit.

3. Inflow Design Flood Control System Plan

The owner or operator of an existing CCR surface impoundment must prepare an initial inflow design flood control system plan to document that the design and construction of the system will achieve the rule's performance standards no later than 18 months after the publication of this rule in the **Federal Register**. New CCR surface impoundments or lateral expansions of CCR surface impoundments must prepare an initial inflow design flood control system plan no later than the date of initial receipt of CCR in the unit. The owner or operator must obtain a certification from a qualified professional engineer that the plan meets all applicable requirements of the rule for inflow design flood control system plans. The plan must also be supported by appropriate engineering calculations. This documentation should also include references, and drawings regarding the identification of the design storm for the catchment area affecting the CCR surface impoundment and the CCR surface impoundment itself, a characterization of the rainfall abstractions, including but not limited to depression storage and infiltration in the upstream catchment area affecting the CCR surface impoundment. In addition, EPA expects supporting documentation to address the selection and basis of an appropriate run-off model and an appropriate run-on or run-off routing model; the identification and characterization of any intake or decant structures of the CCR surface impoundment; an appropriate characterization of the spillway(s) of the CCR surface impoundment and their capacity; and characterization of downstream hydraulic structures which ultimately receive the discharge from the CCR surface impoundment. Finally, the owner or operator must comply with the recordkeeping, notification and internet requirements specified in the rule for the plan.

The owner or operator may amend the written inflow design flood control system plan at any time prior to receipt of CCR in the CCR unit, during the operating life of the CCR unit, during closure of the CCR unit, or following closure of the CCR unit provided the revised plan is placed in the facility's operating record. The owner or operator must amend the written inflow design flood control system plan whenever there is a change in the conditions that would substantially affect the written plan in effect. The owner or operator of the CCR surface impoundment must also periodically update the inflow design flood control system plan. The owner or operator must review or update an existing plan at a frequency no less than every five years. Changes in storm characteristics (*e.g.,* intensity and duration) and upstream catchment area characteristics, hazard potential classifications, as well as build-out, operational changes, and diminishing available capacity, all have the potential to influence inflow design flood volumes and therefore the effectiveness of the existing inflow design flood control systems. A periodic review of the plan to address these and other factors is necessary to ensure that the hydrologic and hydraulic capacity of the unit is maintained over time. An update of the inflow design flood control system plan should document any modifications pertinent to the inflow design flood control system.

The owner or operator may amend the written inflow design flood control system plan at any time and must place the revised plan in the facility's operating record. However, the owner or operator must amend the written inflow design flood control system plan whenever there is a change in the conditions that would substantially affect the written plan in effect. The owner or operator of the CCR unit must also review and, where necessary, update an inflow design flood control system plan every five years. As part of this review, the owner or operator must obtain certification from a qualified professional engineer must certify that the inflow design flood control system plan, and any subsequent amendments continues to meet the requirements of the rule. The date of completion of the initial plan is the basis for establishing the deadline to complete the first subsequent plan. The owner or operator may complete any required plan prior to the required deadline, and must place the completed plan into the facility's operating record within a reasonable amount of time.

I. Operating Criteria—Inspection Requirements for CCR Surface Impoundments

EPA proposed structural stability requirements for CCR surface impoundments based on the long-standing MSHA requirements, with only minor modifications. These structural stability requirements were covered in various sections of the proposed rule (see specifically proposed §§ 257.71, 257.72, 257.83, and 257.84). Section 257.83 addressed requirements for periodic inspections of CCR surface impoundments. In proposing these requirements, the Agency concluded that periodic inspections were critical to ensure that any problems relating to structural stability are quickly identified and remedied to prevent catastrophic releases, such as occurred at Martins Creek, Pennsylvania and TVA's Kingston, Tennessee facility. The proposed rule required owners or operators to conduct: (1) Weekly inspections to detect potentially hazardous conditions or structural weakness; and (2) annual inspections to assure that the design, operation, and maintenance of the surface impoundment was in accordance with generally accepted engineering standards. EPA proposed that weekly inspections be conducted by a person qualified to recognize specific signs of structural instability and other hazardous conditions by visual observation and, if applicable, to monitor instrumentation. The proposed rule also required annual inspection reports from an independent registered professional engineer, certifying that the design, operation, and maintenance of the CCR surface impoundment was in accordance with generally accepted engineering standards. Consistent with the annual inspection requirements, EPA, as part of its recordkeeping requirements also proposed that owners or operators of CCR surface impoundments annually document and report on, among other things: (1) Changes in the geometry of the impounding structure; (2) location and type of instrumentation monitoring the unit; (3) the minimum, maximum and present depth and elevation of the impounded water, sediment or slurry for the reporting period; and (4) storage capacity of the impounding structure (see 75 FR at 35246).

The annual inspection provisions also required that if a potentially hazardous condition developed, the owner or operator must immediately take several actions: Eliminate the potentially hazardous condition; notify potentially affected persons and state and local first responders; notify and prepare to evacuate, if necessary, all personnel from the property who may be affected by the potentially hazardous condition(s); and direct a qualified person to monitor all instruments and examine the structure at least once every eight hours, or more often as required by an authorized representative of the state. Finally, the proposed rule required that inspection and monitoring reports be maintained in the facility operating record and placed on the facility's publicly accessible Internet site as well as promptly reporting the results of the inspection or monitoring to the state.

EPA specifically requested comment on whether to cover all CCR impoundments for stability (including the inspection requirements), 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. The Agency further requested commenters who believed that other regulations or size cut-offs should be used (and not the size cut-offs established in the MSHA regulations) to provide the basis and technical support for their position. (75 FR 35176, 35223). In response to EPA's general solicitation for alternative size cut-offs, the Agency received little response. However, many commenters questioned EPA's decision to require inspections for all CCR surface impoundments, given that the other structural stability requirements were triggered only if the CCR unit exceeded the proposed size threshold (consistent with MSHA requirements). Commenters argued that there was no basis to require inspections of all CCR surface impoundments given that units below the specified size threshold had a much lower risk of catastrophic failure. A more limited requirement the commenter's argued, was supported by MSHA's decision to regulate only those ''larger'' sized units. Other commenters argued that inspection timeframes should take into account site specific conditions at the site and be based on the recommendations of an independent registered professional engineer. Commenters reasoned that while, in theory, a short inspection interval (*i.e.,* a weekly inspection) should increase the chances of finding an adverse condition, the judgment of a qualified professional engineer to establish the frequency and focus, as well as the purpose of the dam safety inspection was a far more effective method for detecting and preventing the development of a potentially adverse situation. Still other commenters questioned the overall value of a weekly inspection if, as proposed, no documentation of the results was required.

In reviewing the proposed regulatory language, it appears an error was made. Although the preamble generally stated that the proposed regulatory requirements addressing stability (which included inspections) applied only to those CCR surface impoundments exceeding the specified size threshold established by the MSHA regulations, the regulatory text required inspections for all CCR units. The final rule requires weekly general inspections and monthly instrumentation inspections to be conducted for all CCR surface impoundments. Periodic inspections of all CCR units are a necessary practice to ensure that the overall structural integrity of the CCR unit is maintained and that actual and potential structural weaknesses and other hazardous conditions are quickly identified and remediated throughout the active life of the unit. All CCR surface impoundments pose some risk of release—whether from a catastrophic failure or from a more limited structural failure, such as occurred at Duke Energy's Dan River plant. Periodic inspections are a generally accepted, prudent engineering practice that will significantly reduce the risks of such failures; during the Assessment Program, EPA discovered that many facilities routinely conduct some sort of periodic inspection and monitoring, although the frequency varied widely between facilities. The final rule merely codifies this practice, by establishing a consistent minimum timeframe. EPA is therefore requiring that all CCR surface impoundments be inspected by a qualified person both weekly (for visual signs of a potentially adverse condition) and monthly (for instrumentation monitoring). Consistent with the proposed rule, EPA is also requiring annual inspections for all CCR surface impoundments that exceed the specified size threshold of: (1) A height of five feet and a storage capacity of 20 acre-feet; or (2) a height of 20 feet, must also be inspected no less than annually by a qualified professional engineer. These inspection requirements are generally being promulgated as proposed, with minor technical clarifications.

The final inspection requirements have been drawn heavily from guidelines established by FEMA for dam safety, under which maintaining structural integrity involves continuous evaluation of the unit, based on periodic inspections. To be most effective, FEMA suggests, and EPA concurs, that inspections be varied with respect to both the time interval between inspections and the level of detail of the inspection. FEMA guidance, in part, suggests that inspections can be categorized as either: Visual observations to identify abnormal conditions (*i.e.,* informal inspections); field inspections by a professional engineer (*i.e.,* intermediate inspections); and a technical review to determine if the unit meets current and accepted design criteria and practices (*i.e.,* formal inspection).[114] In general, FEMA recommends that inspections focusing on visual observations should be conducted often (*e.g.,* weekly) while more substantive technical evaluation should be conducted every year to every five years depending on the engineering analyses required. (See also the preamble discussion on the requirements specified in §§ 257.73 and 257.74 of this rule, in particular the discussion addressing the five year time interval for structural stability and factor of safety reassessments.)

For the reasons discussed above, EPA has concluded, consistent with FEMA guidelines, that routine inspections of all CCR units are necessary to ensure that the units are safely operated and that issues that could disrupt the safety and continuing operation of these units are promptly identified and remediated. Accordingly, the final rule requires both weekly inspections and monthly instrumentation inspections to be conducted at all CCR surface impoundments to confirm that they are operating safely. These inspections must be conducted by a qualified person trained to recognize specific signs of structural instability and other hazardous conditions by visual observation and if, applicable monitor instrumentation. EPA is also retaining the annual inspection requirement for CCR surface impoundments exceeding the specified size threshold established in this rule. This inspection must be conducted and certified by a qualified professional engineer. Units exceeding this size threshold pose a higher degree of risk of release of CCR to the environment than other types of CCR surface impoundments (*e.g.,* incised or ''small'' CCR units) and as such warrant additional regulatory control and oversight.

[114] See ''*Federal Guidelines for Dam Safety*'' Federal Emergency Management Agency. (Reprinted April 2004).

The final rule requires that both weekly inspections of the CCR unit and monthly monitoring of CCR unit instrumentation be initiated within 6 months of the publication of the rule.

Within nine months of the publication of the rule, the owner or operator must complete the initial annual inspection of the CCR unit. Initial annual inspection requires the retaining of a professional engineer along with the familiarization of the engineer with the facility and CCR units. Additionally, the annual inspection should not be conducted unless weekly inspection and monthly instrumentation monitoring has been initiated and established in order to generate a body of information for the professional engineer to consider. Furthermore, in some cold-weather regions of the United States, weather may inhibit adequate inspection of CCR units, whether through snow or ice cover. EPA is establishing a timeframe of nine months after the publication of the rule so as to allow for adequate weather conditions for inspection.

1. Surface Impoundment Inspection Requirements

a. Weekly Inspections

As presented in the proposed rule and finalized here, this rule requires all CCR surface impoundments to be examined by a qualified person at least once every seven days for any appearance of actual or potential structural weakness or other conditions that are disrupting or that have the potential to disrupt the operation or safety of the CCR unit. The results of the inspection by a qualified person must be recorded in the facility's operating record.

Weekly inspections are intended to detect, as early as practicable, signs of distress in a CCR surface impoundment that may result in larger, more severe conditions. They are also designed to identify potential issues with hydraulic structures that may affect the structural safety of the CCR surface impoundment and impact the hydraulic and hydrologic capacity of the CCR surface impoundment. The early detection of signs of structural weaknesses is an essential preventative measure which helps to impede structural failure. The required weekly inspections are designed to identify such signs of structural weakness before they develop into larger, debilitating concerns in the structural stability of the dike.

Appearances of structural weakness may include, but are not limited to: (1) Excessive, turbid, or sediment-laden seepage; (2) signs of piping and other internal erosion; (3) transverse, longitudinal, and desiccation cracking; (4) slides, bulges, boils, sloughs, scarps, sinkholes, or depressions: (5) Abnormally high or low pool levels; (6) animal burrows; (7) excessive or lacking vegetative cover; (8) slope erosion; and (9) debris.

In addition, EPA is also adopting a new provision that requires the qualified person to inspect the discharge of all outlets of hydraulic structures which pass underneath the base of the CCR surface impoundment or through the dike of the CCR unit for abnormal discoloration, flow, or discharge of debris or sediment. The requirement is being added to aid in the identification of any internal or sub-surface issues which cannot be reasonably identified in a routine visual inspection. Abnormal discharges from hydraulic structures are often an indication of potential issues with the sub-surface or internal integrity of the structure. Hydraulic structures, particularly corrugated metal pipe, are subject to deterioration and corrosion over time and, as deterioration proceeds, the hydraulic structure becomes more susceptible to collapse, translation, or malfunction. Issues with hydraulic structures within the dike may exacerbate structural or operational issues with the CCR surface impoundment due to the significant internal deterioration of the dike via the hydraulic structure. As an example, on February 2, 2014, Duke Energy's Dan River Fossil Plant experienced a structural collapse of a corrugated metal storm water discharge pipe which passed underneath the interior of a CCR surface impoundment. The subsequent collapse of the base of the CCR surface impoundment led to a massive release of CCR to the environment. Additionally, the adjacent dike of the CCR surface impoundment was severely damaged due to the erosion of the upstream slope.

Further, an owner or operator may want to consider inspections outside of the weekly, seven-day schedule if an unanticipated event, such as a flood, earthquake, or vandalism occurs on the site. While rare in occurrence, these events may increase the chances that a potential structural stability issue has arisen. Prudent CCR management practices dictate that a visual assessment is warranted after such events. For example, after a large flood (considered a flood with a return period of equal or greater frequency of ten years) there is potential for damage, including structural damage to the CCR surface impoundment, caused by increased reservoir levels that inundate areas infrequently inundated. The slopes of the dike should be inspected to ensure that no significant erosion has occurred due to the flood, or that any large debris or sediment has been deposited on the dike. An inspection should also be conducted following an earthquake where earthquake damage is observed or can be reasonably expected, where ground motion is felt at the CCR surface impoundment or in nearby locations, or following established magnitude-epicenter distance relationships.[115]

b. Monthly Instrumentation Inspection

In a departure from the proposed rule, EPA is requiring the monitoring of all instrumentation supporting the operation of the CCR unit to be conducted by a qualified person no less than once per month. This is a change from the proposal which required instrumentation to be monitored no less than every seven days.

Many commenters argued that requiring inspections every seven days was excessive, and that, based on FEMA guidelines for dam safety, a more reasonable timeframe would be once per month for CCR surface impoundments with a hazard potential rating of ''high'' and quarterly for those CCR surface impoundments with a hazard potential rating of ''significant.'' In considering these comments, the Agency was influenced by a number of factors including the FEMA guidelines suggested by the commenters. Also weighing heavily in EPA's decision were the observations made as part of the Assessment Program, which revealed that many CCR units are equipped with only ''basic'' measuring devices such as piezometers and pool elevation and freeboard instrumentation and not the more sophisticated (*i.e.,* sensitive) measuring devices for measuring pressure, seepage, internal movement, slope movement; and vibration. These findings strongly suggested to the Agency that, given the status of current instrumentation employed at CCR facilities, weekly monitoring would be excessive, impractical, and—of greatest significance—unlikely to indicate any measurable changes in structural stability in such a short timeframe. EPA, therefore, agrees that a monthly timeframe is a more appropriate interval for detecting discernible or significant changes in the operation of the CCR

[115] The U.S. Army Corps of Engineers have developed useful criteria for post-earthquake inspections, specifically their published magnitude-epicenter distance criteria in Table 11.1 of ''Safety of Dams—Policy and Procedures,'' ER 1110–2–1156, 31 March 2014.[115] The criteria stipulate when the dam (or in the case of this rule, CCR surface impoundment) should be inspected.

unit. EPA has not, however, differentiated between high, significant, and low hazard potential CCR surface impoundments in the requirement that instrumentation be monitored monthly, as commenters suggested. Through the assessment effort, EPA identified that typically low hazard potential CCR surface impoundments were monitored less frequently than high- or significant hazard potential CCR surface impoundments by the owner or operator. Additionally, these low hazard potential CCR surface impoundments less commonly were equipped with sophisticated monitoring instrumentation, including remote monitoring instrumentation which would allow the owner or operator to monitor the unit from a remote location. Based on these observations, along with the limited burden that instrumentation monitoring places on the owner or operator, the rule requires all CCR surface impoundments with instrumentation to be monitored monthly.

c. Annual Inspections

The rule requires owners or operators of any CCR surface impoundments exceeding the MSHA size threshold (*i.e.,* a height of five feet or more and a storage volume of 20 acre-feet or more; or a height of 20 feet or more) to conduct annual inspections of the CCR unit throughout its operating life. These annual inspections are focused primarily on the structural stability of the CCR surface impoundment and must ensure that the operation and maintenance of the CCR surface impoundment is in accordance with recognized and generally accepted good engineering standards. Inspections must be conducted and certified by a qualified professional engineer.[116] Incised CCR surface impoundments, as defined in § 257.53 are not subject to the annual inspection requirements. Incised units present lower risks of structural failure, and so weekly inspections are sufficient to address any risks associated with these CCR units.

Annual inspections of any CCR surface impoundment must include, at a minimum: (1) A review of all previously generated information regarding the status and condition of the CCR unit, including, but not limited to, all operating records and publicly accessible internet site entries, design and construction drawings and other documentation; (2) a thorough visual inspection to identify indications of distress, unusual or adverse behavior, or malfunction of the CCR unit and appurtenant structures; and (3) a thorough visual inspection of hydraulic structures underlying the base of the CCR unit and passing through the dike of the CCR unit for structural integrity and continued safe and reliable operation. Additionally, following each inspection, the qualified professional engineer must prepare an inspection report which documents the following: (1) Any changes in geometry of the impounding structure since the previous annual inspection; (2) the location and type of existing instrumentation and the maximum recorded readings of each instrument since the previous annual inspection; (3) the approximate minimum, maximum, and present depth and elevation of the impounded water and CCR since the previous annual inspection; (4) the storage capacity of the impounding structure at the time of inspection; (5) the approximate volume of the impounded water and CCR at the time of the inspection; and (6) any appearances of an actual or potential structural weakness of the CCR unit, in addition to any existing conditions that are disrupting or have the potential to disrupt the operation and safety of the CCR unit and appurtenant structures; and (7) any other change(s) which may have affected the stability or operation of the impounding structure since the previous annual inspection.

This last set of requirements was originally presented in § 257.84 of the proposed rule (*i.e.,* recordkeeping requirements), however, the Agency has moved these requirements to the annual inspection section of the rule because (1) these requirements apply only to CCR surface impoundments exceeding the specified size threshold, rather than all CCR surface impoundments, as proposed; (2) must be reported annually; and (3) are more appropriately housed in the inspection section.

The owner or operator of existing CCR surface impoundments must ensure that the initial annual inspection by a qualified professional engineer is completed and documented with a report no later than nine months after the publication of the rule. EPA established this timeframe for completing an initial annual inspection based on its experience with the Assessment Program. In an effort similar to conducting an initial annual inspection, the following tasks were generally completed within three months: Retaining the services of a qualified professional engineer, developing a scope of work, reviewing existing documentation on the CCR unit, conducting a thorough field inspection, and completing an inspection report. Owners and operators of new CCR surface impoundment must commence annual inspections no later than one year from the initial placement of CCR into the new unit. An annual inspection is not required in any calendar year in which the five year structural stability reassessment is also required to be completed. (See §§ 257.73 and 257.74.) The report which the qualified professional engineer has certified must be placed in the facility's operating record and placed on the facility's publicly accessible internet site. An annual inspection is considered complete when the inspection report has been placed in the facility's operating record. Finally, if a deficiency is identified during an inspection, the owner or operator must take immediate measures to remedy the structural weakness or disrupting condition as soon as feasible.

J. Operating Criteria—Inspections for CCR Landfills

Under 40 CFR part 258, EPA does not require specific inspection requirements for MSWLFs. Rather, EPA relies on states to establish their own inspection criteria and frequency of inspections to ensure protection of human health and the environment. It is the Agency's understanding that many states require owners or operators of MSWLFs to conduct either daily, weekly, quarterly and annual inspections of these units to ensure that the design, construction, operation, and maintenance complies with all requirements. In addition, based on a review of selected state regulations most states conduct state inspections of operating landfills no less than annually.

Under the proposed subtitle D option, EPA did not propose to require mandatory inspections of new or existing landfills or any lateral expansion. However, under the subtitle C option, EPA proposed to apply the requirements of § 264.303 to permitted CCR landfills. Specifically, these requirements stated that CCR landfills while in operation would be required to be inspected weekly and after storms to detect evidence of any of the following: (1) Deterioration, malfunctions, or improper operation of run-on and run-off control systems; (2) proper functioning of wind dispersal control systems, where present; and (3) the presence of leachate in and proper functioning of the leachate collection and removal system where present. (See proposed § 264.1306, 75 FR 35257).

[116] For purposed of this requirement, qualified means an individual experienced in the operation and maintenance of dams and who has been trained to recognize signs of concern and structural weakness by visual observation, and if applicable, to monitor instrumentation.

Upon further evaluation, the Agency has decided, consistent with the weekly inspection requirements proposed for CCR landfills under the subtitle C option, as well as many state requirements for MSWLFs, to require all existing and new CCR landfills and any lateral expansion to conduct, at intervals not exceeding seven days, inspections by a qualified person for any appearances of actual or potential structural weakness or any other conditions which are disrupting or have the potential to disrupt the operation or safety of the CCR landfill. In addition, EPA is also requiring inspections by a qualified professional engineer at intervals not exceeding one year to ensure that the design, construction, operation, and maintenance of the CCR landfill is consistent with recognized and generally accepted good engineering standards. This inspection must include a review of all data in the operating record as well as a visual inspection of the unit to identify signs of distress or malfunction that is or potentially could affect the safe operation of the unit. The qualified professional engineer must then also prepare a report to identify and discuss the findings of the inspection as well as a discussion of potential remedies for addressing any deficiencies discovered during the inspection. The Agency has concluded that all CCR landfills should be routinely inspected to ensure that they are operating as designed and are being maintained in compliance with the federal criteria.

The Agency is promulgating these inspection requirements based on: (1) A review of state municipal landfill inspection requirements; and (2) comments from parties that clearly supported inspections of all CCR landfills. The Agency reviewed MSWLF inspection checklists in a selected number of states to assess the scope of these inspections. The Agency also conducted a preliminary review of state MSWLF regulations for New York, Pennsylvania, Ohio, Wisconsin, Illinois, Missouri, North Dakota and California. All of these states require MSWLF owners or operators to conduct a either daily, weekly, monthly, quarterly and annual inspections addressing the following: (1) Proper placement of the waste; (2) slope stability and erosion control; (3) surface water percolation is minimized (*i.e.* reduce ponding); (4) liner systems and leachate collection systems are properly operated and maintained; (5) water quality monitoring systems are maintained and operating; (6) dust is controlled; and (7) a plan is in place to promptly address and correct problems and deficiencies discovered during the inspection. The Agency also noted during its review of state regulations that states reserve the right to inspect landfills at any time and routinely conduct state inspections on a no less than annual basis. CCR landfills present at least the same level of risks as MSWLFs, and while the operations may differ, both operating systems are equally susceptible to malfunction. Weekly inspections of all CCR landfills by a qualified person are therefore equally necessary to ensure that groundwater monitoring, run-on and run-off controls, liner systems, and leachate collection systems are operated and maintained to reduce adverse environmental and human health impacts.

This rule also requires that owners or operators of all existing and new CCR landfills and any lateral expansion conduct an annual inspection, certified by a qualified professional engineer, to assure that these units are designed, constructed, operated, and maintained throughout their operating life to ensure protection of human health and the environment. The Agency finds that annual inspections for these units are justified for a number of reasons. First, CCR landfills are large engineered units that require that a variety of design and operating parameters be assessed to assure that the CCR landfill is operating as designed. Of particular concern to the Agency is the fact that coal ash is a fine grained material that may have the potential to compact and clog leachate collection systems (see: ''Operations and Maintenance Guidelines for Coal Ash Landfills'' Christopher Hardin, et. al. 2011 World of Coal Ash Conference. May 2011). It is reasonable therefore that the rule requires annual inspections to assure that these liner and leachate systems are assessed to assure that they are performing their functions as designed. Second, a formal annual inspection would review data collected during weekly inspections and determine if any remedial actions are need to address deficiencies. Third, the annual review by a qualified professional engineer ensures that a detailed level of engineering analysis of operating conditions are evaluated which could lead to recommendations to address design or operating issues that need attention.

K. Groundwater Monitoring and Corrective Action

EPA is finalizing groundwater monitoring and corrective action requirements to ensure that groundwater contamination at new and existing CCR units will be detected and cleaned up as necessary to protect human health and the environment. These requirements reflect Congressional intent that protection of groundwater be a prime objective of any new solid waste regulations. As stated in the proposal, EPA's damage cases and risk assessments indicate there is significant potential for CCR landfills and CCR surface impoundments to leach hazardous constituents into groundwater, impair drinking water supplies and cause adverse impacts on human health and the environment. Indeed, groundwater contamination is one of the key environmental and human health risks EPA has identified with CCR landfills and CCR surface impoundments. Groundwater monitoring is a key mechanism for facilities to verify that the existing containment structures, such as liners and leachate collection and removal systems, are functioning as intended. Thus, in order for a CCR landfill or CCR surface impoundment to show no reasonable probability of adverse effects on health or the environment, a system of routine groundwater monitoring to detect any contamination from a CCR unit, and corrective action requirements to address identified contamination, are essential.

EPA proposed to require that a system of monitoring wells be installed at all new and existing CCR units. The regulation would also provide procedures for sampling these wells and methods for statistical analysis of the analytical data derived from the well samples to detect the presence of hazardous constituents released from these CCR units. The Agency proposed a groundwater monitoring program consisting of detection monitoring and assessment monitoring, and a corrective action program. This phased approach to groundwater monitoring and corrective action programs provides for a graduated response over time to the problem of groundwater contamination as the evidence of such contamination increases. This allows for proper consideration of the transport characteristics of CCR constituents in groundwater, while protecting human health and the environment.

EPA largely based these proposed groundwater monitoring requirements on those for MSWLFs in the 40 CFR part 258 criteria, albeit with certain modifications to tailor the requirements to the case at hand. In particular, the possibility that a state may lack a permit program for CCR units made it impossible to include some of the alternatives available in 40 CFR part 258, which establish alternative standards that allow a state, as part of its permit program to tailor the default requirements to account for site specific conditions at the individual facility. EPA also sought to tailor the proposed requirements for CCR units, by incorporating certain provisions from the interim status regulations, which operate in the absence of a permit, and by including in several of the proposed requirements, a certification by an independent registered professional engineer that the rule's requirements had been met.

In the proposed rule, the Agency required facilities to install a groundwater monitoring system that met a specified performance standard and that consisted of a minimum of one upgradient and three downgradient wells at all CCR units. EPA acknowledged in the proposal that the design of an appropriate groundwater monitoring system is particularly dependent on site conditions relating to groundwater flow, and on the development of a system that has a sufficient number of wells, installed at appropriate locations and depths, to yield groundwater samples from the uppermost aquifer that represent the quality of background groundwater that has not been affected by contaminants from a CCR unit. EPA's existing requirements under 40 CFR parts 258 and 264 recognize this, and because they operate in a permitting context, these requirements provide more flexibility in establishing groundwater monitoring systems. But because the same guarantee of permit oversight is not available under the criteria developed for the proposal, EPA proposed to establish a minimum requirement based on the part 265 interim status regulations, which are self-implementing. Long experience demonstrates that these monitoring requirements will be protective of a wide variety of conditions and wastes, and that facilities can feasibly implement these requirements. EPA also noted that in many instances a more detailed groundwater monitoring system will need to be in place, and EPA therefore proposed requiring a certification by the independent registered professional engineer that the groundwater monitoring system is designed to detect all significant groundwater contamination.

EPA also proposed to require that owners and operators of CCR units establish consistent sampling and analysis procedures to determine whether a statistically significant increase in the level of a hazardous constituent(s) has occurred, indicating the presence of groundwater contamination.

As noted, EPA proposed a phased approach to monitoring. The first phase is detection monitoring where indicators would be monitored to determine whether groundwater was potentially being contaminated. The parameters EPA proposed to be used as indicators of groundwater contamination were the following: Boron, chloride, conductivity, fluoride, pH, sulfate, sulfide, and total dissolved solids (TDS). In selecting the parameters for detection monitoring, EPA chose constituents that are present in CCR and would rapidly move through the subsurface, and thus provide an early detection of whether contaminants were migrating from the CCR unit. Under the proposed rule, monitoring would be required no less frequently than semiannually.

When a statistically significant increase over background levels is detected for any of these parameters, the proposed rule required the facility to begin an assessment monitoring program to determine if releases of CCR constituents of concern had occurred. The parameters that were proposed for assessment monitoring were aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chloride, chromium, copper, fluoride, iron, lead, manganese, mercury, molybdenum, pH, selenium, sulphate (sic), sulfide, thallium, and total dissolved solids.

The proposed rule also required that whenever monitoring results indicate a statistically significant level exceeding the groundwater protection standard for any of these parameters, the owner or operator must start the process for cleaning up the contamination, and initiate an assessment of corrective action remedies. The proposed rule required that the assessment of correction action remedies be initiated within 90 days and then completed within 90 days.

EPA proposed that the assessment of corrective measures must consider a number of factors, including the effectiveness, performance, and time needed for the potential remedies. As part of the assessment of corrective measures, the owner or operator was required to identify the source of the release. The owner or operator was also required to gather data on plume definition, fate of the contaminants, stratigraphy and hydraulic properties of the aquifer. The owner or operator also was required to consider whether immediate measures to limit further plume migration or measures to minimize further introduction of contaminants to groundwater would be necessary. EPA also proposed to require the owner or operator to provide notification of the corrective measures assessment to the State Director, place the corrective measures assessment in the operating record and on the owner's or operator's publicly accessible internet site, and discuss the results of the corrective measures assessment in a public meeting with interested and affected parties.

Based on the results of the corrective measures assessment, EPA proposed to require the owner or operator to select a remedy based on a number of factors, including: the long- and short-term effectiveness and protectiveness of the potential remedy, along with the degree of certainty that the remedy will prove successful; the effectiveness of the remedy in controlling the source to reduce further releases; the ease or difficulty of implementing a potential remedy; the degree to which community concerns are addressed by a potential remedy; and potential risks to human health and the environment from exposure to contamination prior to completion of the remedy. The owner or operator was also required to specify as part of the selected remedy a schedule for initiating and completing remedial activities.

Under the proposed rule, implementing the corrective action program required the owner or operator to establish and implement a corrective action groundwater monitoring program; implement the corrective action remedy selected; and take any interim measures necessary to ensure the protection of human health and the environment, all according to the schedule the owner or operator developed during the assessment of corrective measures.

The proposed rule also required that the owner or operator must demonstrate that concentrations of constituents have not exceeded the groundwater protection standards for three consecutive years in order to support a determination that the remedy is complete.

The majority of the commenters supported ''appropriate groundwater monitoring standards for CCR waste management units'' and the development of such standards under a RCRA subtitle D framework. Comments were received on various parts of the groundwater monitoring scheme laid out in the proposed rule. The majority of comments received requested EPA to provide ''more flexibility'' to the proposed requirements. Many commenters wanted the states to be more involved with the process and provided comments suggesting that additional ''flexibility,'' such as is provided in the 40 CFR part 258 regulations for MSWLFs as part of the permitting process, be extended to CCR units. For example, commenters wanted states to have the authority to add or drop monitoring constituents; approve alternative schedules; modify the number of wells needed; allow variances; allow alternatives to the point of compliance specified in the rule; employ alternative methods to detect potential groundwater contamination, such as leak detection systems; allow alternatives to the statistical methods used to determine whether groundwater contamination has occurred; and to replace the qualified professional engineer role in the certification process.

For the final rule, EPA has developed a groundwater monitoring program that is flexible and allows facilities to design a system that accounts for site specific conditions within specific parameters. The final rule establishes an overall performance standard that the system must meet, lays out the minimum requirements of an effective system, and requires the owner or operator to design a system that achieves that overall performance standard based on a full characterization of site conditions.

As described in more detail below, in certain cases, EPA was able to develop performance standards to serve as ''more flexible'' alternatives to the technical specifications laid out in the proposal. In these instances, the available information allowed the Agency to develop performance standards that were sufficiently objective and determinate that EPA could conclude that the 4004(a) standard would be met nationwide.

However, many of the commenters' requests related to alternatives that would be less stringent than the minimum criteria laid out in the proposal and were based on arguments that state regulators (or facilities) should be allowed to ''tailor'' those requirements to sites that did not need those particular requirements. As explained at length in the proposal, EPA is concerned that provisions allowing such modifications are particularly susceptible to abuse, since in many cases the provisions could allow substantial cost avoidance. In the absence of a mandated state oversight mechanism to ensure that the suggested modifications are technically appropriate, these kinds of provisions can operate at the expense of protectiveness. In Unit II of this preamble, EPA explains the extent of our authority to establish criteria under RCRA sections 1008(a)(3) and 4004(a), including the implications associated with the lack of any authority to establish a program analogous to part 258, which relies on approved states to implement the federal criteria through a permitting program. As a result of the statutory structure, this rule is self-implementing and is designed to operate to ensure that facilities will manage CCR in a manner that achieves the 4004(a) standard even in the absence of any regulatory entity available to judge the reasonableness of the desired alternatives. While some states currently do have programs for the regulation of CCR, which in some cases may be more stringent than this final rule, the federal program must be defensible on the record in place at the time the final rule is adopted. Based on the current rulemaking record, in most cases EPA lacked the information necessary to defend the commenters' less stringent alternatives (*i.e.,* the commenters' requested ''flexibilities'') to the minimum technical criteria specified in this rule for these units. Under both the subtitle C and part 258 programs, EPA can rely on subsequent proceedings to develop the information necessary to support such tailoring. This is clearly neither contemplated nor authorized under the regulatory program relevant to this rule.

In addition, given the extremely technical nature of these requirements, EPA remains concerned that such provisions would render the requirements appreciably more difficult for citizens to effectively enforce. Nevertheless, working within these constraints this rule specifically allows the qualified PE to design a system that accounts for site conditions within the parameters of the minimum technical criteria, and EPA has added language to the regulation that expressly clarifies this. Moreover, states that have programs can continue to impose more stringent requirements, and thus can require, for example, additional monitoring wells, monitoring of additional aquifers, and inclusion of additional parameters to the detection monitoring list or the assessment monitoring list. The following discussion addresses in more detail the technical requirements under groundwater monitoring and corrective action in the final rule.

1. Applicability

Consistent with the provisions in the proposed rule, the final rule requires a system of monitoring wells to be installed at all CCR landfills, CCR surface impoundments and lateral expansions. Existing CCR units must install the groundwater monitoring system, develop their groundwater sampling and analysis procedures, develop background levels for appendix III and appendix IV constituents, and begin detection monitoring (§ 257.90 through § 257.94) within two years of the effective date of this rule. The proposed rule required that existing CCR units comply with the groundwater monitoring requirements within one year of the effective date. EPA proposed one year believing that it would be feasible for facilities to install the necessary systems. EPA also believed that a one year timeframe would ensure that existing CCR disposal facilities begin monitoring groundwater as soon as possible, so that releases from existing CCR units are detected and addressed. Comments received on this issue argued that the one-year timeframe was not sufficient to complete a hydrogeologic study and develop a monitoring plan. Several commenters requesting more time mentioned staffing shortages and limited contractor and lab resources. One state, referencing its experience relating to development and implementation of groundwater monitoring systems, said that a one year timeframe to investigate, design and submit and obtain approval for the installation of an effective groundwater monitoring system was unreasonable. Most commenters thought that a timeframe of two years was reasonable. After review of the comments received on this issue and careful reexamination of the actual requirements in the final rule, EPA agrees that a one-year timeframe is not feasible, and has decided to extend the timeframes for completing installation of the system, including background monitoring, to two years. As important as it is to begin detecting and addressing releases to groundwater, it is equally important that these complex systems be designed and installed correctly. That generally entails a number of activities, many of which must occur sequentially, including: determining the uppermost aquifer, deciding whether to install a single or multi-unit monitoring system, collecting and evaluating hydrogeological information that can be used to model the site, characterizing the site geology, characterizing the groundwater flow beneath the site, determining the flow direction and hydraulic gradient, establishing horizontal and vertical flow direction, determining hydraulic conductivity, determining groundwater flow rate, determining the monitoring wells placement, selecting the drilling method, designing the monitoring wells, developing sampling and analysis procedures, choosing a statistical method for evaluating the data and

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beginning detection monitoring. We also recognize that in some states, the state may require the owner or operator to receive state approval before they can install a groundwater monitoring system. Two years is a more reasonable timeframe in which to carry out these activities. New CCR landfills, new CCR surface impoundments and any lateral expansion must comply with these same requirements (§§ 257.90 through 257.94) before any CCR can be placed in the CCR unit.

Consistent with the proposal, the final rule also requires that the owner or operator of the CCR facility annually certify that each CCR unit is in compliance with the groundwater monitoring and corrective action provisions and provide a copy of this certification to the State Director. Because this is a self-implementing rule that relies on citizen enforcement, it is important for the owner or operator of the facility to periodically document that they are in compliance with the existing groundwater monitoring requirements, and an annual certification is the easiest and most effective way to achieve this. While the groundwater monitoring data will be made available on the owner or operator's publicly accessible Web site and in the operating record of the facility, the analysis of these data is complicated and requires a certain level of scientific expertise to analyze the data correctly. As such, a document that serves as both an interpretative record of scientific analysis and regulatory compliance is critically important to the successful implementation of a self-implementing rule that is to be enforced exclusively by citizens and the states. For similar reasons, the certification must also be placed in the operating record, provided to the State Director, and posted on the owner or operator's publicly accessible Web site.

The groundwater monitoring requirements must be met throughout the active life of the CCR unit, as well as during the closure and post-closure care period.

EPA has added a new provision to § 257.90 to address the corrective action requirements that apply when CCR have been released into the environment, such as from the kind of structural failure that occurred with TVA's Kingston Fossil Fuel plant release, or from the kind of release that occurred in North Carolina at the Dan River. EPA inadvertently drafted the corrective action requirements in the proposed rule to apply exclusively upon detection of groundwater contamination caused by a leaking unit. However, there is no reason to establish different corrective action provisions for conducting clean-up operations for different kinds of releases; the same general process is applicable to all kinds of releases.

The new provision requires that in the event of a release from a CCR unit, the owner or operator must immediately take all necessary measures to control the source(s) of releases so as to reduce or eliminate, to the maximum extent practicable, further releases of contaminants into the environment. The owner or operator of the CCR unit is also required to comply with all of the relevant corrective action requirements in §§ 257.96, 257.97, and 257.98.

2. Groundwater Monitoring System Requirements

EPA received comments that supported establishing more prescriptive requirements for the design of the groundwater monitoring system. For example, one commenter argued that three downgradient wells are insufficient to ensure detection of leakage from the very large disposal units typically used for CCR; due to uncertainty in flow directions, the perimeter of the CCR unit must be monitored on its cross-gradient, as well as downgradient sides. The commenter suggested that the minimum number of non-background monitoring wells should instead be three, plus one for every 500 feet of downgradient and cross-gradient perimeter of the CCR unit (*i.e.,* if the perimeter length adds up to 1200 feet, the minimum number of wells would be five), and that wells should be spaced no more than 500 feet apart along the downgradient and cross-gradient perimeter. EPA also received many comments arguing that the minimum requirements were overly prescriptive, and that the final rule should instead allow a professional engineer or hydrologist to design ''an alternative, but equally effective, groundwater monitoring program.'' The majority of comments on groundwater monitoring systems requested that EPA not promulgate requirements that would be incompatible with state requirements.

The final rule provisions are fundamentally the same as those in the proposal, although EPA has also added language to the regulations to better clarify how the requirements in the various sections collectively operate. The final rule establishes a general performance standard that all groundwater monitoring systems must meet: All groundwater monitoring systems must consist of a sufficient number of appropriately located wells (at least one upgradient and three downgradient wells) in order to yield groundwater samples from the uppermost aquifer that represent the quality of background groundwater and the quality of groundwater passing the waste boundary. This is the same performance standard included in the proposed rule. The objective of a groundwater monitoring system is to intercept groundwater to determine whether the groundwater has been contaminated by the CCR unit. Early contaminant detection is important to allow sufficient time for corrective measures to be developed and implemented before sensitive receptors are significantly affected. To accomplish this, the rule requires that wells be located to sample groundwater from the uppermost aquifer at the waste boundary. These requirements have been adopted without fundamental change from the proposal.

Because hydrogeologic conditions vary so widely from one site to another, the rule does not prescribe the exact number, location and depth of monitoring wells needed to achieve the general performance standard. Rather, the rule requires the owner or operator to install a minimum of one upgradient and three downgradient wells, and any additional monitoring wells necessary to achieve the general performance standard of accurately representing the quality of the background groundwater and the groundwater passing the waste boundary. The number, spacing, and depths of the monitoring wells must be determined based on a thorough characterization of the site, including a number of specifically identified factors relating to the hydrogeology of the site (*e.g.,* aquifer thickness, groundwater flow rates and direction). Further, any owner or operator who determines that the specified minimum number of wells is adequate must provide a factual justification for that decision. Factors that may substantiate a reduced density of groundwater monitoring wells includes simple geology (*i.e.,* horizontal, thick, homogenous strata that are continuous across site, with no fractures, faults, folds, or solution channels), a flat and constant hydraulic gradient, uniform hydraulic conductivity, low seepage velocity, and high dispersivity potential.

In essence, the rule establishes a presumption that the minimum of one upgradient and three downgradient wells is not sufficient, and requires the owner or operator to rebut that presumption in order to install only this minimum. This is fundamentally consistent with the proposed rule, which required the installation of a system that would achieve the general performance standard, as well as the ''minimum'' of one upgradient and three downgradient wells. The final regulation merely makes more explicit that both of these requirements must be met.

EPA considered establishing a more prescriptive set of requirements, including a specified number, location, and design of monitoring wells, but because of the highly site specific nature of developing an adequate groundwater monitoring system, determined that it lacked sufficient information to be able to design a single groundwater monitoring system that would be nationally protective at all sites. A properly designed system must account for many variables, most of which are highly dependent on the individual characteristics of the unit and the facility site. Consequently, the final rule leaves the exact system design to be determined by those at the site, including a qualified professional engineer, who can tailor the design of the system to the unit and site conditions.

Nevertheless, EPA is confident that the parameters laid out in the regulation will ensure that the design of groundwater monitoring systems at CCR facilities will be protective. As a practical matter, EPA expects that there will be few cases, if any, where four wells will be sufficient, given that this requirement was originally developed for hazardous waste management units that are typically much smaller than CCR units. As mentioned above, a small unit with simple geology, a flat and constant hydraulic gradient, uniform hydraulic conductivity, low seepage velocity, and high dispersivity potential would be the type of unit for which the minimum number of wells could be sufficient to meet the overall performance standard. Although EPA is finalizing a requirement for one upgradient and three downgradient wells as a regulatory minimum, the Agency expects large CCR units to have many more wells because most CCR sites have hydrologic settings that are too complex for the regulatory minimum to be adequate. Facilities with large CCR units could have as many as thirty or more downgradient wells. This is because the placement and spacing of detection monitoring wells along the downgradient perimeter of the CCR unit must be based on the abundance, extent, and physical/chemical characteristics of the potential contaminant pathways. All potential pathways need to be monitored.

Therefore, even though EPA is not requiring a specific number of wells, the Agency is confident that the combination of the requirements will ensure that protective groundwater monitoring systems will be installed. The owner or operator is required to install a sufficient number of wells to meet the performance standard in § 257.91(a)(1) and (2), provide a justification if they determine the required minimum is adequate, and have a qualified professional engineer certify that their groundwater monitoring system has been designed and constructed to ensure that the groundwater monitoring will meet this performance standard—*i.e.,* accurately represent the quality of groundwater that has not been affected by leakage from any CCR unit—that is, groundwater from background wells and the quality of groundwater passing the waste boundary.

The final rule establishes certain parameters regarding the location of the wells. Upgradient background wells must be located beyond the upgradient extent of potential contamination. However, groundwater quality in areas where the geology is complex can be difficult to characterize. If the facility is new, groundwater samples collected from both upgradient and downgradient locations prior to waste disposal can be used to establish background water quality. Downgradient wells to monitor for any contaminants leaking into the groundwater must be located at the hydraulically downgradient perimeter (*i.e.,* the edge) of the CCR unit or at the closest practical distance from this location.

Determining background groundwater quality by sampling wells that are not hydraulically upgradient may be necessary where hydrogeologic conditions do not allow the owner or operator to determine which wells are hydraulically upgradient (*e.g.,* floodplains, where nearby surface water can influence groundwater). In such cases, the rule allows the owner or operator to establish groundwater quality at existing units by locating wells that are not upgradient under certain conditions (§ 257.91(a)(1)). This provision may be used when hydrogeologic conditions do not allow the owner or operator to determine which wells are hydraulically upgradient and when sampling at other wells will provide data establishing background groundwater quality that is equally or more representative than that provided by upgradient wells. These conditions could include one or more of the following:

- The facility is located above an aquifer in which groundwater flow directions change seasonally.
- The facility is located near production wells that influence the direction of groundwater flow.
- Upgradient groundwater quality is affected by a source of contamination other than the CCR unit.
- The proposed or existing CCR unit overlies a groundwater divide or local source of recharge.
- Geologic units present at downgradient locations are absent at upgradient locations.
- Karst terrain or fault zones modify flow.
- Nearby surface water (*e.g.,* rivers) influences groundwater flow directions.

Additionally, there is nothing in the rule that would prevent the owner or operator from monitoring multiple aquifers in addition to the uppermost significant aquifer. Certain site conditions warrant more extensive monitoring requirements, as discussed in ''Technical Manual Solid Waste Disposal Facility Criteria'', EPA530–R–93–017, USEPA, November, 1993, Chapter 5, Subpart E, Ground-Water Monitoring and Corrective Action.

Each CCR unit must have its own groundwater monitoring system, unless the owner or operator chooses to install a multiunit groundwater monitoring system. The final rule specifies that if a multiunit system is installed, it must be based on the consideration of several factors, including the number, spacing, and orientation of the CCR units, the hydrogeologic setting, the site history and the engineering design of the CCR units. A multiunit groundwater monitoring system must be equally capable of detecting background and groundwater contamination at the waste boundary as an individual monitoring system. This documentation must be certified by a qualified professional engineer. Whether a single or multi-unit system has been installed, the monitoring wells must be cased in a manner maintaining the integrity of the borehole and must be maintained so as to meet design specifications. Both of these provisions have been adopted from the proposal without revision.

3. Sampling and Analysis Requirements

EPA received comment on several aspects of its proposed requirements for conducting groundwater sampling and analyses. Specifically mentioned here, commenters raised concern about the number of samples required to establish background concentrations and about the statistical test methodologies specified in the proposal. As discussed below, EPA has modified the rule to account for the issues raised by these commenters. The sampling and analysis requirements in the final rule have otherwise been adopted from the proposed rule with only minor clarifications.

The rule provides procedures for sampling monitoring wells and methods for the statistical analysis of groundwater monitoring of appendix III (detection monitoring) and appendix IV (assessment monitoring) constituents that may be released from CCR units. The sampling and analysis program must include procedures and documentation for sample collection (including the frequency, water level measurements, well purging, field analyses, and sample withdrawal and collection); sample preservation and handling (including sample containers, sample preservation, sample storage and shipment); chain of custody control; analytical procedures (appropriate methods can be found in ''*Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,*'' SW–846 (USEPA, 1986), *http://www.epa.gov/waste/hazard/testmethods/sw846/online/index.htm*); and quality assurance/quality control. More information and guidance can be found in ''*Technical Manual Solid Waste Disposal Facility Criteria,*'' EPA530–R–93–017, USEPA, November, 1993, Chapter 5, Subpart E, Ground-Water Monitoring and Corrective Action, as well as the ''*Unified Guidance Document: Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities,*'' March 2009, EPA 530/R–09–007.

Similar to the approach used in designing a groundwater a number of system, the final rule adopts a combination of a general performance standard for groundwater sampling and analytical methods, along with particular technical specifications that must be met. The general performance standard requires that the method used must accurately measure hazardous constituents and other monitoring parameters. In addition, the rule specifies that groundwater elevations must be measured in each monitoring well immediately prior to sampling. Also, the rate and direction of the groundwater flow in the uppermost aquifer must be determined each time groundwater is sampled. Further, the rule specifies that the background groundwater quality must be established at a hydraulically upgradient well for each of the monitoring parameters or constituents required by the applicable groundwater monitoring program, except as provided in § 257.91. The number of samples collected to establish groundwater quality data must be consistent with the appropriate statistical procedures determined for the specific statistical method chosen. The sampling must also be conducted to account for both seasonal and spatial variability in groundwater quality.

To establish background levels, the proposed rule required that ''a minimum of four independent samples from each background and downgradient well must be collected and analyzed . . .'' 75 FR 35247–35248 (proposed §§ 257.93(f) and 257.94(b)). This is the same sampling protocol that EPA adopted for both the subtitle C and part 258 groundwater monitoring requirements.

EPA received comments criticizing this sampling protocol. Several commenters stated that more than the required four samples were needed in order to adequately represent background water quality and reduce the number of false negatives. For example, one commenter argued that EPA should require a minimum of one year of monthly monitoring of background concentrations to characterize fluctuations in parameters that will be evaluated statistically. The commenter claimed that this would also help to ensure that quarterly monitoring events are properly timed. Another comment stated that more data points and time were needed to ensure statistical confidence in the data. By contrast, another commenter objected to the requirement to obtain four independent samples, arguing that this requirement was unnecessary and should be deleted. The commenter argued that this requirement was inconsistent with EPA's Unified Guidance (EPA, 2009) for Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, which specifies that replicate samples (*i.e.,* multiple samples from the same location during a given sampling event) should typically be limited to the collection of two samples from the same location, rather than four. Another commenter requested clarification on the number of samples required when establishing background levels that would serve as the point of comparison in determining whether a statistically significant increase over background levels had occurred.

In response to these comments, EPA reviewed the available information to determine whether revisions to the proposed requirements were warranted.

More recent information developed since the promulgation of the subtitle C and part 258 groundwater monitoring requirements indicates that statisticians now generally consider sample sizes of four or less to be insufficient for good statistical analysis because the observations are too few to adequately characterize the parameters of the population. Tests utilizing a small background sample size have low statistical performance in terms of power and per-test false positive rates. In 2009, EPA issued a guidance document that accounts for more recent scientific developments, ''*Unified Guidance Document: Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities,*'' March 2009, EPA 530/R–09–007. This guidance recommends a minimum of eight to ten independent background observations be collected before performing the first statistical test. Sample sets of 20 are considered optimal.

RCRA regulations are predicated on having appropriate and representative background measurements. Samples should be tested against data which best represent current uncontaminated conditions. In addition, as discussed further in Unit VI.K.5 below, the detection of a statistically significant increase over background concentrations of the constituents of concern will have serious implications for unlined surface impoundments, as these units will be required to close whenever the facility makes such a finding. EPA is also cognizant of the significant differences between the subtitle C and part 258 regulations and the final regulations being promulgated for CCR units. Both the subtitle C and the part 258 MSWLF requirements are implemented under permit programs, under which regulatory authorities are specifically authorized to establish more stringent requirements to account for scientific advances (among other things). EPA expects that current permits generally specify a greater number of samples than the minimum laid out in the regulations (*i.e.,* more than four) to determine background concentrations. And because of this it is less critical that those regulations (subtitle C and part 258) reflect the most current science. By contrast, as previously discussed, the provisions adopted under this rule are self-implementing, and will only be updated through a subsequent rulemaking. Accordingly, the Agency agrees with the comments that four samples would be insufficient and has amended the rule to require the owner or operator to collect, at a minimum, eight statistically independent and identically distributed (spatially invariant) samples from each well for each monitoring parameter. Although still a small sample size by statistical standards, eight independent observations allows for minimally acceptable estimates of variability and evaluation of trend and goodness-of fit. While more samples, including a full

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year of background monitoring, would be scientifically ideal, the Agency selected eight samples by balancing the minimum number needed to ensure the scientific accuracy of the results against the need to expedite initiating the groundwater monitoring process of detecting exceedances, along with any necessary corrective action at these facilities.

Background sampling (*i.e.,* the requirement to collect eight statistically independent samples from each well) must be completed for all appendix III and IV constituents by the end of the 24 month period to begin implementation of the groundwater monitoring program.

EPA has also revised the regulatory text relating to the number of samples that must be collected during subsequent sampling events after background concentrations have been established to clarify how the various provisions collectively operate. Consistent with the proposal, the final rule requires the owner or operator to collect and analyze the number of samples from each well necessary to be consistent with the statistical test selected under § 257.93(e) and with the unique characteristics of the site, but at minimum, to collect at least one sample from each background and downgradient well. In cases where the groundwater is ''well-behaved'' one sample from each compliance well could be all that the owner or operator would need to conduct the necessary comparisons. But if statistical assumptions are not met (*e.g.,* the observations are not statistically independent or background well data show trends) a comparison based on a single observation will not yield a significant result, and will likely result in a false positive. Further, detection monitoring tests, such as Student's t-test, look at the difference between the sample means (*e.g.,* upgradient vs downgradient) to determine when an observed difference should be considered more than a chance fluctuation. Every t-test assumes that the observations that make up each data group meet the requirements of statistical independence and stationarity. Therefore, the larger the sample size the more significant the result. In other words, a facility can choose to use only one observation (a group size of one), but the chances are good that the result derived would be non-significant, since there are many reasons sample means can vary. Consequently, it is likely to be in the facility's best interest to take more samples than the minimum, particularly in the early stages of monitoring. As monitoring continues, each successive sample will be added to the sampling data base, which will increase the confidence in the statistical analyses performed. Additional guidance on sample size can be found in the ''*Unified Guidance Document: Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities,*'' March 2009, EPA 530/R–09–007.

The requirements for applying statistical procedures in the rule are the same as those included in the proposed rule, which were based on the statistical procedures used in the MSWLF regulations. The rule requires the owner or operator to select from among the listed statistical procedures based on a determination that the test is appropriate for evaluating groundwater at that site. The statistical method chosen must be appropriate for the distribution of chemical parameters or hazardous constituents. The rule has been revised to include the clarification that normal distributions of data values shall use parametric methods and non-normal distributions shall use non-parametric methods. The rule identifies four statistical procedures, along with an alternative procedure that must meet the performance standard of § 257.93(g). The four specific statistical procedures provided in this final rule are: (1) A parametric analysis of variance followed by multiple comparison procedures to identify statistically significant evidence of contamination; (2) an analysis of variance based on ranks followed by multiple comparison procedures to identify statistically significant evidence of contamination; (3) a tolerance or prediction interval procedure; and (4) a control chart approach. The performance standard for the alternative method in subsection (g) is the same as the performance standard in the proposal, with minor revisions. EPA has deleted the performance standard ''protect human health and the environment'' in subsections (3), (4) and (5). While that standard is perfectly appropriate in a context in which a regulatory authority will apply the standard, EPA is concerned that a qualified professional engineer will be unable to certify that any alternative statistical method meets that standard. EPA received comments from professional engineers raising concern about their ability to certify that many of the requirements in the proposed rule had been met without further specification or clarification. To address those concerns, in those three provisions EPA has substituted a more objective performance standard that more precisely defines the relevant issues to be considered. Specifically, the subsections now specify that those approaches must be ''at least as effective as any other approach in this section for evaluating groundwater.''

The data objectives of the monitoring, in terms of the number of samples collected and the frequency of collection, must be consistent with the statistical method selected. Guidance on selecting a specific method is described in ''*Unified Guidance Document: Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities,*'' March 2009, EPA 530/R–09–007. The owner or operator must indicate in the operating record the statistical method that will be used in the analysis of groundwater monitoring results.

The owner or operator must conduct the statistical comparisons between upgradient and downgradient wells within 90 days of completion of each sampling event and receipt of validated data. The statistical comparison must be conducted in order to determine if a statistically significant increase has occurred over background levels for each parameter or constituent required in the particular groundwater monitoring program that applies to the unit as determined under §§ 257.94(a) or 257.95(a). This has been adopted without revision from the proposal.

EPA is finalizing as proposed the prohibition in § 257.93(b) on field filtering groundwater samples because filtration of samples for metals analyses will not provide accurate information concerning the mobility of metals contaminants, the primary objective of groundwater sampling. Metal contaminants may move through fractured and porous media not only as dissolved species, but also as precipitated phases, polymeric species, or adsorbed to particles of colloidal dimensions (<10 microns). For an assessment of mobility, all mobile species must be considered, including suspended or colloidal particles acting as absorbents for contaminants. Filtration of groundwater samples for metals analyses will not provide accurate information concerning the mobility of metal contaminants because some mobile species in solution are likely to be removed by filtration before chemical analysis. Significant underestimations of mobility may result if filters (typically 0.45 micron) are used to separate dissolved and particulate phases.

In its approach to sampling EPA is specifying in the final rule that owners and operators use 'total recoverable metals' concentrations in measuring groundwater quality. Measurement of total recoverable metals captures both the particulate fraction and dissolved

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fraction of metals in natural waters. Exceedances of ambient water criteria on a total recoverable basis are an indication that metal loadings could be a stress to an ecosystem.

One commenter argued that to prohibit field filtering would potentially bias the results artificially high, particularly at sites where low yielding formations or naturally high levels of turbidity in groundwater are encountered. However, high turbidity can also be the consequence of faulty well design and/or construction, which causes the introduction of foreign materials (high turbidity) through created fracture pathways. A properly designed well should allow for sufficient groundwater flow for sampling, minimize the passage of materials into the well, and exhibit sufficient structural integrity to prevent collapse of the intake structure. It is vital that the well provide a representative hydraulic connection to the geologic formation of interest. Otherwise the water chemistry information cannot be correctly interpreted in relation to groundwater flow or transport of chemical constituents.

Sampling with no filtration means that increased importance is placed on proper well construction and purging sampling procedures to eliminate or minimize sources of sampling artifacts. There should be nothing in the well design that will lead to high levels of turbidity. Groundwater sampling should be conducted utilizing EPA protocol low stress (low-flow) purging and sampling methodology, including measurement and stabilization of key indicator parameters prior to sampling. For purposes of sampling, this final rule presumes that a properly constructed well is capable of yielding groundwater samples with low turbidity (≤5 Nephelometric Turbidity Units (NTU)), and by knowing the cause of turbidity the qualified professional engineer will be able to optimize well performance and reduce turbidity levels, eliminating the need for filtration.

EPA is revising § 257.93(i)(2) to specify a time period of 90 days to determine if a statistically significant increase over background concentrations of one of more of the contaminants has been detected. As proposed, this section specified: ''Within a reasonable period of time after completing sampling and analysis, the owner or operator of the CCR landfill or surface impoundment must determine whether there has been a statistically significant increase over background at each monitoring well.'' Commenters pointed out that this section of the regulation was very vague, and potentially unenforceable. Several commenters suggested that once sampling and analysis had been completed, 90 days would be a reasonable amount of time to complete the statistical analysis to determine whether an exceedance had occurred. No commenter suggested a longer period of time was necessary and that timeframe is consistent with the Agency's experience of the timeframes necessary to complete such analyses. Accordingly, we have revised the provision to require the determination of a statistically significant increase to be made within 90 days of sampling and analysis.

4. Detection Monitoring Program

With three exceptions, EPA is finalizing the regulatory provisions relating to detection monitoring as proposed. The three revisions are the appendix III list of monitoring parameters; the required number of samples to determine background concentrations; and the availability of an option to conduct detection monitoring on a less frequent basis due to a lack of groundwater.

The detection monitoring phase of the groundwater monitoring program in this rule requires that the owners or operators of CCR units establish background concentrations for all monitoring parameters (appendix III and IV of part 257) and sample at least semiannually during the active life of the facility, closure, and post closure periods for a set of detection monitoring indicator parameters (appendix III of part 257).

In response to comments, EPA has revised appendix III to delete conductivity and sulfide from the list of monitoring parameters and to add calcium. Thus, the list of parameters included on the detection monitoring list is boron, calcium, chloride, fluoride, pH, sulfate and total dissolved solids (TDS). The Agency has deleted conductivity from the detection monitoring program because it is merely a proxy for TDS, which is already included on the list of parameters to analyze during detection monitoring. The Agency has also deleted sulfide because it occurs in groundwater only under strongly reducing conditions, and such conditions are rather rare at CCR disposal facilities. Calcium is being added to appendix III because it is an indicator of the extent of leaching from fly ash and FGD gypsum and because of the strong demonstrated link between the leaching of calcium and arsenic, which is one of the primary risk drivers identified in the risk assessment.

As discussed in the preceding section, in detection monitoring, a minimum of eight independent samples from each background and downgradient well must be collected and analyzed for the appendix III and IV parameters no later than 24 months from the effective date of the rule. During subsequent sampling events, at least one sample from each background and downgradient well must be collected and analyzed, although the total number of samples must be consistent with the statistical procedures selected and with the performance standard in § 257.93(g). See discussion above in section 3. Sampling and Analysis Requirements.

Under the proposed rule, monitoring would be required no less frequently than semiannually. In the final rule, semiannual sampling remains the general requirement; however, in response to comments, EPA has decided to include a provision that would allow an alternative sampling frequency if there is not adequate groundwater to flow to sample wells semiannually. Specifically, EPA received comment stating that there may be instances where there simply is not enough water available to collect and analyze on a semiannual basis, especially in western climates where the rate of groundwater recharge may be too slow or a lack of precipitation exists. The commenter also provided an example demonstrating that mining practices in adjacent areas can greatly alter the groundwater flow. Accordingly, EPA has included a provision to address the situations where there is insufficient groundwater available to collect and analyze samples around CCR units on a semiannual basis.

An owner or operator seeking to establish an alternative frequency must demonstrate that less frequent monitoring is necessary based on the following three factors: (1) Lithology of the aquifer and the unsaturated zone; (2) hydraulic conductivity of the aquifer and the unsaturated zone; and (3) groundwater flow rates. In addition, the rule requires the owner or operator to demonstrate that any alternate sampling frequency would be no less effective in ensuring that any leakage from the CCR unit will be discovered within a timeframe that does not materially delay the initiation of any necessary remediation measures. The owner or operator must have a qualified professional engineer certify that the alternative (*i.e.,* less frequent) monitoring will achieve this performance standard. The final rule also specifies that any alternate frequency during the active life (including closure) and the post-closure

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care period shall be no less than annual. As noted, the owner or operator will bear the burden of justifying an alternate frequency under this regulation, and in any court proceeding brought to enforce these requirements. This means that any uncertainty or lack of information will be weighed against the entity seeking to justify the alternate frequency.

Consistent with the proposed rule, if the owner or operator determines that there is a statistically significant increase (SSI) over background for one or more of the parameters listed in appendix III at any monitoring well at the waste boundary, the owner or operator must place a notice in the operating record and on the facility's internet site indicating which parameters have shown statistically significant changes from background levels and notify the State Director.

The facility must also then establish an assessment monitoring program and begin monitoring within 90 days. The owner or operator has the opportunity to demonstrate that a source other than the CCR unit caused the statistically significant increase or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation or a natural variation in groundwater quality. Within 90 days, the owner or operator must prepare a report documenting this demonstration which must then be certified by a qualified professional engineer verifying the accuracy of the information in the report. If a successful demonstration is made within 90 days, the owner or operator may continue detection monitoring. If a successful demonstration is not made within 90 days, the owner or operator must initiate assessment monitoring.

Commenters raised concern that 90 days would not be sufficient to complete all of the activities necessary to determine whether the detection of an SSI was from another source than the CCR unit or was based on inaccurate results. The Agency recognizes that in some circumstances it could take more than 90 days to resample and have laboratories conduct new analyses, or to conduct field investigations to determine that another source is causing the contamination. As a result, § 257.94(e)(3) does not place an ultimate time limit for owners and operators to complete the demonstration. However, if after 90 days the owner or operator has not made a successful demonstration, (s)he must begin an assessment monitoring program. At this stage, there is evidence to indicate that a release has occurred from the CCR unit, and while EPA agrees that the facility may want to confirm that the information is accurate, it is critical that the facility not delay indefinitely the more targeted monitoring to determine whether a constituent of concern is contaminating groundwater. It would not be consistent with the statutory standard to allow a facility unlimited time to delay taking reasonable steps to assess, and if necessary, address potential contamination by continuing to resample until they obtain a "better" answer. Moreover, initiation of an assessment monitoring program does not involve an irretrievable commitment of resources or even a significant investment by the facility, but only requires the facility to begin more targeted sampling for constituents of concern. This represents a reasonable first step to address a potential threat to groundwater. This requirement is also in the MSWLF part 258 regulations. For more information see 56 FR 51078 (October 9, 1991).

Subsequent to initiating the assessment monitoring program, if an owner or operator demonstrates that the statistically significant increase resulted from an error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality, or was caused by a source other than the CCR unit, the owner or operator may cease assessment monitoring and return to detection monitoring. If the demonstration is successful, the owner or operator must have the demonstration certified by a qualified professional engineer, and is required by § 257.94(e)(3) to place a notice in the operating record, and on publicly accessible Internet site and send a copy of the report to the State Director.

5. Assessment Monitoring Program

EPA is adopting an assessment monitoring program that is largely identical to the program laid out in the proposal. However, as discussed in more detail below, some revisions have been made; some were made in response to comments, but most are conforming changes made to be consistent with changes adopted in other provisions, such as the detection monitoring program described previously.

Consistent with the proposed rule, if any of the detection monitoring parameters are detected at a statistically significant level over the established background concentrations, the owner or operator must proceed to the next step, assessment monitoring. Assessment monitoring requires annual sampling and analysis for the full list of constituents included in appendix IV. The number and frequency of samples required for assessment monitoring are the same as those established for detection monitoring. See discussion above in 3. Sampling and Analysis Requirements.

EPA has also revised the list of constituents in appendix IV by deleting the following constituents and parameters: Aluminum, boron, chloride, copper, iron, manganese, pH, sulfate, sulfide, and TDS; and adding the following constituents: Cobalt, lithium, and radium 226 and 228 combined. The following constituents and parameters are being removed from appendix IV because they are on appendix III and therefore will continue to be monitored throughout assessment monitoring: Boron, chloride, pH, sulfate and TDS. Although fluoride is on appendix III, we are also retaining it on appendix IV because it does have an MCL and was found to pose risks in the 2014 risk assessment, and therefore is appropriately considered to be a constituent that is relevant for purposes of corrective action. Aluminum, copper, iron, manganese, and sulfide have been removed because they lack maximum contaminant levels (MCLs) and were not shown to be constituents of concern based on either the risk assessment conducted for this rule or the damage cases (see Units X and XI of this document). Cobalt has been added to appendix IV because cobalt was found to be a risk driver in the 2014 risk assessment, based on certain waste management disposal practices that lead to highly acidic wastes conditions. Lithium is being added to appendix IV because it has been detected in several proven and potential damage cases at levels exceeding EPA's Regional Screening Level (RSL) of soil to groundwater and has been determined as potentially toxic if consumed concurrently with certain drug types.[117] Radium 226 and 228 combined (the sum of the radioactive isotopes radium-226 and radium-228) is being added because there is evidence from several damage cases of exceedances of gross alpha, indicating that radium from the disposal of CCR may be problematic. Appendix IV now contains antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, fluoride, lead, lithium, mercury, molybdenum,

[117] *EPA's Regional Screening Level (RSL) Soil to Groundwater Supporting Table (TR = 1E–6, HQ = 1)* May 2014/Mid-atlantic Risk assessment: *http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm; and Health Consultation: Chesapeake ATGAS 2H Well Site Leroy Hill Road, Leroy, Leroy Township, Bradford County, Pennsylvania,* October 29, 2013. U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry Division of Community Health Investigations Atlanta, Georgia. *http://www.atsdr.cdc.gov/.*

selenium, thallium and radium 226 and 228 combined.

If any appendix IV constituents are detected in any appendix IV analyses, the owner or operator must notify the State Director and continue to monitor, at least semiannually, for both the specific constituents in appendix IV that were detected and all parameters in appendix III. EPA has decided to also include a provision to allow an alternative sampling frequency if there is not adequate groundwater to flow to sample wells semiannually, consistent with the revised provision adopted for the detection monitoring program. If the owner or operator demonstrates at any time during assessment monitoring that all of the detected appendix III and IV constituents are at or below background values for two consecutive sampling events, (s)he must notify the state and may return to detection monitoring. In general, EPA expects that appendix III constituents are unlikely to remain elevated once measures have been taken to address the release of the detected appendix IV constituents. But should appendix III constituent levels remain elevated, detection monitoring continues to be necessary to determine whether another source of contamination is present.

After obtaining the sampling results the owner or operator must place a notice in the operating record and on the facility's internet site indicating which appendix IV constituents have been detected and notify the State Director. Within 90 days and on at least a semiannual basis thereafter, the owner or operator must resample all wells, conduct analyses for all parameters in appendix III and for those constituents in appendix IV that were detected in the initial assessment monitoring sampling event. The results of this resampling must be placed in the owner or operator's operating record, as well as its publicly accessible internet site. The results of the resampling must also be sent to the State Director. These provisions have been adopted without change from the proposal.

For each appendix IV constituent that is detected, a groundwater protection standard must be set. The groundwater protection standards must be the MCL or the background concentration level for the detected constituent, whichever is higher. If there is no MCL promulgated for a detected constituent, then the groundwater protection standard must be set at background. The proposed rule would have allowed the owner or operator to establish an alternative groundwater protection standard for constituents for which MCLs have not been established provided that the alternative groundwater protection standard has been certified by an independent registered professional engineer and the state has been notified that the alternative groundwater protection standard has been placed in the operating record and on the owner's or operator's publicly accessible internet site. This provision had been adopted from the part 258 regulations, but was determined to be inappropriate in a self-implementing rule, as it was unlikely that a facility would have the scientific expertise necessary to conduct a risk assessment, and was too susceptible to potential abuse. Additionally, numerous comments were received suggesting that only those constituents with MCLs be included in appendix IV. The commenters were concerned that only MCLs are enforceable. With the exception of cobalt, lead, lithium and molybdenum (included on appendix IV because of their relevance in the risk assessment and damage cases), all appendix IV constituents have an MCL. In the proposed rule, as stated above, owner or operators were allowed to establish certain types of alternative groundwater protection standards. In the final rule, if a constituent has no MCL (*i.e.,* cobalt, lead, lithium and molybdenum), their groundwater protection standards will be their background levels. These background standards are sufficiently precise that they are enforceable.

The owner or operator must compare the levels of any detected appendix IV constituents to the appropriate groundwater protection standard. If the concentrations of all appendix IV constituents are shown to be at or below background values for two consecutive sampling events using the statistical procedures required by § 257.93, the owner or operator of the CCR disposal facility must place that information in the operating record and on the facility's publicly accessible internet site and notify the State Director. The owner or operator may then return to detection monitoring.

If the concentrations of any appendix III or IV constituents are above background values, but all concentrations are determined to be below the groundwater protection standard using the statistical procedures required by this rule, the owner or operator must continue assessment monitoring program.

If, however, the monitoring indicates a statistically significant increase for any appendix IV constituent over the groundwater protection standard, the owner or operator is required to notify the State Director and local officials of this finding and place a notice in the operating record and on the owner or operator's publicly accessible internet site.

The owner or operator also must characterize the nature and extent of the release. As part of characterizing the nature and extent of the release, the owner or operator must install additional wells, as necessary to define the contaminant plume(s) and collect data on the nature and estimated quantity of the material released. Adequate characterization of the release is critical in designing and effectively implementing a protective corrective action program if groundwater remediation is necessary. The purpose of these additional wells is to delineate the contaminant plume boundary and to eventually demonstrate the effectiveness of corrective action in meeting the groundwater protection standard.

Because the requirements for additional monitoring are entirely specific to the site conditions and the size and nature of the release, the Agency is not able to set requirements that precisely specify the location or the number of additional wells that must be installed. Instead EPA has adopted an approach that corresponds to the approach to designing the original groundwater monitoring system under § 257.91. The regulations establish a general performance standard (''install additional wells as necessary to define the contaminant plume'') and specify a true minimum of installing at least one well at the facility boundary in the direction of contaminant migration in order to ascertain whether the contaminants have migrated past the facility boundary. The regulations also establish a rebuttable presumption that this minimum is insufficient, requiring the owner or operator to justify a decision to install only this minimum. The requirement to justify the decision to only install the minimum number of additional wells is a revision from the proposal that has been adopted to be consistent with the Agency's overall approach to developing an effective groundwater monitoring system.

The Agency has also added some clarification to the proposed requirement to characterize the nature and extent of the release, by requiring the owner or operator to collect data on the nature and estimated quantity of material released, including specific information on the constituents listed in appendix IV and the levels at which they are present in the material released. This information will be necessary to help the owner or operator characterize the release and assist in ultimately deciding on a remedy.

If contamination has migrated off-site, the owner or operator must notify individuals who own land or reside on land overlying the plume.

In addition to characterizing the nature and extent of the release, the owner or operator must initiate an assessment of corrective measures within 90 days of finding a statistically significant increase over background concentrations, and select the appropriate remedy. During this phase, the owner or operator is required to continue at least semiannual monitoring (or an alternative frequency, no less than annually) for all appendix III constituents and for those appendix IV constituents exceeding the groundwater protection standard. To be consistent with the provisions in detection monitoring, EPA has included a provision that would allow the owner or operator to demonstrate that a source other than their CCR unit caused the contamination or that the statistically significant increase above groundwater protection standards resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. This alternative option will not delay compliance with the next phase of the groundwater monitoring and corrective action program. Thus, until such a demonstration is made, the owner or operator must comply with the other requirements of this section, including initiating the assessment of corrective measures. At this stage, the evidence that the CCR unit is leaking is stronger, and the owner or operator has previously had the opportunity to demonstrate that the finding was made in error under the detection monitoring program, so no further delay in initiating measures to address any groundwater contamination is warranted.

Another change since the proposal is that in addition to complying with all of the corrective action requirements—*i.e.,* initiating an assessment of corrective measures, followed by selection of a remedy and implementation of a corrective action program—if the unit is an unlined surface impoundment, it must either retrofit or initiate closure. Further, where the facility has chosen to install a multi-unit groundwater monitoring system, the detection of an SSI of an appendix IV constituent would trigger the corrective action and closure (or retrofit) of all of the unlined surface impoundments covered by that monitoring system, as there will be no way to isolate a particular unlined unit as the source of the contamination. These requirements are discussed in more detail in the Closure section.

6. Assessment of Corrective Measures

This section of the regulations also largely mirrors the analogous provisions in the proposed rule. EPA added some language to reflect that this section is not limited to the remediation of groundwater from a leaking CCR unit but will also apply to contamination caused by any kind of release from a CCR unit. EPA also made some minor revisions in response to comments, and some editorial changes to conform this provision to changes made in other sections of the rule.

Consistent with the proposal, § 257.96(a) specifies that the assessment of corrective measures must be initiated within 90 days of detecting a statistically significant increase of any of the constituents listed in appendix IV, at a level exceeding the groundwater protection standard(s), or of otherwise documenting a release of contaminants from the CCR unit. The regulation also requires the assessment of corrective measures to be completed in 90 days of such a finding, but in response to comments, EPA is adopting a provision that will allow for a single 60 day extension. Multiple commenters argued that 90 days was not adequate to complete the assessment of corrective measures. Commenters stated that for situations with complex hydrogeology, additional studies and sampling may be required in order to assess potential contributing offsite sources, background levels, and possible remedies. They stated that identification of remedy alternatives, collection and analysis of data used to evaluate remedy alternatives, and discussions with vendors/contractors regarding availability of labor and materials are all critical steps in the remedy selection process. As explained in the ''Technical Manual Solid Waste Disposal Facility Criteria,'' EPA530–R–93–017, USEPA, November, 1993, Chapter 5, Subpart E, Ground-Water Monitoring and Corrective Action, the owner or operator will need to: (1) Identify and remediate the source of contamination; and (2) identify and remediate the known contamination. The factors that must be considered in assessing corrective measures include source evaluation, plume delineation, groundwater assessment and source control. Based on the comments received, as well as the Agency's own experience, EPA recognizes that there may be complex situations that require more time to develop a careful and well-thought out corrective measures assessment. Therefore, the final rule has been modified to allow up to an additional 60 days to complete the assessment of corrective measures, provided that a qualified professional engineer certifies that the additional time is necessary. The initial 90 days plus the additional 60 days, which is within the range of time suggested by the commenters, would provide the owner or operator up to 150 days to complete the corrective measures assessment, which EPA expects will be sufficient. The certification must be placed in the operating record, on the owner's or operator's publicly accessible internet site and submitted to the proper state official.

The rule requires the owner or operator to assess the effectiveness of potential remedies in meeting the objectives of § 257.97 by addressing at least: (1) Performance, reliability, ease of implementation and potential impacts; (2) time requirements; and (3) institutional requirements. The proposed rule also included consideration of the costs of remedy implementation. However, that language came directly from the MSWLF rule in part 258. Because Congress did not authorize the consideration of costs in establishing minimum national standards under RCRA section 4004(a), we have removed this factor. In evaluating the performance, reliability, ease of implementation, and potential impacts of each remedy, the owner or operator should evaluate whether specific remedial technologies are appropriate to the problem and the ability of those technologies to achieve the groundwater protection standards. Analysis of a remedy's reliability should include an assessment of the effectiveness of the remedy in controlling the source of the release and its long-term reliability. Source control measures need to be evaluated to limit the migration of the plume, and to ensure an effective remedy. The regulation does not limit the definition of source control to exclude any specific type of measure to achieve this. Remedies must control the source of the contamination to reduce or eliminate further releases by identifying and locating the cause of the release. Source control measures may include the following: Modifying the operational procedures (*e.g.,* banning waste disposal); undertaking more extensive and effective maintenance activities (*e.g.,* excavate waste to repair a liner failure); or, in extreme cases, excavation of deposited wastes for treatment and/or offsite disposal. Construction and operation requirements also should be evaluated. The analysis of the timing of potential remedies should include an evaluation of construction, start-up, and completion time. Timing is particularly important if contamination has migrated off-site. Institutional requirements such as local permit or public health requirements may affect implementation of the remedies evaluated and should be assessed by the owner or operator.

The proposed rule included a provision that would allow an owner or operator to determine that compliance cannot be reasonably achieved with any currently available methods. This has been deleted from the final rule. The Agency determined that without state oversight or a permitting program, that provision was potentially subject to abuse and thus, inappropriate to include in a self-implementing rule.

As part of evaluating potential remedies, the owner or operator must hold a public meeting to discuss the remedies under consideration (prior to selecting a final remedy). Once the owner or operator has selected a remedy, he must place a description of the selected remedy in the operating record, on the owner or operator's publicly accessible internet site and notify the State Director.

7. Selection of Remedy

This section of the final rule has been adopted with only minor changes from the proposal. As in the prior section, EPA has revised certain provision to reflect that this section will also apply to the cleanup of contamination caused by a release from a CCR unit. EPA also deleted a provision that had been adopted from the part 258 regulations, but that was determined to be inappropriate in a self-implementing rule as it was too susceptible to potential abuse.

Based on the results of the corrective measures assessment conducted, the owner or operator must select a remedy. The selected remedy must attain all of the performance standards listed in subsection (b). Specifically, the remedy must protect human health and the environment, attain the groundwater protection standards, control the sources of releases so as to reduce or eliminate, to the maximum extent practicable, further releases of appendix IV constituents into the environment, and comply with any relevant standards for management of wastes generated as a result of the remedial activities. EPA included an additional criterion more directly related to remediation of contamination associated with a release, such as from a collapse or structural failure of a CCR unit, which requires the remedy to ''remove from the environment as much of the contaminated material that was released from the CCR unit as is feasible, taking into account factors such as avoiding the inappropriate disturbance of sensitive ecosystems.'' Together, these criteria reflect the major technical components of any kind of clean up remedy.

The rule also specifies decision criteria to be considered by the owner or operator in selecting the most appropriate remedy. These include: (1) Long and short term effectiveness, and degree of certainty of success; (2) effectiveness of remedy in controlling the source to reduce further releases; (3) ease or difficulty of implementation; and (4) community concerns. Additionally, the rule requires the owner or operator to specify a schedule for implementing and completing the remedial activities. The rule requires the owner or operator to set the schedule because it is impossible for EPA to establish a single schedule appropriate for all possible situations; the schedule will necessarily depend on the nature and size of the contamination, among other factors. The rule outlines six factors to be considered in establishing a schedule for completing remedies (§§ 257.97(d)(1–6)). These factors are: (1) Extent and nature of contamination; (2) reasonable probabilities of remedial technologies in achieving compliance with the groundwater protection standards; (3) availability of treatment or disposal capacity for CCR managed during implementation of the remedy; (4) potential risks to human health and the environment; (5) resource value of the aquifer; and (6) other relevant factors. EPA had included one additional factor in the proposal: ''The desirability of utilizing technologies that are not currently available, but which may offer significant advantages over already available technologies in terms of effectiveness, reliability, safety, or ability to achieve remedial objectives.'' EPA considered that this provision, which could be used to justify delaying remediation measures, was potentially subject to abuse and thus, inappropriate to be included in a self-implementing rule.

For similar reasons, EPA deleted the provisions in the proposal, subsections (e) and (f) that would authorize a facility to determine that remediation of a release is not necessary. These sections which came from the MSWLF rule in part 258 are appropriate where there is state oversight. The preamble to the final MSWLF rule specifically discusses situations in which an approved state may decide not to require cleanup of hazardous constituents released to groundwater from a MSWLF (see 56 FR 51090). However, there is no similar guarantee that an individual facility will act in the public interest.

8. Implementation of the Corrective Action Program

The proposed rule required the owner or operator to include a schedule for initiating the remedial activities in the schedule for implementing the remedy (§ 257.97(d)). The Agency understands that selecting a remedy is closely related to the assessment process and cannot be accomplished unless a sufficiently thorough evaluation of alternatives has been completed. The process of documenting the rationale for selecting a remedy requires that a report be placed in the operating record that clearly defines the corrective action objectives and demonstrates why the selected remedy is anticipated to meet those objectives. The report must identify how the remedy will be protective of human health and the environment, attain the groundwater protection standards (either background or MCLs), attain source control objectives, and comply with waste management standards.

The selection of a remedy also involves a public meeting with interested parties before finally selecting a remedy. For these reasons, the Agency is not establishing a deadline for completing the remedy selection process, but rather expects it to be completed as soon as practicable. Once the assessment of corrective measures has been completed within the timeframe specified in this rule, and the public meeting has occurred, the facility owner or operator must select a remedy and begin implementing that remedy as soon as is practicable. It is vitally important that the facility selects a remedy as soon as practicable and begins designing and implementing that remedy, so that releases to groundwater are addressed without unnecessary delay. EPA understands that there are a variety of activities that may be necessary in order to select the appropriate remedy (*e.g.,* discussions with affected citizens, state and local governments; conducting on-site studies or pilot projects); and, once selected, to implement the remedy (*e.g.,* securing on-site utilities if needed, obtaining any necessary permits, etc.). That is why EPA does not find it appropriate to set specific timeframes for selecting the remedy or to begin implementing the selected remedy. However, in order to ensure that the community is kept informed as to the progress of selecting and implementing the remedy, EPA is requiring that the facility owner or operator, on a semiannual basis, post status reports/updates on their progress to their publicly accessible internet site and submit these to the state.[118]

However, the Agency has concluded that it is reasonable to require that once a remedy has been chosen, the owner or operator of the CCR unit must begin to implement that remedy within a specified period of time. Consistent with the timeframes throughout this section, the final rule requires that within 90 days of selecting a remedy, the owner or operator must have initiated corrective measures, including any interim measures determined to be appropriate, and have established a corrective action groundwater monitoring program (and begin following it). (§ 257.98). This is a reasonable timeframe in which to begin these activities based on EPA's long experience in conducting and overseeing cleanup activities.

The remedy would be considered complete when the owner or operator demonstrates compliance with the groundwater protection standards for a period of three consecutive years, and all other actions required to meet the performance standards in § 257.97(b) have been satisfied (*e.g.,* source control). The owner or operator must obtain certification that the remedy is complete from a qualified professional engineer, and must notify the State Director. The certification must also be placed in the operating record and on the owner or operator's publicly accessible Internet site.

The Agency deleted the provision that allows an owner or operator to determine that compliance cannot be reasonably achieved with any currently available methods. The Agency determined that without state oversight or a permitting program, that provision was potentially subject to abuse and thus, inappropriate to be included in a self-implementing rule.

9. Timing Overview

The groundwater monitoring regulations require that the owner or operator of existing CCR units must comply with § 257.90–§ 257.94 within 30 months of the date of publication of the rule. Essentially, that means that by the end of 30 months, the owner or operator must (1) install the groundwater monitoring system; (2) document the sampling and analysis procedures; (3) establish which statistical tests will be used to determine exceedances; (4) sample all wells to have a minimum of 8 samples for all appendix III and IV parameters; and (5) determine if there is a statistically significant exceedance of any appendix III parameter, which would trigger assessment monitoring.

New CCR units must comply with §§ 257.90–257.93, including the requirement under § 257.94(b) to collect and analyze eight independent samples from each well for the parameters listed in appendix III and IV to this part to determine background levels for all appendix III and IV constituents, before commencing operation. Essentially, that means that before receiving CCR waste, the owner or operator must (1) install the groundwater monitoring system; (2) document the sampling and analysis procedures; (3) establish which statistical tests will be used to determine exceedances; and (4) sample all wells to have a minimum of eight samples for all appendix III and IV parameters.

If assessment monitoring is triggered, within three months the owner or operator must sample all wells for all appendix IV constituents (minimum of one sample) and resample (minimum of one sample) all wells for all appendix III parameters and those appendix IV constituents that were detected in the first round of sampling. The owner or operator could also simultaneously use this three month timeframe to demonstrate that the statistically significant increase found in detection monitoring was due to another source or sampling and analysis error. While conducting assessment monitoring, the owner or operator must continue sampling for all appendix III constituents and any appendix IV detected constituents semiannually. The owner or operator must sample for all appendix IV constituents annually.

The owner or operator must also establish groundwater protection standards (MCL or background levels) for all appendix IV constituents detected during sampling.

If one or more appendix IV constituents are detected at statistically significant levels above the groundwater protection standards established, or a release from a CCR unit has been detected, corrective action is triggered. The owner or operator must characterize the nature and extent of the release by installing additional monitoring wells, collecting data on the quantity and concentration levels of regulated constituents in the released material, sampling and notifying the State Director, local government officials, and any persons who own land or reside on the land that overlies the plume if the plume has migrated off site. The owner or operator must also place the notification in their operating record and on their publicly accessible Internet site.

If corrective action is triggered, within three months the owner or operator must initiate an assessment of corrective measures. If the CCR unit is an unlined surface impoundment, the unit must stop receiving CCR and non-CCR wastes and initiate closure of the unit or begin to retrofit the unit within six months. The owner or operator could also simultaneously use these three months to initiate an assessment of corrective measures to demonstrate that the statistically significant increase found during assessment monitoring was due to another source or sampling and analysis error.

The assessment of corrective measures must be completed in three months, with the possibility of an additional two months if the owner or operator demonstrates the need for additional time. The owner or operator must continue assessment monitoring and provide notification of the corrective measures assessment to the State Director and place the assessment in the operating record and on the owner's or operator's publicly accessible Internet site. The owner or operator also must discuss the results of the corrective measures assessment at least one month prior to selection of remedy in a public meeting.

Within three months of selecting a remedy, the owner or operator must initiate remedial activities. Corrective action is completed when the owner or operator demonstrates compliance with the groundwater protection standards for three consecutive years.

L. Closure of Inactive Units.

As discussed in Unit VI.A of this document, EPA proposed that inactive CCR surface impoundments that had not completed closure in accordance with specified standards by the effective date would be subject to all of the requirements applicable to existing CCR surface impoundments. EPA adopted this approach to create an incentive to expedite the closure of these units, with all of the significant risk mitigation that such a measure would entail. EPA is retaining this general approach in the final rule, but has revised the provision to grant inactive CCR surface impoundments more time to complete closure, consistent with the other closure provisions in the final rule. The

[118] As evidenced in 42 U.S.C. 6971(f), Congress intended that the OSHA be able to enforce its regulations to protect workers exposed to hazardous waste and that EPA and OSHA would work together to ensure that. EPA is clarifying that it intends that the CCR disposal rule not preempt applicable OSHA standards designed to protect workers exposed to CCRs; thus EPA's final rule on CCR disposal will apply in addition to any applicable OSHA standards. The Agency has added specific regulatory language in this section to address this intent.

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final rule extends the deadline to three years from publication of the rule in the **Federal Register**.

The proposal was based on EPA's belief that the timeframes between publication of the final rule and the effective date would be sufficient for facilities to close inactive CCR surface impoundments. This was particularly true under the subtitle C option, where the timeframe between publication and the effective date could be as long as 18 months, due to the need for subsequent action by authorized states. Under the proposed rule, the maximum amount of time a facility would have to initiate and complete closure of a disposal unit was seven months. However, as discussed elsewhere in this preamble, EPA received numerous comments raising concern that these timeframes would essentially be ''impossible to meet'' for surface impoundments located in certain geographic and climatic conditions, as well as for all of the larger units. These comments convinced EPA that it had not adequately accounted for the complexities inherent in electric generating facility operations, and the different characteristics of CCR surface impoundments in designing the closure provisions in the proposal. EPA has revised the timeframes applicable to closures in the final rule accordingly in light of these issues. See Unit VI.M of this document. These same considerations apply with respect to this provision, and additional time is therefore necessary to make this option truly viable.

EPA selected three years based primarily on two factors. EPA initially focused on the minimum amount of time necessary to close a CCR surface impoundment. As discussed in more detail in Unit VI.M of this document, there can be a substantial range in the amount of time needed to close a surface impoundment, depending on, for example, the size and location of the unit.

However, a critical factor in EPA's decision is that under this approach these units will not be subject to the rule's groundwater monitoring or structural stability requirements (provided they complete closure within three years). Moreover, based on the information in the record, it appears highly unlikely that groundwater monitoring is currently being conducted at these units (as discussed in Unit IV.A of this document, the information on groundwater monitoring requirements applicable to existing units was extremely sparse, but many older units appear to lack effective groundwater monitoring systems). EPA considered that allowing these inactive units to remain in place without taking measures to address the continuing threat that these units present for a substantial amount of time could not be justified. EPA therefore focused on the amount of time authorized under the rule for implementation of the groundwater monitoring requirements (*i.e.,* 2 years from the effective date) and for key structural stability requirements (*i.e.,* 18 months to complete key analyses).

As discussed in more detail in the next section, the information in the record demonstrates that it is feasible to complete the closure of CCR surface impoundments within three years. EPA recognizes that larger CCR surface impoundments (*i.e.,* above 40 acres) may not be able to close within this timeframe. However, to be able to support this provision, EPA must balance the risk mitigation achieved by closure of CCR surface impoundments against the risks inherent in allowing inactive CCR surface impoundments to remain in place for longer periods of time. The longer inactive CCR impoundments remain without all of the protections provided by the final rule, the greater the potential for significant health and environment impacts. Larger units are also the ones more likely to present the highest risks, and so warrant the greater oversight provided by application of all of the technical criteria to their operation (and closure). Consequently, EPA is unable to justify expanding this option to include the longer timeframes available under §§ 257.102 or 257.103.

The criteria for conducting the closure of inactive CCR surface impoundments are essentially the same as those applicable to active CCR units. Inactive units can either clean close units, or close with waste in place, subject to same performance standards in § 257.102 for all other CCR units. If an inactive CCR surface impoundment is completely closed within the three year timeframe, no other requirements apply to that unit. This means that no groundwater monitoring or other post-closure care requirements would apply to these units. Once an inactive CCR surface impoundment has been breached and dewatered, the risks are essentially the same as the risks associated with an inactive CCR landfill, which are not subject to any requirements under the final rule.

However, owners or operators of inactive CCR surface impoundments that have not completed closure within this timeframe must comply with all of the requirements applicable to existing CCR impoundments. If the facility intends to maintain the inactive unit indefinitely, whether to provide potential future capacity, or to continue to dredge the unit to provide material for beneficial use, or with the idea that it may be repurposed for other facility operations (*e.g.,* to manage stormwater), there is no basis for distinguishing between these units and actively managed units on the basis of the potential risks. Thus, such units would need, for example, to meet all of the location and structural stability criteria (which could independently compel closure of the unit), install the groundwater monitoring system, and begin to monitor within the timeframes established in the final rule. This also means that any facility that initiates closure under this provision but fails to complete it within this timeframe, must comply with all groundwater monitoring requirements in §§ 257.90–98 (*e.g.,* install groundwater monitoring wells) as well as all of the post-closure care requirements.

M. Closure and Post-Closure Care

Closure and post-closure care are an integral part of the design and operation of CCR landfills and CCR surface impoundments.[119] EPA solicited public comment on closure and post-closure care requirements under a subtitle D approach in the proposed rule and sought additional comment on specific closure requirements in a subsequent notice of data availability.

For CCR landfills, the proposed closure and post-closure care requirements were modeled on current regulations that apply to municipal solid waste landfills, which are codified in part 258. In some cases, the proposed requirements were modified to reflect the lack of a mandatory permitting mechanism (see Unit V.A. of this preamble for additional information), in addition to other changes EPA believed were appropriate to ensure that there would be no reasonable probability of adverse effects from the wastes that remain after a CCR unit had closed. For CCR surface impoundments, the Agency modeled the proposed requirements on current regulations that apply to interim status hazardous waste surface impoundments, which are codified in part 265. Some additional proposed provisions were based on requirements currently applicable to water, sediment, or slurry impoundments and

[119] As discussed in the proposed rule, EPA's ''Guide for Industrial Waste Management'' documents the general consensus on the need for effective closure and post-closure care requirements (Chapter 11). This guide can be accessed at *http://www.epa.gov/epawaste/nonhaz/industrial/guide/*.

impounding structures that are regulated by the MSHA. See 30 CFR part 77, subpart C.

The proposed rule included a number of closure and post-closure criteria, including: (1) Requirements to prepare closure and post-closure plans; (2) requirements for conducting closure of a CCR unit when the CCR is removed and when the CCR is left in place, including design criteria for a final cover system; (3) timeframes to commence and complete closure activities; (4) closure and post-closure care certification requirements; and (5) requirements for conducting post-closure care. The Agency received numerous comments on the proposed closure and post-closure criteria, with the majority of comments pertaining to the proposed timeframes for closure (*i.e.,* timeframes for commencing and completing closure) of a CCR surface impoundment. As a result of these comments, EPA solicited additional comments on the timeframes for closure in a NODA published on August 2, 2013 (NODA 3). See 78 FR at 46944. The sections below explain the approach and rationale for the final rule closure and post-closure care criteria based on the comments received in response to the proposed rule and the NODA.

1. Closure Plan

The Agency proposed to require that the owners or operators of CCR landfills and CCR surface impoundments prepare a written closure plan describing the closure of the unit and providing a schedule for implementation of the plan. 75 FR at 35207–08. The closure plan would describe the steps necessary to close the CCR unit at any point during the active life based on recognized and generally accepted good engineering practices. The proposal also identified the minimum information necessary to include in the closure plan. This information included: (1) An estimate of the largest area of the CCR unit that would ever require a final cover during the active life of the CCR unit; (2) an estimate of the maximum inventory of CCR that would ever be present on-site over the active life of the CCR unit; (3) a description of the final cover and the procedures to be used to install the final cover; (4) a description of how the facility will provide for major slope stability following closure; (5) a description of the measures the owner or operator will adopt to preclude the probability of future impoundment of water, sediment, or slurry; and (6) a schedule for the implementation of the closure plan. See proposed § 257.100(a) and (g). The proposed rule would also have required each owner or operator to develop the closure plan by the effective date of the final rule. Finally, EPA proposed to require the owner or operator to have the closure plan certified by an independent registered professional engineer, in addition to complying with all of the notification and posting requirements under the rule.

EPA received few public comments on either the proposal to develop a closure plan or the individual elements of the closure plan. Some commenters generally supported the requirement for an owner or operator to develop a closure plan for the CCR unit, and no commenters opposed it. However, one commenter requested that EPA include more specific requirements for slope stability in the regulatory language beyond the general requirement to address major slope stability in the closure plan for units that close with waste in place.

The Agency agrees that the proposed regulatory language should provide more specific criteria defining the expectations with regard to major slope stability. The proposed regulation merely required the owner or operator to ''provide for major slope stability'' in the closure plan, or in other words, to include measures to ensure that slope stability issues will be accounted for in designing the final cover. See 75 FR 35252.

EPA explained that unit closure must provide for major slope stability to prevent the sloughing of the cover system over the wastes that will remain in the CCR unit over the long term. Sloughing of a land slope can occur when the earth material becomes saturated with water and incapable of maintaining the slope resulting in the movement or sliding of the earth material. 75 FR at 35209. Slope stability is a critical issue in the design of final cover systems for both surface impoundments and landfills because cover system slope instability has been attributed to a number of final cover system failures.[120] More specifically, the primary causes of final cover system slope failure during construction have been identified as: (1) Placing soil over the sideslope geosynthetics from the top of the slope downward, rather than the toe of the slope upward; (2) using presumed values for critical interface shear strengths that were not conservative; and (3) using interface shear strength values from laboratory tests performed under conditions not representative of the actual field conditions. For final cover system slope failures after rainfall or thaw, the primary causes of failure have been identified as: (1) Not accounting for seepage forces; (2) clogging of the internal drainage layer, which leads to increased seepage forces; and (3) not accounting for moisture at the geomembrane and compacted clay liner interface (which weakened the interface) due to both rain falling on the compacted clay liner surface during construction and freeze-thaw effects.

Given that slope stability is a critical issue in the design and eventual performance of a final cover system, EPA has adopted a new criterion in the performance standard that all closures must meet: The owner or operator must ensure that the CCR unit is closed in a manner that will ''provide for major slope stability to prevent the sloughing or movement of the final cover system during closure and throughout the post-closure care period.'' See § 257.102(d)(1)(iii). Or in other words, the owner or operator must design a final cover system with any measures necessary to ensure that the major slopes of the closed CCR unit remain stable. Consistent with the proposal, the closure plan must discuss how the final cover system will achieve the performance standards specified in the regulation, which will necessarily include how the measures taken to address major slope stability. As explained in the proposed rule, the original provision was based on existing MSHA standards, specifically the requirements under 30 CFR 77.216–5 which apply to abandoned water, sediment or slurry impoundments and impounding structures.[121] 75 FR 35208–09. Under these requirements major slope stability includes long term stability considerations, such as ''erosion control, drainage, etc.'' These issues are equally relevant to the closure of CCR units, and EPA expects facilities to account for these factors in their final closure plans.

The remaining information elements of the closure plan have been adopted without revision (although EPA has reorganized the final regulatory text for greater clarity). These are briefly summarized below:

a. An estimate of the largest area of the CCR unit ever requiring a final cover during the active life of the CCR unit. If

[120] USEPA, ''Assessment and Recommendations for Improving the Performance of Waste Containment Systems,'' EPA/600/R–02/099, December 2002.

[121] The term ''abandoned'' is defined in the MSHA regulations under 30 CFR 77.217, and as applied to an impoundment or impounding structure such term means that work on the structure has been completed in accordance with a plan for abandonment approved by the District Manager.

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the owner or operator routinely closes portions of a CCR unit as the design capacity is reached, the closure plan should indicate the largest area of the CCR unit that will be open (and requiring a final cover) at one time.

b. An estimate of the maximum inventory of CCR ever on-site over the active life of the CCR unit. If the owner or operator routinely closes portions of a CCR unit as the design capacity is reached, the closure plan should indicate the maximum inventory of CCR that will be open (and requiring a final cover) at one time.

c. A description of the final cover and the procedures to be used to install the final cover. The closure plan should also discuss how the closure performance standard will be achieved.

d. A description of the provisions to preclude the probability of future impoundment of water, sediment, or slurry. The final grades of the final cover system should promote surface water run-off and minimize erosion. The closure plan should also discuss the steepness of the slopes of the final cover system, in addition to the vertical spacing and width of benches.

e. A schedule for the implementation of the closure plan.

This rule also provides new procedures for amending an existing written closure plan. While the proposed rule did not specifically allow or require the owner or operator to revise an existing closure plan, EPA recognizes that available information and conditions known at the time the closure plan is prepared may very well change during the active life of the CCR unit, which could be decades in some cases. In order to eliminate any potential confusion over whether an owner or operator is allowed under this rule to revise the closure plan to reflect a change in conditions or circumstances, the final rule adopts new procedures for amending a written closure plan. These new procedures allow the owner or operator to revise the closure plan at any time provided the revised plan is placed in the facility's operating record, in addition to complying with all of the notification and posting requirements under the rule. Furthermore, the final rule requires the closure plan be amended any time there is a change in conditions that would substantially affect the written closure plan in effect.

Finally, in a departure from the proposed rule, the final rule provides owners and operators one year from the rule's effective date to prepare the initial written closure plan, which is one year longer than proposed. EPA made this change as part of its effort to coordinate the compliance and implementation timeframes in the CCR rule with another Agency rulemaking—the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category (ELG) rulemaking—that may affect owners and operators of CCR units. See 78 FR 34442. As explained in that proposal, consistent with RCRA section 1006(b), EPA has sought to effectively coordinate any final RCRA requirements with the ELG requirements, to minimize the overall complexity of these two regulatory structures, and to facilitate the implementation of engineering, financial and permitting activities. EPA's goal is to ensure that the two rules work together to effectively address the discharge of pollutants from steam electric generating facilities and the human health and environmental risks associated with the disposal of CCRs, without creating avoidable or unnecessary burdens.

EPA proposed to require facilities to complete a closure plan by the rule's effective date, or six months following the rule's publication. However, this would have required owners or operators to prepare closure plans approximately three months prior to publication of the ELG final rule. Given that an understanding of the ELG rule would likely affect the details and content of a closure plan, the Agency concluded that it would make no sense to require an owner or operator to prepare a closure plan within six months, only to have them update it months later, after the owner or operator understands the requirements of both the CCR and ELG final rules. No measureable environmental or health benefit would be gained by having a closure plan in place for those three months. Moreover, EPA wants to ensure that closure plans are well considered, and the knowledge that a plan may need to be substantially revised in the near future could create a contrary incentive.

By extending the deadline for preparation of the closure plan by one year, owner or operators will have slightly more than six months after the ELG rule is published to complete a closure plan. This is consistent with the six month timeframe EPA originally proposed, which as noted, would have required completion of the closure plan within six months of publication of the final CCR rule.

2. Closure of a CCR Unit Through Removal and Decontamination

The proposed rule would have allowed facilities to close a CCR unit either through CCR removal and decontamination of all areas affected by releases from the CCR unit (''clean closure'') or with CCR in place with a final cover system. The Agency proposed that if the owner or operator elects to clean close a CCR unit, CCR removal and decontamination are complete when constituent concentrations throughout the CCR unit and any areas affected by releases from the CCR unit do not exceed the numeric cleanup levels for those constituents found in CCR established by the state in which the CCR unit is located, to the extent that the state has established cleanup levels. 75 FR 35208. In the absence of state cleanup levels, the proposal stated that metals should be removed to either statistically equivalent background levels, or to maximum contaminant levels or health-based numbers. Once a facility had completed clean closure of a CCR unit, EPA proposed that post-closure care would not be required for that unit. EPA also noted that it was considering whether to adopt a further incentive for clean closure, under which the owner or operator could remove the deed notation required under the proposed rule, once all CCR has been removed from the facility and notification provided to the state.

Several commenters urged EPA to not require clean closure as the only method of closing a CCR unit, arguing that clean closure is not feasible or not necessary. Others acknowledged that clean closure is not only a viable option for their CCR units, but in some cases it would be ''the only prudent closure option.'' A few commenters suggested criteria to determine the conditions under which clean closure would be appropriate. For example, one commenter agreed with EPA that the risk-based corrective action process (RBCA) would be useful in determining whether waste removal is appropriate at the site.

EPA received relatively few comments on the specific standards for conducting clean closure. One commenter identified six criteria that should be included in any final regulation in order to allow a facility to have been deemed to have completed clean closure of a CCR surface impoundment and thereby avoid post-closure care. Some of the commenter's suggestions were comparable to requirements in the proposal. However the commenter also included requirements to ensure that adequate engineering controls were used to prevent contamination of soil and groundwater during excavation, and requirements for quarterly monitoring of shallow groundwater beneath the surface impoundment for a period of five years to demonstrate that no residual CCR was left in place. Finally, a number of commenters supported a provision that would allow the owner or operator to remove the deed notation required provided all CCR is removed from the site.

EPA did not propose to require clean closure nor to establish restrictions on the situations in which clean closure would be appropriate. As EPA acknowledged in the proposal, most facilities will likely not clean close their CCR units given the expense and difficulty of such an operation. Because clean closure is generally preferable from the standpoint of land re-use and redevelopment, EPA has explicitly identified this as an acceptable means of closing a CCR unit. However, both methods of closure (*i.e.,* clean closure and closure with waste in place) can be equally protective, provided they are conducted properly. Thus, consistent with the proposal, the final rule allows the owner or operator to determine whether clean closure or closure with the waste in place is appropriate for their particular unit. EPA agrees that the RBCA process, using recognized and generally accepted good engineering practices such as the ASTM Eco–RBCA process, can be a useful tool to evaluate whether waste removal is appropriate at the site. It is, however, not a necessary prerequisite.

EPA has adopted the provisions governing clean closure from the proposed rule with only one revision. The final provisions consist of two performance standards: First, the owner or operator must remove all CCR from the unit and decontaminate all areas affected by releases from the CCR landfill or surface impoundment. As part of meeting this performance standard, the final rule requires facility owners or operators to remove all wastes from the closing unit, and remove all liners contaminated with CCR waste and CCR waste leachate. The final rule also requires the owner or operator to remove and decontaminate all areas affected by releases from the CCR unit. This would require removal or decontamination of the underlying and surrounding soils and flushing, pumping, and/or treating the aquifer. The Agency interprets the term ''soil'' broadly to include both unsaturated soils and soils containing groundwater.

Second, the final rule specifies that closure has been completed when all CCR in the unit and any areas affected by releases from the CCR unit have been removed and groundwater monitoring demonstrates that all concentrations of the assessment monitoring constituents listed in appendix IV to part 257 do not exceed either statistically equivalent background levels or MCLs. This standard encompasses both saturated and unsaturated soils, as well as the groundwater. As part of attaining this standard, facility owners and operators will need to document that any contaminants left in the subsoils (*i.e.,* contaminated groundwater left in soils below the former landfill or impoundment) will not impact any environmental media including groundwater, surface water, or the atmosphere in excess of Agency-recommended limits or factors. Typically, any metals in these ''subsoils'' in excess of background levels are allowed to either naturally attenuate, or are removed by flushing. Once the facility has removed all of the assessment monitoring constituents listed in appendix IV down to background levels or MCLs the groundwater is considered to be ''clean'' and closure is complete.

EPA disagrees that specific provisions requiring the use of adequate engineering controls to prevent contamination of soil and groundwater during excavation are necessary to ensure that closure will be protective. To the extent that any contamination of soil or groundwater has occurred during CCR removal, this would constitute a release (or an ''area affected by a release'') from the CCR unit, and the final performance standard requires the facility to ensure that this has been removed before closure is deemed to be complete.

Contrary to the commenter's suggestion that quarterly monitoring for five years is necessary to demonstrate that no residual CCR was left in place, the rule requires a facility to document that all appendix IV concentrations are below MCL or background levels for two consecutive sampling events, using the statistical procedures in § 257.93(g). This is the same sampling required to demonstrate under the groundwater monitoring program that there is no longer a reason to suspect a source of contamination, and that consequently assessment monitoring can cease. EPA selected these provisions as the most factually analogous to the circumstances surrounding the clean closure of a CCR unit. Once a facility has removed the waste and any liner, the presumption is that the source of contamination has been removed as well. Although there may be site-specific factors that could support the need for a longer monitoring period, there is no factual basis to require a longer minimum period of sampling on a national basis.

This represents a change from the proposal. EPA proposed a performance standard that required decontamination to either any state established numeric cleanup levels for CCR constituents, or in the absence of state cleanup levels, the removal of metals to either statistically equivalent background levels, or to MCLs, or health-based numbers. This was taken directly from the current part 258 standards for MSWLFs. EPA has deleted both of these standards as inappropriate for these units.

The reference to state established clean up levels was inadvertently carried over from the existing part 258 regulations. As explained throughout this preamble, EPA is unable to rely on state programs to establish the specific standards under this rule; the record does not contain information on all state cleanup standards, and there is no mechanism for states to operate approved programs in lieu of federal programs.

EPA determined that the requirement to clean all soils to background levels was equally inappropriate. In practice, EPA does not routinely require complete removal of all contamination (that is, cleanup to 'background') from a closing unit even for hazardous waste units. Requiring CCR units to clean up soils to levels before the site was contaminated, would be more stringent than current hazardous waste policies. There is no basis in the current record to impose provisions for the remediation of CCR units that are more stringent than those imposed on hazardous wastes.

Upon completion, the unit is exempt from the groundwater monitoring and any other post-closure care requirements. In addition, the final rule adopts the proposal to allow the owner or operator to remove the deed notation required under § 257.102(i)(4), upon certification that clean closure has been completed. EPA proposed this option to create a further incentive for clean closure, and it is clear from the commenters, who uniformly supported this option, that it does so. Some commenters raised concern about the effect this option will have on state laws, which may not allow the deed notation to be removed. EPA notes that these criteria do not preempt state laws; to the extent state law requires the facility to retain a deed notation despite the completion of clean closure, those requirements will remain in place, notwithstanding this final rule.

3. Closure of a CCR Unit With CCR in Place

The proposed rule would have also allowed facilities to close a CCR unit by leaving the CCR in place and installing a final cover system. The final cover system would have been required to be designed and constructed to a have a permeability less than or equal to the permeability of any bottom liner system or the natural subsoils present, or a permeability no greater than 1×10^{-5} centimeters per second (cm/sec), whichever is less. The proposal would have also required an infiltration layer that contains a minimum of 18 inches of earthen material and an erosion layer containing a minimum of six inches of earthen material that is capable of sustaining native plant growth to help minimize erosion of the final cover. These proposed requirements were generally modeled after the performance standard and technical requirements contained in § 258.60 for MSWLFs. 75 FR 35208. EPA also proposed that the final cover system would have to be designed to minimize the disruption of the final cover through a design that accommodates settling and subsidence and provides for major slope stability to prevent the sloughing of the closed CCR unit over the long term. These last two criteria are based on existing requirements for interim status units under RCRA part 265 and MSHA requirements under 30 CFR part 77, subpart C, respectively.

As proposed, CCR surface impoundments would have been subject to an additional set of performance standards. The owner or operator of a CCR surface impoundment would have been required to either drain the CCR unit or solidify the remaining wastes. In addition, the owner or operator would have been required to stabilize the wastes to a bearing capacity to support the final cover. The proposed criteria would also have required that the final cover for all CCR units be designed to minimize the migration of liquids through the closed CCR surface impoundment over the long term; promote drainage, and accommodate settling and subsidence so that the final cover's integrity is maintained. Finally, closure of the CCR unit would also have been subject to the general performance standard that the probability of future impoundment of water, sediment, or slurry be precluded.

The Agency also proposed to allow owners or operators of CCR units to select an alternative final cover design. As proposed, the alternative final cover design would have required an infiltration layer that achieves an equivalent reduction in infiltration, and an erosion layer that would provide equivalent protection from wind and water erosion, as the infiltration and erosion layers specified for final covers described above. In addition, the proposed approach for alternative final cover designs would have also required certification by an independent registered engineer, notification being provided to the state that the alternative final cover design has been placed in the facility's operating record, and placement of the alternative final cover design on the owner or operator's publicly accessible Internet site.

a. Final Cover System Design

EPA received comments supporting the proposed approach, while other commenters opposed the proposed final cover system design requirements. One state commenter generally supported using the part 258 final cover design requirements as a general model for CCR units. This commenter also requested that the Agency clarify whether new CCR units would be required to install a composite final cover system given that it was proposed that new CCR units would be required to designed and constructed with a composite bottom liner. Another state indicated that its state regulations allow final cover designs similar to that proposed by EPA, although the state requires a 24 inch infiltration layer and a 12 inch erosion layer. Another commenter referenced current research showing that soil-only covers may not be effective in minimizing infiltration over the long term under certain climates. This commenter recommended that a geomembrane should be made a standard component of the cover system. Other commenters stated that the final cover system should be a composite system consisting of a synthetic component and a low permeability clay component. A state commenter offered that post-closure maintenance of composite cap system incorporating a geomembrane has been challenging in that state. Another commenter stated that a compacted clay liner should not be used as a final cover for landfills due to the potential for settlement cracking, desiccation cracking, and root and animal penetration. Instead, it was suggested that if a single barrier system is used, then a benefit-cost analysis favors a geomembrane, and if a composite barrier is to be used, a benefit-cost analysis favors a composite system of a geomembrane and geosynthetic clay liner.

The Agency also received many comments on the proposed approach to allow the use of alternative final cover systems. Most commenters supported allowing the use of alternative covers. One commenter stated that the use of geosynthetic clay liners in lieu of 18 inches of earthen material for the infiltration layer is a commonly accepted for cover systems for MSWLFs. This commenter also noted that that geosynthetic clay liners have documented permeability characteristics on the order of 1×10^{-9} cm/sec. Another commenter supported allowing the use of alternative cover systems because a one-size-fits-all approach is not appropriate for final cover system designs. A state also offered that appropriately designed alternative final covers such as capillary barrier covers and evapotranspiration covers are being successfully used at facilities in the state.

After considering comments received regarding final covers, the Agency is essentially finalizing the approach in the proposed rule with minor revisions. The final rule allows owners or operators to use a final cover system consisting of an infiltration layer and an erosion layer, provided the infiltration layer has a permeability less than or equal to the bottom liner or natural subsoils. However, regardless of the bottom liner or natural subsoils present, the final cover must have a permeability no greater than 1×10^{-5} cm/sec.

To address the commenters' concerns that the final cover system may not function effectively as designed over the long term under certain circumstances, the rule also includes a performance standard that any final cover system must meet. This standard is modeled after the closure performance standard applicable to interim status hazardous waste units under § 265.111. The final rule requires that any final cover system control, minimize or eliminate, to the maximum extent practicable, post-closure infiltration of liquids into the waste and releases of leachate (in addition to CCR or contaminated run-off) to the ground or surface waters. Thus, a facility must ensure that in designing a final cover for a CCR unit they account for any condition that may cause the final cover system not to perform as designed. This could include accounting for site conditions that may increase the likelihood that a cover would be susceptible to desiccation cracking or settlement cracking. Under this performance standard, if the cover system results in liquids infiltration or releases of leachate from the CCR unit, the final cover would not be an appropriate cover. The final rule requires the final cover system design to be certified by a qualified professional engineer that the design meets both the performance standard and cover system criteria.

The final rule does not require the use of composite final covers, such as a geomembrane underlain by a compacted soil infiltration layer. This is also the case in situations for a CCR unit that is designed with a composite bottom liner or if the permeability of the soil underlying the unit is comparable to the permeability of a geomembrane. As EPA has concluded for municipal solid waste landfills, in certain site-specific situations it may be possible to construct an infiltration layer that achieves an equivalent reduction in infiltration without matching the permeability in the bottom liner material. 62 FR 40710.

Nonetheless, in certain locations, composite cover systems may be necessary to achieve the rule's performance standards. EPA acknowledges that under certain circumstances issues can arise with compacted clay barriers, particularly when used alone. These can include desiccation, freeze-thaw sensitivity, and distortion due to total and differential settlement of the underlying wastes. These issues can generally be addressed through proper maintenance of the cover system; and in fact the final rule requires as part of post-closure care that the owner or operator maintain the integrity and effectiveness of any final cover, including making repairs to the final cover to correct the effects of settlement, subsidence, erosion, or other events, and preventing run-on and run-off from eroding or otherwise damaging the final cover. Consequently, EPA is not mandating the installation of a composite liner system.

However, fewer problems are typically seen with the use of composite cover systems. And while ongoing oversight and proper maintenance is necessary to ensure the efficacy of any cover system, less effort is generally involved to ensure the continued performance of a composite cover system. EPA therefore generally recommends that facilities install a composite cover system, rather than a compacted clay barrier, as the composite system has often proven to be more effective (and cost effective) over the long term. For these reasons, EPA also anticipates that composite cover systems will be recommended in many circumstances by qualified professional engineers.

The final rule also allows the use of an alternative final cover. The rule requires that the alternative final cover must include infiltration and erosion layer that achieve equivalent performance as the minimum designs specified for final cover systems as discussed above. As discussed in the proposed rule, EPA included this provision to increase the flexibility for an owner or operator of a CCR unit to account for site-specific conditions. Moreover, these provisions will provide an opportunity to incorporate future technology improvements that would be missed if the rule required prescriptive design measures. In addition, these requirements would not supersede more stringent state requirements. Thus, if a state either has more prescriptive or more stringent standards in its state regulations applicable to CCR units, those state requirements would control any final cover system or alternative final cover system design.

While the rule provides the owner or operator flexibility in selecting the final cover for the unit, EPA remains concerned about the lack of guaranteed state oversight on final cover selection. A final cover system that does not perform as designed may result in unacceptable infiltration of water into the closed CCR unit that may lead to leachate and releases from the unit. To address this concern, as well as the concerns raised by commenters regarding the long-term performance of certain cover systems by providing further assurance that the final cover system will perform over the long term, EPA has deleted the proposed provision that would have allowed owners or operators to shorten the length of the post-closure care period. As discussed in Unit M.9 below, the final rule requires facilities to conduct post-closure care for all CCR units for 30 years.

b. Performance Standards When Leaving CCR in Place

EPA received no significant comments on the proposed performance standards. The Agency is therefore finalizing these requirements without revision from the proposal (although EPA has reorganized the final regulatory text for greater clarity). The performance standards are summarized below:

i. As discussed in the previous section, the CCR unit must be closed in a manner that will control, minimize or eliminate, to the maximum extent practicable, post-closure infiltration of liquids into the waste and releases of CCR, leachate, or contaminated run-off to the ground or surface waters.

ii. The CCR unit must be closed in a manner that will preclude the probability of future impoundment of water, sediment, or slurry.

iii. The CCR unit must be closed in a manner that will provide for major slope stability, which is discussed is Unit M.1 of this document for closure plans above.

iv. The CCR unit must be closed in a manner that will minimize the need for further maintenance of the unit.

v. The CCR unit must be closed in the shortest amount of time consistent with recognized and generally accepted good engineering practices. The Agency added this performance standard to be consistent with the final provisions applicable for the timeframes for initiating and completing the closure of CCR units.

4. Timeframes for Closure

The Agency proposed that closure of a CCR landfill or CCR surface impoundment must be initiated by the owner or operator no later than 30 days following the known final receipt of CCR. To address concerns about ''inactive'' or abandoned units, the proposed rule also provided that a CCR unit must initiate closure no later than one year after the most recent receipt of CCR if the CCR unit had remaining capacity and there was a reasonable likelihood that the CCR unit would receive additional CCR (*i.e.,* the rule would have forced the facility to close the CCR unit). See 77 FR at 35209 and proposed § 257.100(j). In addition, the proposed rule would have required an owner or operator to complete closure activities within 180 days of initiating closure. See proposed § 257.100(k). Thus, the maximum amount of time a facility would have had to initiate and complete closure of a CCR unit was seven months.

While the existing closure criteria for MSWLFs allow the Director of an approved State to grant time extensions for closure (both to initiate and to complete closure) if steps are taken to prevent threats to human health and the environment from the unclosed unit, EPA proposed not to include similar provisions for owners or operators of CCR units. At proposal, the Agency believed that extending the closure deadlines was inappropriate because, in the absence of an approved state program, the owner or operator could unilaterally decide to extend the time for closure of a CCR unit, without any basis, or oversight by a regulatory authority. 75 FR 35209.

EPA received numerous comments in response to the proposed deadlines under the subtitle D proposed approach. Industry and state commenters stated that the proposed deadlines to begin and complete closure activities (30 and 180 days, respectively) are technically impracticable and simply too short for the vast majority of CCR units, especially for CCR surface impoundments to complete closure. Commenters stated that a 30-day deadline to initiate closure activities may not be workable in situations such as when there are construction limitations due to seasonal or climatic conditions, and should not be required in circumstances when a coal-fired generating unit is temporarily idled (*e.g.,* maintenance related outages or an outage corresponding with a CCR handling system conversion). Regarding the amount of time needed to close a unit, numerous commenters noted that it would be impossible to properly complete closure activities within the proposed 180 days at most CCR surface impoundments due to the length of time needed to dewater an impoundment and stabilize the wastes prior to constructing the final cover system. For example, commenters pointed out that dewatering of a surface impoundment alone can take several years to complete because impoundments can be hundreds of acres in size. One commenter provided information related to an ongoing CCR surface impoundment closure where the dewatering and ash stabilizing phases of closure took two years to complete. Commenters also stated that because a large number of CCR units will have to be closed during roughly the same timeframe, facilities may not be able to obtain the necessary specialized personnel, equipment, and materials (*e.g.,* clay or fill material, liner materials) to close multiple units simultaneously. This issue may be further complicated in locations where multiple facilities are competing for the same limited resources. Commenters further argued that adopting the same closure deadlines applicable to MSWLFs is not appropriate given differences in size, design, and operation (*e.g.,* CCR surface impoundments contain large volumes of water, MSWLFs typically close each component cell when it reaches its disposal capacity). As a result of these concerns, commenters recommended that EPA extend the deadlines both to commence and complete closure activities. The majority of the these commenters, however, urged EPA not to establish specific deadlines for closure and instead require facilities to close a CCR unit consistent with a closure plan approved by a state, or developed and certified by a qualified professional, such as a professional engineer.

In a subsequent NODA, the Agency solicited additional public comment on several different options to address these concerns. 78 FR at 46944–46. With respect to the deadline to initiate closure, EPA presented several examples of routine and legitimate circumstances in which CCR units would not receive CCR for periods longer than one year, even though the facility intended to continue to use the unit. For example, EPA discussed circumstances in which the facility alternates between two surface impoundments, only one of which is operational at a time. Once the impoundment has reached capacity, the facility dewaters the unit, and begins to send CCR to the second impoundment. Once the unit is dewatered, the CCR is excavated and disposed in an adjacent landfill. The time to fill these units has varied over the years as demand has fluctuated, but a typical time to fill a unit with CCR is two years, perhaps longer, during which the other unit is ''idle,'' in that it does not ''receive CCR,'' but it remains operational.

The Agency also solicited comment on a revised approach to the deadline to initiate closure. The approach entailed establishing a rebuttable presumption that if the CCR unit has not received waste within a particular period of time (*e.g.,* 18–24 months), the CCR unit would be considered inactive and unit closure would be required to begin within a specified time. However, if the facility could substantiate that there was a reasonable likelihood that the CCR unit would again receive CCR in the future and also was able to document certain findings, the owner or operator would not need to immediately commence closure of the CCR unit. In the NODA, EPA discussed several examples of situations that could support a demonstration that immediate closure of the CCR unit was not necessary. One example was if an owner or operator could document that a CCR unit had been dedicated to a temporarily idled coal-fired generating unit and there was a reasonable likelihood that CCRs would be disposed in the CCR unit once the coal-fired generating unit resumed operation. Another situation presented was a CCR unit dedicated to a coal-fired generating unit that was not burning coal at the time (*e.g.,* electricity was being generated with other fuels such as natural gas), but the facility needed the CCR unit following resumption of coal burning. A final example involved normal facility operations that include periods during which the CCR unit does not receive CCR for extended periods (*e.g.,* the alternating use of two CCR surface impoundments discussed above). As part of this approach, the Agency solicited comment on whether to limit the length of time an owner or operator can maintain an idle CCR unit.

With respect to the deadline for completing closure, EPA acknowledged in the NODA that different deadlines, at least for the larger CCR units, were warranted. Information that the Agency has obtained throughout the rulemaking confirmed commenters' claims that the timeframes originally proposed to complete closure of CCR surface impoundments will be practicably infeasible for the larger impoundments. However, the Agency cautioned that any ultimate timeframe provided in the rule that would be practicable for the largest CCR units would be far too long to justify as timeframes for closure of the smaller impoundments. EPA explained that it intended to examine available closure plans for CCR surface impoundments to determine whether there are consistent timeframes or other factors that EPA could adopt as part of the regulations. EPA specifically identified two closure plans of CCR units that were scheduled to close as a possible source of useful information. These plans projected that closure would take multiple years to complete for modestly-sized CCR surface impoundments (*i.e.,* less than 50 acres).

a. Deadlines To Initiate Closure

In response to the NODA, most utility commenters stated that the time to initiate closure should be tied to reasonable triggers that account for the diverse uses of CCR surface impoundments and CCR landfills. In particular, these commenters recommended that closure not be initiated for an idled CCR unit if the CCR unit was expected to receive additional waste in the future, whether CCR or any other waste the unit may be authorized to manage. These commenters also supported the scenarios EPA described in the NODA as examples of legitimate situations that could warrant delaying the immediate closure of a CCR unit. Many of these commenters generally agreed that the rebuttable presumption alternative discussed in the NODA could be an appropriate approach for closure, in particular for CCR units not covered by a state-approved operating plan, provided the regulatory approach would be implemented in a manner that did not restrict other legitimate uses of the CCR unit. Many of these commenters also asserted that a limit on the length of time a CCR unit can remain idle is not practical because the owner or operator will not be able to predict with any degree of certainty how long a CCR unit will be idled. Several of these commenters also urged EPA to specify in the final rule what EPA intended by the phrase ''initiation of closure;'' that is, that EPA define the activities or actions the owner or operator must take by the deadlines specified in the rule.

A trade organization and other commenters warned that strict restraints on the initiation (and completion) of closure of CCR units would pre-empt opportunities for reclaiming CCR from these CCR units for beneficial use of CCR. These commenters recommended that the final rule create meaningful incentives for the beneficial use of CCR already in CCR units which will become unavailable to reclamation once a final cover system is put in place. For example, one commenter suggested that an incentive could be deferring deadlines for closure of a CCR unit if an owner or operator reduces its net tonnage by a set amount, such as 10,000 tons per year, if the CCR is beneficially used. EPA also received comments from several states that generally supported the rebuttable presumption concept. One state supported a longer rebuttable presumption time period of three years that could be extended if approved by the state on a case-by-case basis.

After consideration of all of the public comments, the Agency is adopting an approach that largely mirrors the approach outlined in the NODA. Closure of a CCR unit is triggered in one of three ways. The first is upon the known final receipt of waste (CCR or otherwise), or when an owner or operator removes the known final volume of CCR from the CCR unit for the purpose of beneficial use of CCR. Under these scenarios, the final rule requires an owner or operator to commence closure of the CCR unit within 30 days of such known final receipt or known final volume removal, whichever date is later.

The second way closure can be triggered relates to ''idled'' CCR units. This applies to situations in which the CCR unit has remaining disposal, treatment, or storage capacity, or there has been a temporary pause in the removal activities of CCR from the CCR unit. In these situations, the rule establishes a presumption that the owner or operator must initiate closure of the CCR unit no later than two years after the most recent receipt of CCR or any non-CCR waste stream, or no later than two years after the most recent date that CCR was removed from the CCR unit for the purpose of beneficial use, whichever date is later. The rule, however, provides procedures for an owner or operator of the CCR unit to rebut this presumption and obtain additional time, provided the owner or operator can make the prescribed demonstrations.

The final way closure is triggered is when a CCR unit fails to meet certain of the technical criteria. Specifically, an owner or operator may be compelled to close a CCR unit in the following circumstances: (1) If the CCR unit has been sited inappropriately; *i.e.,* cannot meet the applicable location criteria; (2) if an unlined CCR surface impoundment is found to contaminate groundwater in excess of a groundwater protection standard; or (3) if a CCR surface impoundment cannot demonstrate the minimum factors of safety regarding structural integrity of the CCR unit. When closure is triggered under these circumstances, the owner or operator must initiate closure of the CCR unit within six months. Each of these is discussed in more detail below.

i. ''Known Final Receipt'' of CCR

Several commenters suggested that the rule not link the deadlines to initiate closure solely to when a CCR unit ceases to receive CCR. Many of these commenters provided information that CCR units also serve functions other than managing CCR, including the management of other wastes or water treatment. Thus, while there are periods of time that certain CCR units will receive both CCR and non-CCR wastes, there are also other times when the same CCR unit will only receive non-CCR wastes or perform other forms of active waste management in the unit, *e.g.,* specific water treatment functions. EPA agrees that these are legitimate waste management activities, and EPA is aware of no risks that would warrant cessation of such activities simply because the unit is no longer receiving CCR. Therefore, in response to these comments, the final rule no longer requires closure based solely upon the receipt of CCR. Instead, the final rule requires closure to be initiated after the CCR unit ceases to receive any waste or waste stream into the CCR unit. See § 257.102(e)(1) and (e)(2) in the rule.

The Agency also agrees with those commenters that supported delaying the commencement of closure of a CCR unit if substantial quantities of CCR are removed from the CCR unit for the beneficial use of the waste. This could include, for example, removal of CCR from a CCR unit followed by its use as a partial replacement for Portland cement. As discussed in Unit IV.B of this preamble, EPA has identified significant benefits from reducing the disposal volumes of CCR in CCR landfills and CCR surface impoundments, including reduced risks associated with the practice of CCR disposal, benefits from reducing the need to mine and process virgin materials, and energy and greenhouse gas benefits. EPA finds these potential benefits compelling and is therefore revising the closure requirements in the rule to accommodate the removal and beneficial use of CCR. EPA has therefore revised the rule to provide that closure of an otherwise idled CCR unit is not immediately triggered, as long as the owner or operator is removing substantial quantities of CCR from the unit. However, once removal of CCR for beneficial use is no longer taking place, the rule would require the owner or operator to initiate closure of the CCR unit. See § 257.102(e)(1) and (e)(2) in the rule.

After considering comments received regarding the specific timeframe by which closure must be initiated following known final receipt of wastes, the Agency is finalizing the 30 day timeframe from the proposed rule. Several commenters expressed concern that 30 days is too short because it does not account for the potential that weather or seasonal concerns may interfere or cause substantial delay. The Agency acknowledges that weather or seasonal effects can delay certain activities, but disagrees that the rule provision needs to be revised to account for those. This provision does not require that specific actions or activities must be initiated during this 30-day period. For example, the rule does not require the installation of the final cover system (or the commencement of removal of CCR from the CCR unit) necessarily begin within this 30-day period. Instead, the provision is more flexible; the owner or operator can initiate closure by taking other actions necessary to implement the closure plan that are not weather or seasonal dependent, such as turning off pumps supporting sluice lines or taking any steps necessary to comply with any state or other agency standards that are a prerequisite to initiating closure. Provided the owner or operator has started to take the measures to implement the closure plan that can be feasibly undertaken, the facility will have complied with this requirement.

The 30-day period remains equally appropriate under the wider provision that allows closure to be triggered either by the known final receipt of all wastes in the unit, or upon the known final volume removal of CCR for beneficial use of CCR. There are no facts unique to these circumstances that would necessitate an extension beyond the 30 day timeframe. Furthermore, as the terms ''known final receipt'' and ''known final volume removal'' suggest, the owner or operator has made the determination to cease managing waste in the CCR unit, or to cease removing CCR from the CCR unit for beneficial use purposes. This will likely occur in situations where the CCR unit is reaching its disposal capacity (or treatment capacity when the CCR unit is receiving non-CCR waste streams) or the owner or operator intends to close the CCR unit for other purposes (*e.g.,* the closing of a CCR surface impoundment following conversion to dry handling of CCR). Given that these situations can generally be anticipated and planned for in advance, EPA is not aware of circumstances that would prevent owners or operators from at least commencing closure within this 30-day period. In summary, the owner or operator must commence closure of the CCR unit with 30 days of known final receipt of CCR or any non-CCR waste stream, or within 30 days of known final removal of CCR for beneficial use, whichever date is later.

ii. Temporarily Idled Units

This situation involves CCR units with remaining CCR disposal or storage capacity (or treatment capacity for non-CCR waste streams) that may sit idle for extended periods of time (*e.g.,* potentially years at a time); however, the owner or operator intends to continue to maintain the idled unit to receive CCR or non-CCR waste streams in the future. EPA proposed that these CCR units could remain idle for up to one year, but that closure of the CCR unit would have to be initiated no later than one year after the most recent receipt of CCRs. See 75 FR 35252 (proposed § 257.100(j)). The majority of commenters claimed that one year was too short and would require the premature closure of CCR units that would be needed in the future. In response to these comments and new information documenting examples of legitimate circumstances in which CCR units were idled for more than one year, EPA solicited comment on a revised approach to establish longer timeframes to initiate closure for temporarily idled CCR units. As discussed previously, this approach entailed establishing a rebuttable presumption that if the CCR unit has not received waste within a specified period of time (*i.e.,* 18 months to two years), the CCR unit would be considered inactive and closure of the CCR unit would be required. However, this time could be extended beyond the 18 months or two years if the facility could substantiate certain findings. See 78 FR at 46945.

After considering comments received, the Agency is essentially finalizing the approach presented in the 2013 NODA. Specifically, in situations where the CCR unit has remaining disposal or storage capacity (or treatment capacity for non-CCR wastestreams) and there is a reasonable likelihood that the CCR unit will receive additional CCR or non-CCR waste in the future, the final rule allows the owner or operator to keep the CCR unit available for use for up to two years. However, if the CCR unit has not received CCR or any non-CCR waste within two years of the last receipt of CCR or any non-CCR waste, whichever date is later, the rule requires closure of the CCR unit unless the owner or operator can document that additional time is necessary to accommodate routine operations and legitimate waste management activities.

The Agency agrees that it is not necessary to require closure of temporarily idled CCR units after one year. Information in the record documents numerous examples of legitimate circumstances in which CCR units were idled for more than one year. In most of the examples provided CCR units are temporarily idled for periods that can last more than one year, but typically use of the CCR units resumes within approximately two years. Based on this information EPA has concluded that a two year timeframe before presumptively requiring closure of a CCR unit would be more consistent with current practice, and is better supported by the available information.

This same information documented that there can be situations in which a CCR unit is idled for longer periods of time (*e.g.,* a coal-fired boiler may be idled for years during which another fossil fuel is burned (*e.g.,* natural gas), and the CCR unit will be needed when the utility returns to coal burning. In order to obtain additional time beyond two years, the owner or operator must document in writing both that the CCR unit has remaining disposal or storage capacity and the facts that support a conclusion that there is a reasonable likelihood that the CCR unit will accept CCR or non-CCR waste in the foreseeable future. The facility would need to substantiate those findings, including the specific reasons the owner or operator believes ''that there is a reasonable likelihood that CCR will be disposed in the waste disposal unit.'' These findings would need to be certified by the owner or operator of the CCR unit.

The rule identifies examples of specific scenarios that would support a determination that there is a continuing need for the unit to support future waste management activities (*e.g.,* that the CCR will resume receiving CCR or non-CCR waste in the future). These are intended to be illustrative rather than an exclusive list; there may well be additional circumstances in which routine operations or legitimate waste management practices would support the necessary determination. The particular situations identified in the rule generally match those discussed in the NODA or reflect situations identified in public comments. Specifically, the rule identifies four particular circumstances: (1) Normal plant operations include periods during which the CCR unit does not receive wastes (CCR or non-CCR waste streams). This may include the alternating use between one CCR unit that receives CCR while dewatering or removing CCR from a second unit. (2) The CCR unit is dedicated to a coal-fired boiler unit that is temporarily idled (*i.e.,* CCR is not being generated) and there is a reasonable likelihood that the coal-fired boiler will resume operations in the future. (3) The CCR unit is dedicated to an operating coal-fired boiler (*i.e.,* CCR is being generated); however, no CCR is being placed in the CCR unit because the CCR is being entirely diverted to beneficial uses, but there is a reasonable likelihood that the CCR unit will again be used in the foreseeable future. (4) The CCR unit currently receives only non-CCR waste streams and those non-CCR waste streams are not generated for an extended period of time, but there is a reasonable likelihood that the CCR unit will again receive non-CCR waste streams in the future. As noted, a facility must substantiate these findings; it is not sufficient to merely repeat the words of the regulation and conclude that additional time is warranted.

The final rule allows an owner or operator to obtain additional two-year time extensions for as long as the owner or operator continues to be able to provide a factual basis to justify the need for additional time via a written demonstration. Because these idled units must continue to comply with all applicable technical requirements, including those for groundwater monitoring, corrective action, and structural stability, a fixed or definitive limit on the amount of time that a CCR unit can sit idle is not necessary.

In addition, the Agency agrees that the final rule should better define the actions or activities that constitute ''initiation of closure'' of a CCR unit. A clear definition will assist in the implementation and understanding of the rule. Commenters suggested a number of actions or activities, any one of which would be sufficient to show that closure of the CCR unit has been initiated. Examples provided by the commenters included the removal of CCR sluice lines; beginning the necessary permitting processes (*i.e.,* submitting a completed permit application); turning off pumps supporting the sluice lines; preparing a bid for contractors; or procuring capping materials such as clay or top soil.

The final rule specifies that closure has been initiated when the owner or operator takes two actions. The first action is that the owner or operator must have permanently ceased placing CCR and non-CCR waste streams in the CCR unit. As suggested by commenters, permanent removal of CCR sluice lines or inactivation of the pumping system supporting the sluicing operation would be evidence that placement of CCR and non-CCR waste streams has ceased. The second action is that the owner or operator must have taken steps to implement the written closure plan required by the rule. This second action would include submitting a completed application for any required state or agency permit or permit modification in order to implement closure of the CCR unit, or taking any steps necessary to comply with any state or other agency standards or regulations that are a prerequisite to initiating or completing the closure of the CCR unit. Once the owner or operator has completed both of these actions, closure of the CCR unit has been initiated for purposes of this rule. See § 257.102(e)(3) in this rule.

iii. Closure for Cause

Finally, the Agency is clarifying that the closure initiation timeframes specified above—the 30 day period for known final receipt or known final volume removal and the 2 year period for temporarily idled CCR units—do not apply to closures initiated for cause. As discussed elsewhere in the preamble, the final rule requires certain CCR surface impoundments and CCR landfills to close. The situations include: Unlined CCR surface impoundments whose groundwater monitoring shows an exceedance of a groundwater protection standard; existing CCR surface impoundments that do not comply with the location criteria; CCR surface impoundments that are not designed and operated to achieve minimum safety factors; and existing CCR landfills that do not comply with the location criteria for unstable areas. In these situations, the final rule specifies that the owner or operator must initiate closure activities within six months of making the relevant determination that the CCR unit must close.

b. Deadlines To Complete Closure

In response to the August 2013 NODA, many utility commenters stated that the time period to complete closure must be sufficiently flexible to account for the inherent uncertainties in predicting a closure schedule. These commenters pointed to potentially innumerable complications and circumstances beyond the control of the owner or operator that render it nearly impossible to predict with precision when the closure of a CCR unit will be completed. These commenters also believe it is impractical and unrealistic for the rule to subject the closure of CCR units to any type of fixed regulatory structure. They maintained their position from the proposed rule that it would be impossible to properly complete closure of most CCR surface impoundments within 180 days. Their recommendation is to allow closure timeframes to be governed by the a state-approved closure process, which would include the owner or operator developing and submitting a closure plan to the state and mechanisms for the state to verify and enforce compliance with all closure requirements, including the closure plan. Under this approach, the owner or operator's compliance with the requirements of the state-approved closure process (including following the closure plan, completing mitigation, etc.) would represent compliance with this rule's closure requirements. For CCR units not subject to a state-approved closure process, these commenters recommended that the owner or operator should demonstrate compliance with the CCR closure requirements by submitting a closure plan to the state that is certified by an independent professional engineer. In this case, because there is not direct state oversight and administration of the closure process, the timelines in the closure plan could be subject to a modified set of tiered timeframes for completing closure, provided owners or operators could demonstrate that more time is needed to close the unit on a case-by-case basis.[122] These commenters also opposed any closure approach with firm and inflexible timeframes because no single factor (*e.g.,* the acreage of the CCR unit or the volume of CCR in the unit) is determinative in all instances of how long it will take to complete closure of the CCR unit. Commenters also cautioned that pre-closure closure plans (and the closure schedules contained therein) may not be an actual reflection of the time it will take to close the unit due to unforeseen or variable conditions. Finally, these commenters also generally opposed the idea discussed in the NODA of petitioning the Agency for a site-specific rule to vary from a generally applicable deadline.

Many commenters described the numerous factors that could affect timeframes for closure of a CCR unit. Most comments were specific to CCR surface impoundments where closures are typically more complex as compared to CCR landfills due to the presence of water in impoundments. Factors most often cited by the commenters that may affect the time required to close a CCR unit included: (1) The size and volume of CCR in the unit; (2) the geotechnical characteristics of the CCR; (3) the type or design of the surface impoundment (*i.e.,* diked, incised, valley fill, and side hill); (4) the need to coordinate or obtain approvals from state permitting officials; (5) the availability of qualified engineers, contractors, and materials since closing a CCR unit is a specialized activity, especially given that many units may be required to close simultaneously; (6) climate and weather that can affect dewatering operations and the length of a construction season; (7) the time needed to obtain replacement disposal capacity for a closing unit that would ensure ongoing facility operations; and (8) dam safety considerations during closure. Many of commenters identified that the dewatering process (an early necessary step in the closure process) as being a site-specific issue, as the time that will be needed to dewater an impoundment can vary considerably depending on the type of CCR unit, the volume of CCR in unit, and the geotechnical properties of the CCR. Several commenters also cited that closure times for some CCR units will require substantial volumes of fill material to properly grade a closing surface impoundment to facilitate positive drainage from the closed unit. These commenters provided estimates on the volumes of fill material needed and showed that the earthmoving aspect of this step alone can take many years to complete in some cases.

Several state commenters generally supported the tiered closure alternative discussed in the NODA. However, these commenters urged EPA to include provisions in the rule to provide flexibility for closing units to demonstrate the need for additional time on a case-by-case basis.

i. Timeframes for Completing Closure

In the August 2013 NODA the Agency solicited comment on ways to establish categories of timeframes that would adequately account for the various factors that can affect the amount of

[122] The tiered timeframes for completing closure could be based on the size of the CCR unit (after obtaining necessary state and local approvals): (1) Within 3 years for an impoundment with an area less than 20 acres; (2) Within five years for an impoundment between 20 and 50 acres; (3) Within 8 years for an impoundment between 50 and 75 acres; (4) Within 10 years for an impoundment with an area of 75 acres or more; and (5) Within 180 days for a landfill. Under this approach, the owner or operator could demonstrate the need for additional time to close the CCR unit.

time needed to properly close a CCR surface impoundment. One approach discussed in the NODA was called the ''tiered approach'' that was based on comments received in response to the proposed rule. Under that approach, the final rule would establish fixed timeframes to complete closure that varied depending on the size of the impoundment (*i.e.,* surface area acreage). The Agency stated in the NODA that the concept of a tiered approach was appealing; however, the precise basis for the distinctions (*i.e.,* unit size cutoffs) and timeframes were not clear. EPA further explained its concern that factors other than size (*e.g.,* climate, geography, unit configuration) would also appear to be relevant, and that any timeframes should account for those other factors. EPA encouraged commenters interested in supporting a tiered approach to provide the rationale and data to support any suggested categories of timeframes. 78 FR 46946. Most commenters opposed the tiered approach by itself (*i.e.,* an approach without an accompanying process by which an owner or operator could obtain additional time due to site-specific circumstances) because they felt there simply are too many factors that can affect closure timeframes. These commenters concluded that basing closure timeframes on a subset of factors would not be appropriate. As one commenter noted, a 20 acre impoundment 10 feet deep can likely be dewatered and closed more quickly than a 20 acre impoundment 30 feet deep.

After considering comments and information available on closure timeframes, EPA has concluded that there are insufficient data and information to adopt the kind of tiered approach discussed in the NODA. EPA is convinced that the available information does not support an approach that would establish fixed and definitive timeframes for closure, based on a select subset of factors that distinguish between surface impoundments (*e.g.,* a 50 acre diked impoundment holding 500 acre-feet of CCR with a hydraulic conductivity of 1×10^{-5} centimeters per second located in a state in the southwest with a permitting program would be required to close in four and one-half years, while a 50 acre cross valley impoundment holding 1,500 acre-feet of CCR with a hydraulic conductivity of 1×10^{-6} centimeters per second located in a state in the upper midwest with a permitting program would be required to close in seven years, etc.). While information is available for surface impoundments on certain factors, such as the size and type of the unit and geographic information, the Agency has little to no data for a number of other key factors. For example, EPA has no information on the geotechnical properties of the CCR that can affect the time needed to dewater a unit, the volumes of clays, soils, and other materials that will be needed for closure, and information on the time needed to obtain state approvals (in accordance with state CCR programs) related to closure of a unit.

In discussing the tiered approach EPA noted that commenters had suggested that the largest CCR surface impoundments (*i.e.,* those having a surface area greater than 75 acres) should be subject to a site-specific deadline to complete closure. In the NODA, the Agency explained that a site-specific deadline may not be practicable unless the rule were to establish a ''variance'' process as part of the rule. 78 FR 46946. Under a variance approach, EPA would establish a specific deadline (*e.g.,* closure must be completed no later than five years from the date closure activities are initiated), but would allow facilities to petition EPA for a site-specific rule to establish an alternate deadline. In response to the NODA, some commenters expressed interest in such an approach, but other commenters found the approach not practicable since each owner or operator would need to petition the Agency for a site-specific rule. Some commenters believed that a site-specific rule process, which would necessarily involve a notice and comment process, would be an unwieldy process leading to unnecessary delays. The Agency agrees that this is also not a practical alternative to establish timeframes to complete closure.

Recognizing the numerous factors that can affect the amount of time needed to close an impoundment, many commenters suggested EPA not establish any type of fixed regulatory deadline for closure. Instead, these commenters recommended that the rule allow closure timeframes to be governed by a state-approved closure process. Under this process suggested by commenters, an adequate state-approved closure process would include one where the owner or operator developing and submitting a closure plan to the state and mechanisms for the state to verify and enforce compliance with all closure requirements, including the closure plan. Under the commenter's recommendation, compliance with the requirements of the state-approved closure process would not be compliance with the closure requirements of this rule. As discussed elsewhere in this preamble, under subtitle D of RCRA, the Agency cannot rely on the existence of a state permitting authority to implement the subtitle D requirements.

Some other commenters suggested EPA not establish any type of fixed regulatory deadline for closure in the rule, and instead rely on the closure plan developed and certified by a professional engineer. The Agency disagrees that this approach would meet the protectiveness standard of RCRA section 4004(a). CCR units present significant risks, and it is critical that facilities complete closure expeditiously—particularly those that are closing because they are structurally unsound or are contaminating groundwater. To be able to determine that the rule will be protective, the final rule must limit the discretion of individual facilities, many of whom may have significant incentives for delay, and avoid the potential for abuse. Moreover, in contrast to corrective action, where EPA was truly unable to establish an outer limit on the necessary timeframes—including even a presumptive outer bound—closures, while complex, do not vary to the same degree as site remediation actions. Consequently, as discussed later in this section, the available data were sufficient to support the establishment of definitive timeframes.

Most commenters, however, were generally supportive of an approach that would establish timeframes for closure, whether in a tiered-like approach (*i.e.,* timeframes for closure based on one or more characteristics of the unit) or under a ''rebuttable presumption'' approach, so long as the rule would provide the owner or operator a process or procedures to demonstrate the need for additional time. As explained in the NODA, such an approach could be implemented by establishing a presumption that facilities complete closure within a specified timeframe, such as five years, unless the facility could document that closure is not feasible to complete within the presumptive timeframe.

After consideration of all of the public comments, EPA is adopting an approach that takes elements from two of the alternatives discussed in the NODA: The concept of tiered timeframes based primarily on the size of the surface impoundment, and the concept of a rebuttable presumption. The final rule establishes a presumption that the owner or operator must complete the closure of a CCR surface impoundment within five years of initiating closure activities. For CCR landfills the presumption is that the owner or operator must complete closure within six months of initiating closure activities. The rule, however, provides procedures for an owner or operator to rebut either presumption and obtain additional time, provided the owner or operator can make the prescribed demonstrations. For CCR surface impoundments, the amount of additional time beyond the five years varies based on the size (using surface area acreage of the CCR unit as the surrogate of size) of the unit. For impoundments 40 acres or smaller, the maximum time extension is two years. For impoundments greater than 40 acres, the maximum time extension is five two-year extensions (ten years) and the owner or operator must substantiate the factual circumstances demonstrating the need for each two year extension. For a CCR landfill, the amount of additional time beyond the six months does not vary according to the size of the landfill, rather the maximum time extension is two one-year extensions (two years) for any CCR landfill. The owner or operator must substantiate the factual circumstances demonstrating the need for each one-year extension.

ii. CCR Surface Impoundment Timeframes

To develop these timeframes the Agency began by identifying the period of time in which most surface impoundments could feasibly complete closure. EPA intended this period of time to serve as the basis for the rebuttable presumption of the rule. As EPA recognized in the NODA, a timeframe that would be feasible for the largest units would grant more time than could be justified to complete the closure of smaller units. The closure of CCR units, and particularly the closure of CCR units that are compelled to close because they fail to comply with the rule's requirements (*e.g.,* are structurally unstable or are contaminating groundwater), needs to occur as expeditiously as is feasible. While these units (and particularly the larger CCR surface impoundments) are in the process of closing, they continue to present risks to human health and the environment. On the other hand a presumptive time period that is feasible for a small percentage of units would simply result in a greater number of facilities that would need to obtain time extensions. It is well established that the law cannot compel actions that are physically impossible, ''*lex non cogit ad impossibilia,*'' and it is incumbent on EPA to develop a regulation that does not in essence establish such a standard.

The available information shows that CCR surface impoundments can vary in size by orders of magnitude (*i.e.,* from less than one acre to nearly 1,000 acres). EPA evaluated the information on the size distribution of CCR surface impoundments in its database of survey results from EPA's 2009 Information Request.[123] Through this effort, EPA received a substantial amount of factual information from 240 facilities covering 676 surface impoundments, including surface area information on over 650 impoundments. The database of survey responses shows that the median surface impoundment is approximately 14 acres in size, 75 percent of impoundments are 50 acres or smaller, 80 percent of impoundments are 66 acres or smaller, and 90 percent of impoundments are 111 acres or smaller.

Available information on actual and projected timeframes needed to close CCR surface impoundments of varying sizes (using surface area as the surrogate for size) is summarized below. Much of this information came from public comments from utilities. The largest CCR surface impoundment in this data set that has actually completed closure is a 40-acre unit that closed over a period of approximately five years (*i.e.,* the surface impoundment at PPL Corporation's Martins Creek Power Plant).[124] This facility closed with waste in place, and included installation of a final cover system. According to the facility, this CCR unit ceased receiving wastewater in January 2008, and the closure work began with dewatering the unit and preparing the revised closure plan and permit modification applications. Installation of the final cover, in addition to final soil grading and seeding of the unit was completed in spring 2012. By early 2013, all remaining closure actions were completed and state regulators issued final approvals in July 2013. EPA gave substantial weight to this information because (1) it was a CCR surface impoundment—the units of greatest relevance to the issue at hand; (2) the closure was recently completed, and so would accurately reflect current and available engineering practices; and (3) the facility actually completed closure of the unit. See EPA–HQ–RCRA–2012–0028–0103 and EPA–HQ–RCRA–2012–0028–0113.

As another example, American Electric Power (AEP) provided some information on the recent closure of a CCR surface impoundment in 2013. This 21-acre unit had been inactive for several years and was closed over the course of two construction seasons. The impoundment was closed by leaving CCR in place and installing a composite cap, in addition to the installation of hydraulic appurtenances to control the design storm events. See EPA–HQ–RCRA–2012–0028–0067.

Cleco Corporation provided planned closure timeframes contained in existing permits for its CCR surface impoundments. For three of its CCR surface impoundments, which in aggregate totaled 66 acres, Cleco Corporation estimated that it could take approximately one year to complete closure, which would be accomplished by leaving CCR in place and installing a final cover system. Cleco Corporation also estimated that it would take approximately nine months to complete closure of two additional CCR surface impoundments, with an aggregate acreage of 5.5 acres, by removing CCR from the CCR units, (*i.e.,* clean closure of the units). Information on the size of any of the five CCR units was not provided, which complicates the Agency's ability to assess the closure of any of the individual CCR units. In addition, the time period appears to begin when dewatering operations are initiated and the comments do not discuss how much time may be needed to obtain any necessary approvals from the state prior to commencing closure activities. See EPA–HQ–RCRA–2012–0028–0106.

Similarly, Xcel Energy stated in its comments to the NODA that it closed four CCR surface impoundments at its Northern States Power of Minnesota's Minnesota Valley Plant by removing all of their contents. See EPA–HQ–RCRA–2012–0028–0079. While the commenter did not provide any information on the time needed to close the four CCR units, other information available to the Agency indicated that closure took place sometime after May 2009 and was completed prior to September 2013. Based on information obtained from Xcel Energy in response to EPA's request for information from May 2009, the four CCR units at the Minnesota Valley Plant each have a surface area less than one acre. In addition, the response to the information request showed that one CCR surface impoundment was nearly full of ash, a second was more than half full, and the final two CCR units were less than one quarter full.

In the August 2013 NODA, the Agency solicited comment on a draft plan to close two CCR surface

[123] More information on EPA's Information Request, including a data base of survey responses, can be accessed at *http://www.epa.gov/epawaste/nonhaz/industrial/special/fossil/surveys/index.htm.*

[124] EPA included information on the planned closure of this CCR surface impoundment in the NODA. 78 FR 46945. The closure plan estimated that the closure process would take approximately three years to complete.

impoundments at Santee Cooper's Grainger Generating Station in South Carolina. 78 FR 46945. The plan estimated that closure of the two CCR units, approximately 42 and 39 acres in surface area, could be accomplished during a three year period. This original estimate was based on closing the unit with waste in place and installing a final cover. However, Santee Cooper has since amended its draft plan and is now pursuing closure by removal of CCR and transport off-site for either disposal or beneficial use.[125] The revised draft envisions the complete removal of CCR from both CCR units and also one foot of underlying soil beneath the units. In total, the draft closure plan estimates that approximately 1.3 million cubic yards of CCR and underlying soil will be removed from both units—approximately 900,000 cubic yards from one unit and 400,000 cubic yards from the second—over a period of six to ten years.

The Florida Electric Power Coordinating Group (FCG) claimed that, based on FGC member experience, closing a 30 acre CCR surface impoundment is expected to take approximately two years to complete, but provided no additional information or details. See EPA–HQ–RCRA–2012–0028–0064.

The Utility Solid Waste Activities Group (USWAG) provided another projected closure schedule for a 20 acre CCR surface impoundment operated by Luminant. This facility was in the process of closing the unit when the comments were prepared. The schedule estimated that completion of all closure activities, would take approximately 45 months (3 years, 9 months) to complete. However, the commenter also states that, when complete, the ''full closure period will take approximately 84 months (seven years) due to the unique circumstances of that closure.'' No other information was provided on this closure to explain the ''unique circumstances'' that warrant such an extended period of time. See EPA–HQ–RCRA–2012–0028–0113.

There is other information in these data that indicates that larger impoundments may be able to complete closure within approximately the same timeframes as smaller units. For example, the data included the projected closure of a 100-acre CCR surface impoundment over a four and one-half year period, which seems to indicate that larger units may be able to close in approximately the same period of time. However, the Agency gave substantially less weight to this information for a number of reasons. Most critically, this information merely demonstrated projected timeframes for CCR surface impoundments, not actual timeframes that had been achieved. In addition, for some of these data, it was unclear whether the circumstances that allowed for completion within this timeframe were generally applicable to the majority of CCR surface impoundments. In one instance, the commenter noted that the time to complete closure was shorter than would normally be expected because the impoundment was being closed well before it reached full capacity and because water in the impoundment could be pumped into an adjacent impoundment. The commenter also noted that the impoundment had been built with a leachate collection system to facilitate dewatering at closure. See EPA–HQ–RCRA–2012–0028–0113.

Moreover, the majority of commenters claimed that it would take substantially longer than five years to close the largest impoundments. For example, USWAG stated that one of its members obtained ''approval for a closure plan for a 343-acre surface impoundment that provided for a twelve-year closure period to ensure adequate time to complete dewatering of the impoundment, assure the stability of the dewatered CCRs, and uniformly construct the slope of the final cover materials.'' No other information was provided on this closure example. See EPA–HQ–RCRA–2009–0640–10483. USWAG also provided information on the closure of the CCR surface impoundment at First Energy's Little Blue Run Disposal Area. This 950 acre surface impoundment, which is the largest CCR surface impoundment in the country, has a projected closure period of 15 years.

Similarly, to illustrate the time required simply for earthmoving operations to close a large CCR surface impoundment (in their example, 350 acres), Duke Energy Corporation estimated that the time needed in the schedule to deliver and place the necessary volume of materials for construction of the final cover and the sub-base to the cover system could take between nine and 12 years. This estimate is based on the need for approximately 10 to 11 million cubic yards of fill to construct and shape the sub-base of the final cover and the cover system itself that would require nearly 500,000 truckloads to deliver. See EPA–HQ–RCRA–2012–0028–0095.[126]

Collectively, this information formed the basis for the five year presumptive default. As noted the median size of CCR surface impoundments is approximately 14 acres, and 75 percent of impoundments are 50 acres or smaller. The information presented by the utilities documents that impoundments as large as 66 acres under normal circumstances can close within two to three years. EPA therefore expects that most, if not all, units should be able to complete closure within five years. For all but the very largest units, this timeframe would even accommodate potential delays caused by weather or any other unpredictable variables. This is clearly demonstrated by the examples presented by public comments, and by the recent example of the 40-acre CCR surface impoundment in Martins Creek that closed within five years.

EPA also notes that five years is the timeframe Congress mandated for the completion of open dumps to close or upgrade. While the closure times apply generally to all units—both those whose closure is mandated by this final rule and those that close because the facility decides to do so—the statutory directive provides further support for EPA's decision.

But as many commenters stated, initial estimates can and often do vary from actual closure times due to unforeseen or variable conditions. EPA acknowledges that a host of variables can, and frequently do, delay closure activities, such that the initial time estimates to complete closure of the unit are ultimately exceeded. For example, the 40 acre impoundment at Martins Creek Power Plant discussed above was initially scheduled in its closure plan to be completed within three years; however, closure ultimately took five years to complete. The additional two

[125] ''Amended Closure Plan Wastewater Ash Ponds, Grainger Generating Station, Conway, South Carolina,'' January 2014.

[126] EPA also received information from Consumers Energy Company on the closure of three former fly ash surface impoundments at the JR Whiting plant. These surface impoundments (combined) totaled approximately 52 acres and are scheduled to be closed with a final cover over an approximately 12-year period. The commenter claimed that the extended time for closure ''was necessary to allow dewatering and the filling of numerous voids, but principally to allow the generation of fly ash to allow the placement of structurally placed, low permeability ash to provide minimal required slopes for closure and to serve as the select layer for the flexible membrane liner.'' See EPA–HQ–RCRA–2012–0028–0068. Information on the individual size of any of the three CCR units was not provided in the comments, which complicates any assessment of the time needed to complete closure of any single CCR unit. Because the facility appears to be continuing to use the unit to actively manage waste, EPA does not consider this to be representative of a typical closure process.

years was due to the need to obtain approval of a modified closure plan from the state, as well as modifications to three permits, in addition to obtaining other local planning approvals. Further time was also needed to accommodate the public notice and comment processes for several of the permits and approvals.

EPA recognizes that there are a number of unpredictable or variable conditions that can affect the time needed to close a CCR unit and that those conditions are not within the control of the owner or operator. For example, some states require review and approval of a closure plan prior to initiating of closure activities. See, for example, 25 Pa. Code sections 288.292(b) and 289.311(b) for CCR landfills and CCR surface impoundments, respectively. Another commenter noted that in Illinois, permits from several different authorities may need to be obtained to commence closure, including the Illinois Department of Natural Resources, the U.S. Army Corps of Engineers, and the U.S. Fish and Wildlife Services.

Climate and weather can also impact the time needed to complete closure. For example, an unusually wet or short construction season can result in schedule delays; one commenter noted that in certain regions of the Midwest, it is possible for as much as 40 inches of rain to fall in a given season.

To account for these conditions, a substantial majority of commenters requested that the final rule include the potential for time extensions, and several specifically referenced the need for a ''force majeure'' provision. One commenter also recommended that a ''force majeure'' clause specifically include delays caused by court order (*i.e.,* appeals of permits issued by state agencies causing judgments in court). Another commenter provided an example of a ''force majeure'' provision that could serve as a model:

An extension shall be granted for any scheduled activity delayed by an event of force majeure which shall mean any event arising from causes beyond the control of the owner that causes a delay in or prevents the performance of any of the conditions under this rule including but not limited to: acts of God, fire, war, insurrection, civil disturbance, explosion; adverse weather conditions that could not be reasonably anticipated causing unusual delay in transportation and/or field work activities; restraint by court order or order of public authority; inability to obtain, after exercise of reasonable diligence and timely submittal of all applicable applications, any necessary authorizations, approvals, permits, or licenses due to action or inaction of any governmental agency or authority; and delays caused by compliance with applicable statutes or regulations governing contracting, procurement or acquisition procedures, despite the exercise of reasonable diligence by representatives of the owner.

Events which are not force majeure include by example, but are not limited to, unanticipated or increased costs of performance, changed economic circumstances, normal precipitation events, or failure by the owner to exercise due diligence in obtaining governmental permits or performing any other requirement of this rule or any procedure necessary to provide performance pursuant to the provisions of this rule.

EPA agrees that the rule should include procedures to obtain extensions of time to complete closure of the unit, based on the complexity of the activity. As previously noted, the law, including a regulation, cannot compel the impossible. However, because the record demonstrates that most units, even the larger units, can close within that five year timeframe, the rule establishes a high threshold to obtain additional time. To account for those instances of true physical impossibility, the rule limits extensions to circumstances in which the owner or operator can demonstrate that the additional time is needed due to factors that are truly beyond the facility's control—*i.e.,* could fairly be characterized as an example of ''force majeure.'' To obtain additional time, the owner or operator of the CCR unit must document in writing the exact reasons why additional time is needed. The regulation specifies that such reasons could include: (1) Complications stemming from the climate and weather, such as unusual amounts of precipitation or a significantly shortened construction season; (2) the time required to dewater a surface impoundment due to the volume of CCR contained in the CCR unit or the geotechnical characteristics of the CCR in the unit; (3) the geology and terrain surrounding the CCR unit will affect the amount of material needed to close the CCR unit; or (4) the time required or delays caused by the need to obtain State permits and/or to comply with other State requirements. These findings would need to be certified by the owner or operator of the unit, as well as by a qualified professional engineer.

The final rule limits the amount of time that closure can be extended based on the size of the CCR unit. Specifically, the rule allows CCR surface impoundments 40 acres or smaller a time extension of up to two years, while CCR surface impoundments larger than 40 acres can obtain up to five two-year extensions. The 40 acre size demarcation is based on the available information showing that surface impoundments of 40 acres or smaller routinely have either completed closure or are projected to be able to complete closure within a timeframe shorter than five years. EPA expects that facilities will account for all potential delays that can reasonably be foreseen in planning their closure activities, and that this is feasible within this five year timeframe. Consequently the final rule restricts facilities with units of this size to a single extension to account for truly exception circumstances (*e.g.,* Acts of God).

The Agency also recognizes that there is increased uncertainty for CCR surface impoundments larger than 40 acres. First, while available information documents that some CCR surface impoundments larger than 40 acres can be closed within this same five year period, the Agency has other information indicating that closure of units larger than 40 acres can be expected to take much longer than five years. For example, the largest surface impoundment in the country is approximately 950 acres and is scheduled to cease receiving CCR by December 31, 2016 and commence closure in 2017. The facility's projected closure period is 15 years. However, EPA currently has no data (anecdotal or otherwise) on the actual timeframes in which a surface impoundment of that size has completed closure. Given that closure for the largest of surface impoundments could reasonably be expected to take more than five years to complete, the Agency has concluded that surface impoundments larger than 40 acres need to be provided with the possibility of additional time extensions beyond the two years provided to impoundments less than 40 acres. Based on available information, in particular the current estimates of the time needed to close the largest unit in the country, the rule authorizes a facility to obtain a maximum of five time extensions, totaling as much as ten years in two year increments to close a CCR surface impoundment greater than 40 acres. However, the owner or operator must substantiate the factual circumstances demonstrating the need for each two-year extension.

Several commenters also urged EPA to specify in the final rule what EPA intended by the phrase ''completion of closure;'' and to define the activities or actions the owner or operator must complete to satisfy the closure requirements. For purposes of this rule, closure of a CCR unit is complete when the unit meets all of the requirements of this rule and the owner or operator obtains certification from a qualified professional engineer verifying that closure has indeed been completed, consistent with all of the performance standards in the rule. While EPA recognizes that under some state programs closure is not considered complete until the owner or operator receives certification from the state, this is not a prerequisite to completion of closure under these federal rules.

iii. Closure Timeframes for CCR Landfills

Similar to the approach for CCR surface impoundments, EPA recognizes that there can be unforeseen and extraordinary circumstances that warrant additional time to close a CCR landfill. Accordingly, the rule adopts procedures analogous to those for CCR surface impoundments that allow the owner or operator to obtain additional time to complete the closure of a CCR landfill, provided the owner or operator can make the prescribed demonstrations. However, the amount of additional time the facility can obtain beyond the presumptive six month timeframe does not depend on the size of the landfill; rather the maximum time extension is two one-year extensions (two years) for any CCR landfill. As with the procedures for CCR surface impoundments, the owner or operator must substantiate the factual circumstances demonstrating the need for each one-year extension.

EPA developed this timeframe based on its review of the available information in the record regarding the timeframes for completing the closure of CCR landfills, some of which is summarized below. Additional information may also be found in the comment response document.

In response to the August 2013 NODA, Nebraska Public Power District (NPPD) provided information documenting that it completed closure of a 10 acre CCR landfill within 180 days after the final volume of fly ash and bottom ash was placed in the CCR landfill. Closure was accomplished by leaving CCR in place and installing a final cover system. NPPD's comments do not indicate what year closure of this CCR landfill was completed. See EPA–HQ–RCRA–2012–0028–0076.

The Florida Electric Power Coordinating Group (FCG) stated in its comments that FCG member experience with CCR landfill closure has ''demonstrated the need for a period of time greater than 180 days to complete closure activities.'' However, the commenter did not provide any information indicating how long such closures actually took, nor any information to substantiate their claim. See EPA–HQ–RCRA–2012–0028–0064.

Overall, the closure of CCR landfills is less complex than the closure of CCR surface impoundments. Portions of the CCR landfills that reach final grade can be closed as other areas of the CCR landfill continue to receive CCR, which is typically not possible at CCR surface impoundments. Nor does the owner or operator need to dewater the unit, which appears to be the aspect of closure most likely to be a source of unanticipated circumstances. Finally, there is substantially less uncertainty with respect to the timeframes to complete the closure of CCR landfills, which are not all that different (in this respect) than landfills containing other forms of solid or hazardous waste. EPA therefore has greater confidence that a fixed period of two years will be adequate to account for the vast majority of circumstances.

c. Alternative Closure Requirements

The Agency is finalizing alternative closure requirements in two narrow circumstances for a CCR landfill or CCR surface impoundment that would otherwise have to cease receiving CCR and close, consistent with the requirements of § 257.101(a), (b)(1), or (d). The first is where the owner or operator can certify that CCR must continue to be managed in that CCR unit due to the absence of both on-site and off-site alternative disposal capacity. § 257.103(a). The second is where the owner or operator of a facility certifies that the facility will cease operation of the coal-fired boilers no later than the dates specified in the rule, but lacks alternative disposal capacity in the interim. § 257.103(b). Under either of these alternatives, CCR units may continue to receive CCR under the specified conditions explained below. In addition, under either alternative, the owner or operator must continue to comply with all other requirements of the rule, including the requirement to conduct any necessary corrective action.

1. No alternative CCR disposal capacity (§ 257.103(a)).

The Agency recognizes that the circumstance may arise where a facility's only disposal capacity, both on-site and off-site, is in a CCR unit that has triggered the closure requirements in § 257.101(a), (b)(1), or (d). As a result, the facility may be faced with either violating the closure requirements in § 257.101 by continuing to place CCR in a unit that is required to close, or having to cease generating power at that facility because there is no place in which to dispose of the resulting waste. For example, while it is possible to transport dry ash off-site to alternate disposal facility that simply is not feasible for wet-generated CCR. Nor can facilities immediately convert to dry handling systems. As noted previously, the law cannot compel actions that are physically impossible, and it is incumbent on EPA to develop a regulation that does not in essence establish such a standard.

Should a facility choose to comply with the regulation and stop generating power, there would be significant risks to human health that would arise if a community would be left without power for an extended period of time. As information in the record demonstrates, obtaining alternative capacity can sometimes require a substantial amount of time (*e.g.,* if the facility needs to construct alternative capacity, including potentially the need to locate an alternative site or purchase additional property). EPA recognizes that there are also significant risks to human health and the environment, as demonstrated throughout this preamble, from a leaking or improperly sited CCR unit, and that these risks justify requiring those units to either retrofit to meet the federal criteria established in the final rule or close. EPA also acknowledges that in the interim period while the owner or operator seeks to obtain additional capacity, the risks associated with the continued use of these units will be significant. However, the Agency believes that the risks to the wider community from the disruption of power over the short-term outweigh the risks associated with the increased groundwater contamination from continued use of these units. This conclusion is further buttressed by the fact that during this interim period the risks associated with allowing these units to continue to receive CCR are mitigated by all of the other requirements of the rule with which the facility must continue to comply, including the requirements to continue groundwater monitoring and corrective action.

Under § 257.103(a)(1), a CCR unit that would otherwise be required to cease receiving CCR under § 257.101(a), (b)(1), or (d), may continue to receive CCR provided the owner or operator certifies that the CCR generated at that facility must continue to be managed in that unit due to the absence of alternative disposal capacity both on-site and off-site. The rule also requires the owner or operator to document this claim, and the claim must be based on the real absence of an alternative and not justified based on the costs or inconvenience of alternative disposal capacity. § 257.103(a)(1)(i). The owner or operator must also remain in compliance with all other requirements of this rule, including the requirement to take any necessary corrective action. § 257.103(a)(1)(ii). Because this alternative is only available as long as the absence of disposal capacity exists, the owner or operator must document its efforts to obtain additional capacity. If any additional capacity is identified, the owner or operator must arrange to use it as soon as is feasible. § 257.103(a)(1)(iii). The owner or operator is also required to prepare an annual progress report documenting the continued absence of disposal capacity and must also document the progress made toward developing alternative capacity. § 257.103(a)(1)(iv).

Once alternative disposal capacity is available, the CCR unit must cease receiving CCR and must initiate closure following the timeframes in § 257.102(e) and (f). Finally, if the owner or operator has not identified alternative capacity within five years after the initial certification the CCR unit subject to this section must cease receiving CCR and must initiate closure following the timeframes in § 257.102(e) and (f). As discussed elsewhere in this preamble, several commenters provided information to document the length of time needed to obtain additional capacity. Based on this information, the five year timeframe provided for under this alternative is expected to provide sufficient time to obtain alternative disposal capacity and to avoid the consequences of a forced immediate closure of a power plant.

2. Permanent cessation of a coal-fired boiler by a date certain. (§ 257.103(b)).

Under this provision, the Agency addresses the circumstance where a facility's only disposal capacity, both on-site and off-site, is in a CCR unit that has triggered the closure requirements in § 257.101(a), (b)(1), or (d), but the owner or operator of coal-fired power plant has decided to permanently cease operation of that plant within one of two timeframes specified in the regulation. For the same reasons discussed immediately above, EPA has concluded that the provisions of § 257.103(b) represent the most reasonable balance between the competing risks.

Additionally, EPA anticipates that some owners or operators will decide to permanently cease operation of a coal-fired power plant in response to the combined effects of new and/or existing statutory or regulatory requirements promulgated under the Clean Air Act and under the Clean Water Act (*e.g.* the proposed Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category. See 78 FR 34442, in combination with market dynamics. As discussed earlier in this preamble, RCRA section 1006(b) directs EPA to integrate the provisions of RCRA for purposes of administration and enforcement and to avoid duplication, to the maximum extent practicable, with the appropriate provisions of other EPA statutes, including the CAA and the CWA. As noted earlier, section 1006(b) conditions EPA's authority to reduce or eliminate RCRA requirements on the Agency's ability to demonstrate that the integration meets RCRA's protectiveness mandate (42 U.S.C. 6005(b)(1)). *See Chemical Waste Management* v. *EPA,* 976 F.2d 2, 23, 25 (D.C. Cir. 1992). The provisions of § 257.103(b) are fully consistent with the direction in section 1006(b) to account for the provisions of other EPA statutes which may lead an owner or operator to close a coal-fired power plant.

EPA has also concluded that the provisions of § 257.103(b) meet RCRA's protectiveness mandate. As stated above, EPA recognizes that there are long-term risks to human health and the environment, as demonstrated throughout this preamble, from a leaking CCR unit and those risks justify requiring those units to either meet the federal criteria established in this rule or close. However, the risks associated with allowing these units to continue to receive CCR are mitigated by the requirement that the facility must comply with all other requirements of the rule, including initiating groundwater monitoring and corrective action where necessary. And a critical factor is that facilities that choose to rely on this alternative will be required to *complete* closure of their disposal unit in an expedited timeframe. Thus, the risks from these units will be fully addressed sooner. Consequently, while over the short term the risks will be higher, overall, the risks will be at least equivalent to, or potentially lower than if the CCR unit had closed in accordance with the normal closure timeframes.

Under § 257.103(b)(1), a CCR unit that would otherwise be required to cease receiving CCR under § 257.101(a), (b)(1), or (d), may continue to receive CCR provided the owner or operator of the facility certifies that the facility will cease operation of the coal-fired boilers within the timeframes specified in paragraphs (b)(2) through (b)(4) and that the CCR generated at that facility (before the plant ceases to operate) must continue to be managed in that unit due to the absence of alternative disposal capacity both on-site and off-site. The rule also requires the owner or operator to document the facts that support this claim. The regulation specifies that the claim must be based on the real absence of alternative disposal capacity, and not justified based on the costs or inconvenience of alternative disposal capacity. § 257.103(b)(1)(i). The owner or operator must also remain in compliance with all other requirements of this rule, including the requirement to take any necessary corrective action. § 257.103(b)(1)(ii). The owner or operator is also required to prepare an annual progress report documenting the continued absence of disposal capacity and must also document the progress made toward the closing of the coal-fired boiler. § 257.103(b)(1)(iii).

Under § 257.103(b)(1), the owner or operator does not need to demonstrate any efforts to develop alternative capacity because of the impending closure of the power plant itself.

Consistent with the general timeframes provided for the closure of CCR surface impoundments, EPA has established different timeframes based on the size of the CCR unit. Under § 257.103(b)(2), where the disposal unit is a CCR surface impoundment 40 acres or smaller in size, the coal-fired boiler must cease operation and the disposal unit must have completed closure within 8.5 years of the publication date of the rule. Where the disposal unit is a CCR surface impoundment larger than 40 acres in size, the coal-fired boiler must cease operation and the disposal unit must have completed closure within 13.5 years of the publication date of the rule. § 257.103(b)(3). Finally, under § 257.103(b)(4), where the disposal unit is a CCR landfill, the coal-fired boiler must cease operation and the disposal unit must have completed closure within 6 years of the publication date of the rule. These timeframes were selected to ensure that closure of these units will be completed in a measurably shorter timeframe, and that overall the risks will be lower, or at least equivalent to, the level of risk that would be achieved under the rule's ''standard'' closure provisions.

5. Notation on the Deed to Property

The proposed rule would have required, following closure of the CCR unit, the owner or operator to record a notation on the deed or some other instrument normally examined during a title search. This notation would notify any potential purchaser in perpetuity that the property has been used as a CCR landfill or CCR surface impoundment and that use of the land is restricted under the rule's post-closure care provisions. After the notation was completed, the proposed rule would have required the owner or operator to notify the state that the notation has been recorded and a copy has been placed in the facility's operating record and on its publicly accessible internet site. In addition, the Agency solicited public comment on adding a provision to the rule to allow removal of the deed notation once all CCR are removed from the CCR unit, and notification is provided to the state of this action. The EPA solicited comment on this potential approach as a way to create a further incentive for clean closure of the facility. 75 FR at 35208–09. The proposal further encouraged commenters who are interested in supporting such an option to suggest alternatives to state oversight to provide for facility accountability.

EPA received few public comments on the proposed requirement to record a deed notation to the property (or some other instrument that is normally examined during title search). One commenter provided general support for the proposed requirement to record a deed notation to the property. Another commenter urged EPA to ensure that any deed notation requirements should not interfere or conflict with existing state property laws that provide for environmental covenants.

EPA did receive several comments in response to the Agency's solicitation of comment on adding a provision to the rule to allow removal of the deed notation when all CCR are removed from the facility, and notification is provided to the state of this action. One commenter supported the addition of this provision, stating that the licensure requirements of the Professional Engineer provide an assurance of integrity because the Professional Engineer would be required to verify that closure has been completed in accordance with the closure plan. This commenter also stated that it would be sufficient to allow removal of a deed notation upon an application to the state agency supported by a declaration of a licensed professional, subject to state agency review and approval. Another commenter supported providing the incentive for clean closure and allowing the facility to demonstrate the ''cleanliness of the closure.'' The commenter also recommended that the information provided by the facility should be followed by a review from an independent third party with knowledge of the industry and associated environmental issues.

After considering comments, the final rule requires an owner or operator to record a notation on the deed or some other instrument normally examined during a title search. This notation notifies any potential purchaser in perpetuity that the property has been used as a CCR landfill or CCR surface impoundment and that use of the land is restricted under the rule's post-closure care provisions. See § 257.102(i). In response to the commenter that urged EPA to ensure that any deed notation requirements should not interfere or conflict with existing state property laws, the Agency has no information that the proposed requirement would create such a conflict. In addition, the commenter did not provide any information or suggest that EPA's proposed approach would actually interfere or conflict with existing state property laws. Therefore, the Agency is finalizing the deed notation requirement as proposed.

In addition, regarding the Agency's solicitation of comment on adding a provision to the rule to allow removal of the deed notation when all CCR are removed from the facility, as discussed in Unit VI.M.2 of this preamble, the final rule adopts the proposal to allow the owner or operator to remove the deed notation required under § 257.102(i)(4), upon certification that clean closure has been completed. The rationale for this decision is discussed in that unit of the preamble.

6. Notification of Intent To Close and Certification of Closure Completion

The Agency proposed to require owners or operators to notify the state that a notice of intent to close a CCR unit has been placed in the facility's operating record and on the publicly accessible internet site. This notification had to be completed prior to beginning closure of the CCR unit. Following closure of a CCR unit, the proposed rule would also have required the owner or operator to obtain a certification from an independent registered professional engineer verifying that closure has been completed in accordance with the written closure plan. As proposed, this certification would be placed in the facility's operating record and on the publicly accessible Internet site.

The Agency received no public comments on the proposed requirements to develop a notification of intent to close or the certification of completion of closure. Therefore, the Agency is finalizing these requirements as proposed. See § 257.102(g) and (h).

7. Post-Closure Care Plan

The Agency proposed to require that the owners or operators of CCR landfills and CCR surface impoundments prepare a written post-closure care plan describing how the CCR unit would be maintained after closure. See proposed § 257.101(c). The proposal also identified the minimum information necessary to include in the post-closure care plan. This information included: (1) A description of the monitoring and maintenance activities for the CCR unit and the frequency at which these activities would be performed; (2) the name, address, and telephone number of the person or office to contact about the facility during the post-closure care period; and (3) a description of the planned uses of the property during the post-closure care period.

The proposed rule further provided that the post-closure use of the property shall not disturb the integrity of the final cover, liner(s), or any other components of the containment system, or the function of the post-closure monitoring systems unless necessary to comply with the requirements of the rule. The proposal would have allowed a disturbance if the owner or operator of the CCR unit demonstrated that disturbance of the final cover, liner, or other component of the containment system, including any removal of CCR, would not increase the potential threat to human health or the environment. A professional engineer would have been required to certify such a demonstration.

The Agency received no significant comments on the proposed post-closure care requirements. The Agency's responses to these comments are addressed in the closure comment response document, which is available in the rulemaking docket. Therefore, the Agency is finalizing these requirements substantially as proposed. See § 257.102(g) and (h).

8. Post-Closure Care Activities

Following closure of a CCR landfill or CCR surface impoundment, EPA proposed that the owner or operator would be required to conduct post-closure care of the closed unit. At a minimum, the proposal would have required the owner or operator to conduct at least the following: (1) Maintain the integrity and effectiveness of any final cover, including making repairs to the final cover to correct the effects of settlement, subsidence, erosion, or other events, and preventing run-on and run-off from eroding or otherwise damaging the final cover; (2) maintain the integrity and effectiveness of the leachate collection and removal system and operating the leachate collection and removal system in accordance with applicable requirements under the design criteria for such systems; and (3) maintain the groundwater monitoring system in

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accordance with applicable requirements under the groundwater monitoring and corrective action rule provisions.

EPA received few public comments on the proposed activities to conduct during the post-closure care period. These commenters were supportive of the activities and specifically urged the rule to require the monitoring of groundwater throughout the post-closure care period. The Agency received no comments opposing the proposed post-closure care activities. Therefore, EPA is finalizing the same post-closure care activities in this rule. See § 257.104(b). In addition, consistent with the proposal, the rule clarifies that certain CCR units are not subject to these post-closure care activities. Specifically, owners or operators that elect to close a CCR unit by removing CCR (*i.e.,* clean close the CCR unit) are not subject to any post-closure care requirements. See § 257.104(a)(2) and Unit M.2 of this preamble. In addition, owners or operators of inactive CCR surface impoundments that elect to complete closure of the unit within 30 months of the rule's effective date are not subject to any post-closure care requirements. See § 257.104(a)(3).

9. Length of Post-Closure Care Period

The Agency proposed that the owner or operator of a CCR unit conduct post-closure care for 30 years. EPA also proposed to allow utilities to conduct post-closure care for a decreased length of time if the owner or operator demonstrates that the reduced period is sufficient to protect human health and the environment. The owner or operator would have been required to have this demonstration certified by a professional engineer, in addition to complying with all of the notification and posting requirements under the proposed rule. The proposed rule would also have allowed an increase in the post-closure care period if the owner or operator of the CCR unit determined that it is necessary to protect human health and the environment. EPA also recognized in the proposed rule that state oversight can be critical to ensure that post-closure care is conducted for the length of time necessary to protect human health and the environment; however the Agency also recognized that there is no set length of time for post-closure care that will be appropriate for all possible sites, and all possible conditions. Therefore, EPA solicited comment on alternative methods to account for different conditions, yet still provide methods of oversight to assure facility accountability.

Some commenters supported the proposed approach because it provided flexibility to increase or decrease the post-closure care period of 30 years. EPA also received comments from a number of states documenting the current state requirements; some states require a post-closure care period of less than 30 years, some require 30 years, and one state currently requires 40 years for CCR units. Other commenters opposed the shortening of the 30-year period without state involvement and approval.

After considering public comments, and in a departure from the proposed rule, the Agency is requiring that post-closure care be conducted for a minimum of 30 years. EPA is making this change due to the lack of guaranteed state oversight for this rule. The Agency has concluded that providing the owner or operator the flexibility to shorten the post-closure care period is no longer appropriate, particularly given the flexibility being provided for the selection of a final cover system or alternative final cover system. As discussed in Unit M.3 above, the information available to the Agency supports the need to proceed cautiously. By not allowing the post-closure care period to be shortened, EPA better ensures that the final cover system will be properly maintained. In addition, a mandatory 30 year period ensures that if problems do arise with respect to a final cover system, the groundwater monitoring and corrective action provisions of the rule will detect and address any releases from the CCR unit, at least during the post-closure care period.

10. Notification of Completion of Post-Closure Care Period

The Agency proposed to require owners or operators of CCR units to notify the state that a notice of completion of the post-closure care period has been placed in the facility's operating record and on the publicly accessible Internet site. The proposed approach would have required the owner or operator to obtain a certification from an independent registered professional engineer verifying that post-closure care has been completed in accordance with the written post-closure care plan.

The Agency received no public comments on the proposed requirement to develop a notification of completion of the post-closure care period. Therefore, the Agency is finalizing these requirements as proposed. See § 257.104(e).

N. Recordkeeping, Notification and Posting of Information to the Internet

In response to EPA's lack of authority to require a state permit program or to oversee state programs, EPA has sought to enhance the protectiveness of the regulatory requirements by providing for state and public notifications of the third party certifications, as well as requiring a robust set of other information that documents the decisions made or actions taken to comply with the technical requirements of the rule. Consistent with the proposed rule, owners or operators of CCR units are required to document how the various provisions of the rule have been met by placing information (*e.g.,* plans, records, notifications, reports) in the operating record and providing notification of these actions to the State Director/or appropriate Tribal authority. The owner or operator is also required to establish and maintain a publicly accessible Internet site that posts documentation that has, in many instances, also been entered into the operating record. The owner or operator is required to maintain a copy of the current Emergency Action Plan, the current fugitive dust control plan, and the current written closure plan as long as the facility remains active. EPA believes that the establishment and maintenance of this information in both the operating record and on a publicly accessible Internet site is appropriate so as to allow states and citizens access to all of the information necessary to show that the rule has been implemented in accordance with the regulatory requirements.

With regard to the specific recordkeeping and reporting requirements outlined in the proposal, the Agency received very little comment. Commenters were primarily concerned not with the specific recordkeeping requirements but rather how the recordkeeping requirements aligned with the overall approach of the RCRA subtitle D regulatory scheme. These comments and the Agency's responses are discussed in Unit V of this preamble.

The combined mechanisms of recordkeeping, notifications, and maintaining a publicly accessible Internet site will serve to provide interested parties with the information necessary to determine whether the owner or operator is implementing and is operating in accordance with the requirements of the rule. As stated in the proposal and reiterated here, EPA believes that it cannot conclude that the RCRA subtitle D regulations will ensure there is no reasonable probability of adverse effects on health or the environment, unless there are mechanisms for states and citizens to monitor the situation, such as when groundwater monitoring shows exceedances above the groundwater protection standard specified in the rule, so they can determine when intervention is appropriate. EPA also believes that the recordkeeping and notification requirements will minimize the danger of owners or operators abusing the self-implementing system being established in this rule through increased transparency and by facilitating the citizen suit enforcement provisions applicable to the rule.

In contrast to the proposed rule, the Agency has identified for ease of implementation each recordkeeping, notification and Internet posting required in this rule. The proceeding section provides a summary of the requirements for each reporting mechanism.

1. Recordkeeping Requirements

This rule requires the owner or operator of a CCR landfill or CCR surface impoundment and any lateral expansion to maintain files of all required information (*e.g.,* demonstrations, plans, notifications, and reports) that supports the implementation of this rule in an operating record located at the facility. Each file must be maintained in the operating record for a period of at least five years following submittal of the file into the operating record. In certain instances, however, files must be maintained until the CCR unit completes closure. For example, the initial and periodic structural stability assessments as required under section § 257.73(d) and § 257.74(d) must be maintained for five years consistent with the timeframe for periodic reassessments. Whereas, information on the construction of a CCR surface impoundment must be maintained until the CCR unit completes closure (see 257.73(c) and 257.102.) These timeframes are generally consistent with the timeframes required for maintaining hazardous waste compliance records under subtitle C of RCRA and with the timeframes outlined in the proposed subtitle C option for the regulation of CCR. (See specifically 40 CFR 264.73 and 265.73.)

Owners or operators with more than one CCR unit may elect to consolidate all files into one operating record provided that each unit is identified and files for that unit are maintained separately in different sections of the operating record. The owner or operator of the CCR unit must place files documenting compliance with the location restrictions; design criteria; operating criteria; groundwater monitoring and corrective action; closure and post closure care, into the operating record, with the specific documentation requirements found in § 257.105. In the development of this final rule, the Agency has included in the regulatory language a comprehensive listing of each recordkeeping and notification required by the rule. The Agency anticipates that this effort will facilitate owners or operators efforts in complying with the reporting provisions of the rule, and will provide other interested parties with a guide to the reporting provisions of the rule.

2. Notification Requirements

As previously discussed, owners or operators are required to notify State Directors and/or the appropriate Tribal authority when specific documentation has been placed in the operating record and on the owner or operator's publicly accessible Web site. In most instances these notifications must be certified by a qualified professional engineer and may, in certain instances will be accompanied with additional information and or data supporting the notification. For example under § 257.106(f)(1), within 60 days of commencing construction of a new CCR unit, a notification of the availability of the design criteria specified under § 257.105(f)(1) or (f)(3) in the operating record and on the owner or operator's publicly accessible Internet site. If however, the owner or operator of the CCR units elects to install an alternative composite liner, the owner or operator must also submit to the State Director and/or appropriate Tribal authority a copy of the alternative composite liner design which has been certified by a qualified professional engineer.

Notification requirements can be found in § 257.106, and are required for location criteria, design criteria, operating criteria, groundwater monitoring and corrective action and closure and post closure care.

3. Publicly Accessible Internet Site Requirements

The Agency is finalizing, as proposed a requirement for owners and operators of any CCR unit to establish and maintain a publicly accessible Internet site, titled ''CCR Rule Compliance Data and Information.'' As with the operating record, owners or operators that maintain multiple CCR units may elect to use one Internet site in order to comply with these requirements, provided that the Web site clearly and distinctly identifies information from each of the CCR units by name and location. Unless provided otherwise in the rule, information posted to the Internet site must be available for a period no less than three years from the initial posting date. Posting of information must be completed no later than 30 days from submittal of the information to the operating record. This timeframe is consistent with the notification requirements of the rule. As with the other criteria in this section, Internet postings are required for various elements identified in the following sections: Location restrictions; design criteria; operating criteria; groundwater monitoring and corrective action; closure and post closure care. These requirements are enforceable by citizen suits.

VII. Summary of Major Differences Between the Proposed and Final Rules

The basic regulatory framework outlined in the proposed rule under the subtitle D option, is being adopted in this final rule for the regulation of CCR landfills and CCR surface impoundments and any lateral expansion. However, as discussed in Unit VI of this document, the Agency has made a number of revisions to several of the provisions in the proposed rule, including (1) the timeframes for closure; (2) locations restrictions—placement above the uppermost aquifer; (3) the use of an alternative composite liner design; (4) revisions to align the structural stability criteria with the experience and data generated by the Assessment Program; and (5) air criteria. These changes have been made in response to public comments and additional information collected and analyses conducted by EPA in the course of responding to those comments. These are discussed in greater detail below. Under the proposed rule, all new CCR landfills and all CCR surface impoundments that had not completed closure would be required to retrofit to a composite liner or close within five years. However, after reviewing comments and further evaluation, the Agency has concluded that this regulatory approach was unnecessary in light of the protections afforded by the other technical provisions of the rule (*e.g.,* groundwater monitoring, corrective action). In the final rule, EPA is allowing unlined CCR surface impoundments to continue to operate for the remainder of the active life, provided that the facility documents through groundwater monitoring that the CCR surface impoundment is not contaminating groundwater. However, if groundwater

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monitoring at the facility demonstrates that the unlined CCR surface impoundment has exceeded any groundwater protection standard, the owner or operator must initiate corrective action, and either remove all CCR from the unit and install a composite liner (*i.e.,* ''retrofit'') or close within five years. In a departure from the proposed rule, CCR surface impoundments less than 40 acres may receive one two-year extension, providing for a maximum of seven years to complete closure. Units greater than 40 acres may receive up to five two-year extensions providing a maximum of 15 years to complete closure. These units are also eligible for alternative closure timeframes to account for site specific operational constraints.

In addition, under the proposed rule, CCR surface impoundments that had not closed in accordance with the rule would be subject to all the provisions of the rule. After further evaluation, EPA has revised the provision to allow an inactive CCR surface impoundment three years from publication of the rule in the **Federal Register** to complete closure. Owners or operators of inactive CCR surface impoundments that have not completed closure within this timeframe are subject to all the applicable requirements of the rule.

In response to comment and upon further evaluation the Agency is amending the location restriction relating to the placement of the CCR unit above the natural water table. Under the proposal, new landfills, any CCR surface impoundment, and all lateral expansions would have been required to have a base located a minimum of two feet above the upper limit of the natural water table. In the final rule, the Agency has amended this requirement to require that new CCR landfills and all CCR surface impoundments, and all lateral expansions be constructed with a base no less than 1.52 meters (five feet) above the uppermost aquifer or must demonstrate that there will not be an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuations in groundwater elevations (including the seasonal high water table.) EPA has made this change in response to comments and further evaluation demonstrating that this standard is the minimum distance necessary to demonstrate that no reasonable probability of adverse effects on human health and the environment will occur.

EPA proposed to require all new CCR landfills, CCR surface impoundments and any lateral expansion to be constructed with a composite liner. A composite liner was defined as a system consisting of two components; the upper component consisting of a minimum 30-mil FML and the lower component consisting of at least two feet of compacted soil. Based on public comments and further evaluation, the Agency is finalizing a new requirement that allows an owner or operator to install an alternative composite liner provided it meets the performance standard established in the rule. EPA has concluded that this alternative composite liner affords the same protection to groundwater resources as a composite liner.

Under the proposed rule, all CCR landfills and CCR surface impoundments would have been required to manage fugitive dusts in a manner not to exceed 35 µg/m3. The proposal also required owners or operators to control the wind dispersal of dusts consistent with the standard, and to document the measures taken to comply with the requirements. In response to comments and upon further evaluation, the Agency has removed the numerical standard of 35 µg/m3 from the rule and is establishing a performance standard for fugitive dust control. This standard requires owners or operators of any CCR unit to adopt measures that will effectively minimize CCR from becoming airborne at the facility. The Agency considers this standard to be generally consistent with the proposed rule with the added advantage of allowing for flexibility in achieving compliance. The owner or operator must also prepare an annual CCR fugitive dust control report that describes actions taken by the owner or operator to control CCR fugitive dust and to present a record of all citizen complaints during the previous year, as well as a summary of the corrective action measures taken.

VIII. Implementation Timeframes for Minimum National Criteria and Coordination With Steam Electric ELG Rule

The final rule generally establishes timeframes for the technical criteria based on the amount of time determined to be necessary to implement the requirements (*e.g.,* installing the groundwater monitoring wells). In establishing these timeframes, EPA also accounted for other Agency rulemakings that may affect owners or operators of CCR units, namely the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category (ELG) (78 FR 34432 (June 7, 2013)) and the Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units (Clean Power Plan) (79 FR 34830 (June 18, 2014)). Specifically, the implementation timeframes in this rule will not require owners or operators of CCR units to make decisions about those CCR units without first understanding the implications that such decisions would have for meeting the requirements of each rule. For example, this final rule requires the closure and post-closure plans to be prepared following the anticipated publication of the ELG and Clean Power Plan final rules so that owners or operators of CCR units can take into consideration those final rules as they prepare the closure and post-closure care plans.

This is also particularly true in the situation where the minimum criteria in the CCR rule could potentially require a surface impoundment to either undergo RCRA closure or retrofit with a composite liner. A decision on what action to take with that unit may ultimately be directly influenced by the requirements of the ELG rule; for example, if the final ELG rule requires a conversion to dry handing of fly ash, then it may not make economic sense for an electric utility to retrofit a surface impoundment that contains wet-handled fly ash since it would be required to cease that practice under the ELG rule. Thus, under the final timeframes in this rule, any such decision will not have to be made by the owner or operator of a CCR unit until well after the ELG rule is final and the regulatory requirements are well understood. In this example, the earliest date that a CCR surface impoundment may be triggered into a retrofit or closure decision is approximately February 2017 (the exact date would be 24 months following publication of this final rule), which would apply to a CCR surface impoundment that fails to achieve minimum safety factors for the CCR unit. This is due to the fact that the owner or operator must complete the initial safety factor assessment within 18 months of the publication of this rule plus an additional six months to initiate closure of the CCR unit if the minimum factors or safety are not achieved. The ELG rule is scheduled to be finalized in September 2015 and its effective date is 60 days following its publication. Thus, there is ample time for the owners and operators of CCR units to understand the requirements of both regulations and to make the appropriate business decisions.

The tables below summarize the implementation timeframes for the minimum criteria for existing CCR surface impoundments and for existing CCR landfills being promulgated in this rule.

IMPLEMENTATION TIMEFRAMES FOR THE MINIMUM CRITERIA FOR EXISTING CCR SURFACE IMPOUNDMENTS

Requirement	Implementation timeframe (number of months after publication of rule)	Description of requirement to be completed
Location Restrictions (§ 257.60–§ 257.64)	42 months	—Complete demonstration for placement above the uppermost aquifer. —Complete demonstrations for wetlands, fault areas, seismic impact zones, and unstable areas.
Design Criteria (§ 257.71)	18 months	—Document whether CCR unit is either a lined or unlined CCR surface impoundment.
Structural Integrity (§ 257.73)	8 months	—Install permanent marker.
	18 months	—Compile a history of construction, complete initial hazard potential classification assessment, initial structural stability assessment, and initial safety factor assessment.
	24 months	—Prepare emergency action plan.
Air Criteria (§ 257.80)	6 months	—Prepare fugitive dust control plan.
Hydrologic and Hydraulic Capacity (§ 257.82)	18 months	—Prepare initial inflow design flood control system plan.
Inspections (§ 257.83)	6 months	—Initiate weekly inspections of the CCR unit.
	6 months	—Initiate monthly monitoring of CCR unit instrumentation.
	9 months	—Complete the initial annual inspection of the CCR unit.
Groundwater Monitoring and Corrective Action (§ 257.90–§ 257.98).	30 months	—Install the groundwater monitoring system; develop the groundwater sampling and analysis program; initiate the detection monitoring program; and begin evaluating the groundwater monitoring data for statistically significant increases over background levels.
Closure and Post-Closure Care (§ 257.103–§ 257.104).	18 months	—Prepare written closure and post-closure care plans.
Recordkeeping, Notification, and Internet Requirements (§ 257.105–§ 257.107).	6 months	—Conduct required recordkeeping. —Provide required notifications. —Establish CCR website.

IMPLEMENTATION TIMEFRAMES FOR THE MINIMUM CRITERIA FOR EXISTING CCR LANDFILLS

Requirement	Implementation timeframe (number of months after publication of rule)	Description of requirement to be completed
Location Restrictions (§ 257.64)	42 months	—Complete demonstration for unstable areas.
Air Criteria (§ 257.80)	6 months	—Prepare fugitive dust control plan.
Run-On and Run-Off Controls (§ 257.81).	18 months	—Prepare initial run-on and run-off control system plan.
Inspections (§ 257.83)	6 months	—Initiate weekly inspections of the CCR unit.
	9 months	—Complete the initial annual inspection of the CCR unit.
Groundwater Monitoring and Corrective Action (§ 257.90–§ 257.98).	30 months	—Install the groundwater monitoring system; develop the groundwater sampling and analysis program; initiate the detection monitoring program; and begin evaluating the groundwater monitoring data for statistically significant increases over background levels.
Closure and Post-Closure Care (§ 257.103—§ 257.104).	18 months	—Prepare written closure and post-closure care plans.
Recordkeeping, Notification, and Internet Requirements (§ 257.105—§ 257.107).	6 months	—Conduct required recordkeeping. —Provide required notifications. —Establish CCR website.

IX. Implementation of the Minimum Federal Criteria and State Solid Waste Management Plans

As explained earlier in this document, the final regulations EPA is promulgating under RCRA subtitle D impose minimum federal criteria with which CCR units must comply without any additional action by a state or federal regulator. As discussed previously in this document, under the provisions of subtitle D applicable to solid waste, states are not required to adopt or implement these regulations, to develop a permit program, or submit a program covering these units to EPA for approval and there is no mechanism for EPA to officially approve or authorize a state program to operate ''in lieu of'' the federal regulations.

EPA has, however, received numerous comments regarding the potential implementation challenges that this statutory and resulting regulatory structure may pose, particularly in states that already have a comprehensive regulatory program governing CCR units. These concerns include the fact that facilities may need to comply with two sets of potentially differing regulations, perhaps resulting in confusion for the regulated community and the general public, and also potentially resulting in inconsistent results from citizens seeking enforcement of the criteria. The commenters were also concerned that there is no explicit mechanism for EPA to officially approve a state program (as there is in subtitle C or in the municipal solid waste provisions of subtitle D). In addition, in states without a current formal program for overseeing CCR landfills and surface impoundments at coal fired electric utilities, stakeholders have expressed a preference for a state mechanism for implementing the federal requirements. Finally, many stakeholders expressed a strong preference for a permit program with its opportunities for public input and transparency.

Moreover, EPA recognizes the critical role that our state partners play in implementation and ensuring compliance with environmental regulations. This is particularly important in complex situations, such as presented by CCR landfills and surface impoundments that involve corrective action and requirements and timelines for closure of units. EPA expects that states will be active partners in overseeing the regulation of CCR landfills and CCR surface impoundments, and has adopted a number of provisions to ensure that States have the information necessary to undertake this role. First, the final regulations require owners or operators of regulated CCR units to notify the state of actions taken to comply with the requirements of the rule (see § 257.106). Facilities will also be required to maintain a publicly accessible internet site that will document the facility's compliance with the requirements of the rule; states (along with other members of the public) will be able to access this site to monitor facility activities (see § 257.107). (For a detailed discussion of these requirements, please see Unit VI.N of this document.)

In order to ease implementation the regulatory requirements for CCR landfills and CCR surface impoundments, EPA strongly encourages the states to adopt at least the federal minimum criteria into their regulations. EPA recognizes that some states have already adopted requirements that go beyond the minimum federal requirements; for example, some states currently impose financial assurance requirements for CCR units, and require a permit for some or all of these units. This rule will not affect these state requirements. The federal criteria promulgated today are minimum requirements and do not preclude States' from adopting more stringent requirements where they deem to be appropriate.

As noted above, commenters on the proposal voiced concerns that because EPA does not have the authority to approve a state program under subtitle D of RCRA, there is no document in which EPA formally provides its judgment that a state solid waste program substantially incorporates the minimum federal criteria. However, a mechanism for this has been available for many years through the solid waste management planning process already in the regulations at 40 CFR part 256 ''Guidelines for Development and Implementation of state Solid Waste Management Plans.'' This process, designed early in the development of the waste management infrastructure, was structured to encourage states to effectively plan for and manage their solid wastes, including upgrading or closing any units that were considered ''open dumps'' through the development of SWMPs. Currently most states have SWMPs that have previously been submitted to and approved by EPA. EPA strongly recommends that states take advantage of this process by revising their SWMPs to address the issuance of the revised federal requirements in this final rule, and to submit revisions of these plans to EPA for review, using the provisions contained in 40 CFR part 256. To be clear, EPA is not suggesting that states revise their entire SWMPs, but only that states revise their plans to address the revised federal requirements being promulgated today. EPA would then review and approve the revised SWMPs provided they demonstrate that the minimum federal requirements in this final rule will be met. In this way, EPAs approval of a revised SWMP signals EPA's opinion that the state SWMP meets the minimum federal criteria.

As noted above, the part 256 regulations established the system for the development and approval of initial SWMPs as well as their revisions. For the convenience of the reader, we describe these regulations in the following paragraphs. The regulations lay out a series of requirements that a plan must meet to be approved, as well as a number of recommendations that should also be reflected in the solid waste management plan. (*e.g.,* 40 CFR 256.01–256.04 and 256.20–256.27.) For example, § 256.02 sets out the scope of the SWMPs, requiring that the plans address ''all solid waste in the state that poses potential adverse effects on public health or the environment or provides an opportunity for resource conservation or resource recovery.'' The regulations also specify that the plan must require that all solid waste shall be disposed of in ''sanitary landfills,''—*i.e.,* units that meet any federal requirements promulgated under RCRA section 4004(a)—or otherwise disposed of in an environmentally sound manner. 40 CFR 256.01(a)(2). The plan must also prohibit the establishment of new open dumps, and provide for the closing or upgrading of all existing open dumps within the state, pursuant to the requirements of RCRA section 4005. 40 CFR 256.01(a)(2)–(3). State plans must also ''set forth an orderly and manageable process for achieving the objectives of the Act and meeting the requirements of these guidelines.'' 40 CFR 256.02(d). The regulations further specify that the plan ''shall describe as specifically as possible the activities to be undertaken, including detailed schedules and milestones.'' Id.

The part 256 regulations further require a SWMP to identify the state's legal authorities, and regulatory powers, including any revisions that may be necessary to implement the plan. 40 CFR 256.02(e). The plan must also identify and set out the responsibilities of state, local, and regional authorities that will implement the state plan. 40 CFR 256.10(a). Thus, the SWMP is the comprehensive compendium, developed and adopted with public participation, setting forth how solid waste is managed in a particular state. As such, SWMPs have been a key component of solid waste programs for many years. As stated above, states that have approved plans will only need to address these requirements for CCR landfills and surface impoundments.

In addition to the substantive requirements, the part 256 regulations impose a number of procedural obligations. Before submission to EPA, the SWMP must be adopted by the state pursuant to state administrative processes and developed in accordance with the public participation requirements set out in § 256.60. In addition, all SWMPs were to contain procedures for revisions. 40 CFR 256.03(e). EPA anticipates that states would rely on their existing procedures to revise their SWMPs to implement the new federal criteria.

Currently, most states have approved SWMPs. These approvals were based on the requirements applicable to solid waste management that were in force at the time of approval. Now, because EPA is promulgating revised federal criteria, the facilities that will be considered to be ''sanitary landfills'' and ''open dumps'' is changing. Thus, EPA expects that SWMPs in many states will need to be revised to account for these revised Federal requirements. Consistent with the provisions in § 256.01(a)(2)–(3) and with the requirement in § 256.03(e) that such plans are to be revised where necessary, in order to maintain approval of these plans EPA expects that states will revise their SWMPs to account for the promulgation of revised federal criteria for CCR landfills and surface impoundments.

As fully explained later in this section, the plans are generally the best tool available for demonstrating how CCR units will be regulated in a state, including how the state intends its state requirements to relate to the federal regulations. In addition, EPA anticipates that the public participation processes will have substantial benefit, by involving all sectors of the community in addressing the management of CCR in a particular state.

EPA believes that the revised SWMPs will have significant benefits and provide the best mechanism available to respond to the concerns expressed by commenters regarding the role of states in management of this waste. First, the revised plans will enable states to set out, as part of their overall solid waste program, how the State intends to regulate CCR landfills and surface impoundments; that is, these plans can demonstrate how, if at all, the state program has incorporated the minimum national criteria and can highlight those areas where the state regulations are more stringent than or otherwise go beyond the federal minimum criteria. For example, the plan can describe the actions the state will take to oversee CCR units, particularly those units undergoing closure or corrective action, and how the State intends to review or use the notices and other information pertaining to the units that the facility owners will be providing to the state (as required in the federal regulations). Providing this detail can greatly assist the regulated community to understand the regulatory structure under which they will be operating. It can also assist the general public in understanding the regulations and thereby their ability to monitor industry's compliance with the rule.

Second, substantial benefits will be gained through the public participation process required as part of revising the state plans. See 40 CFR 256.60. At a minimum, these processes will promote greater awareness of the federal regulatory requirements, as well as how these fit into the overall context of solid waste management in the State, which will be very valuable as the new minimum criteria for CCR are implemented. In addition, these processes will provide the public and communities near CCR landfills and surface impoundments with an opportunity to participate in the decision making about how CCR are managed in their state. Finally, the record generated by the public participation process has an inherent value to states, the utilities, and the general public in that it can demonstrate explicitly the manner in which issues related to the regulation of CCR landfills and surface impoundments were raised and resolved in the state. This record would be a value in any later proceedings seeking enforcement of the rule.

Third, once EPA has approved a SWMP that incorporates or goes beyond the minimum federal requirements, EPA expects that facilities will operate in compliance with that plan and the underlying state regulations. In those circumstances, EPA's view is that facilities adhering to the requirements of a state program that is identical to or more stringent than an approved SWMP will meet or exceed the minimum federal criteria. In addition, EPA anticipates that a facility that operates in accord with an approved SWMP will be able to beneficially use that fact in a citizen suit brought to enforce the federal criteria; EPA believes a court will accord substantial weight to the fact that a facility is operating in accord with an EPA-approved SWMP. In addition, as noted above, the record generated by the public participation process in developing the SWMP has an inherent value to the states, the utilities, and the general public in any such litigation. The more specific the record is on the public process regarding how the SWMP would incorporate the minimum federal requirements and any state oversight the more valuable it would be in any court proceedings to complement EPA's approval of the SWMP. As fully explained earlier, EPA approval of a state SWMP does not mean that the state program operates ''in lieu of'' the federal program as EPA does not have the authority to make such a determination.

The process and criteria for approval of SWMPs are set out in 40 CFR part 256. The part 256 regulations state that EPA has six months from submittal of a plan to either approve or disapprove it. The regulations further state that EPA will approve a plan if the agency determines that the plan: (a) Meets the requirement set out in RCRA Section 4003(a)(1), (2), (3), and (5); (b) and contains provisions for revisions. Those requirements of 4003(a) are: The identification of the responsibilities of state, local, and regional authorities in the implementation of the plan and the means for coordinating regional planning and implementation; prohibition on the establishment of new open dumps and the requirement that all solid waste be utilized for resource recovery or disposed of in landfills meeting the minimum federal criteria; provision of the closing or upgrading of all existing open dumps; and no prohibition on negotiating or entering into contracts for the supply of solid waste to resource recovery facilities. In this rule, EPA has established minimum national criteria for CCR disposal facilities, which effectively define when CCR disposal facilities are open dumps. In order for EPA to approve a revised state SWMP, it must determine that the state plan provides enforceable regulatory requirements for the closing or upgrading of CCR disposal facilities that constitute open dumps. A state SWMP can do so through direct incorporation and implementation of the minimum federal criteria established by this rule or through incorporation of alternative requirements that are at least as protective of public health and the environment.

EPA anticipates that it will be able to review and approve state SWMPs that adopt the federal regulations in total or go beyond the federal minimum criteria very quickly; EPA's review of plans that do not adopt the federal minimum criteria or alter them substantially is likely to be more difficult and therefore more time consuming. EPA's review of and decision to approve or disapprove a state solid waste management plan will be based on the record before the Agency at the time of that decision. This record includes the record developed during the public participation process in which the state engaged prior to submitting the revised SWMP to EPA for approval. Should information come to EPA's attention at a later date that a state is not implementing its approved plan or taking actions at variance with the plan's provisions, EPA will take appropriate steps including potentially withdrawing approval of the SWMP.

Because SWMPs form a critical part of the implementation of this rule, EPA intends to engage the states very soon after promulgation of the minimum criteria to develop a streamlined, efficient process for review and approval of these revised plans. EPA also intends to develop both guidance for states to use to submit revisions and for EPA to use in its review of the revisions.

In addition, EPA is exploring options for developing and publishing the statutorily required inventory of open dumps. Specifically, within one year of the promulgation of federal criteria under RCRA section 4004(a), section 4005(b) directs EPA ''to assist the states in complying'' with the directive in section 4003(a)(3) that state SWMPs shall provide for closure and upgrading of open dumps (*i.e.,* facilities that do not meet the revised federal criteria) by publishing an inventory of all ''open dumps'' in the US. 42 U.S.C. 6945(b). Because the minimum criteria promulgated today include implementation timelines, it is possible for a facility to become an open dump in the future for failure to meet the minimum criteria. Thus, EPA anticipates publishing an initial inventory and likely subsequent periodic updates.

Finally, in addition to benefits just described of a revised SWMP, RCRA Section 4005 provides an incentive in certain circumstances for states to obtain EPA approval on revised SWMPs. Under section 4005, States with approved SWMPs can provide additional time for facilities that do not meet the national minimum criteria (*i.e.,* ''open dumps''), to come into compliance. As noted above, within one year of the promulgation of federal criteria under RCRA section 4004(a), section 4005(b) directs EPA ''to assist the states in complying'' with the directive in section 4003(a)(3) that state SWMPs shall provide for closure and upgrading of open dumps (*i.e.,* facilities that do not meet the revised Federal criteria) by publishing an inventory of all ''open dumps'' in the US. 42 U.S.C. 6945(b). Facilities on this inventory are eligible to obtain a ''schedule of compliance'' from a state with an approved management plan, provided certain additional criteria have been met. Specifically, the facility must demonstrate that it is unable to use other ''public or private alternatives'' to manage its waste in the non-compliant unit. In such cases, the state may establish a schedule of remedial measures that includes ''an enforceable sequence of actions or operations'' which must lead to compliance within a ''reasonable time (not to exceed five years from the date of publication of criteria).'' 42 U.S.C. 6945(a). Such a schedule would shield the facility from any suit brought to enforce the criteria. Thus, if a State receives EPA approval on its revised plan, it can offer facilities additional time, albeit limited, to come into compliance with the federal requirements. EPA expects, however, that few facilities will either be eligible for or need to take advantage of this flexibility. First, as a practical matter, only a limited number of facilities or units will fall into the category of open dumps within the relevant timeframes. As noted, an open dump is defined as a solid waste facility that does not meet the federal minimum criteria. 42 U.S.C. 6903(14). As also explained, the final criteria establish timeframes for facilities to implement the technical requirements, ranging between six months to several years, including certain provisions that authorize extensions. Until those deadlines pass, the facility is not an open dump and therefore would not be eligible for or need a compliance schedule under section 4005. Because the statute limits the states' ability to set compliance schedules to five years from the publication of the criteria, if a facility is out of compliance with the criteria either shortly before or after this time five-year timeframe, from a purely practical perspective, compliance schedules are no longer a viable option. Thus for certain of the provisions (*e.g.,* closure, which generally must be completed within five years) compliance schedules would never be available.

Second, the timeframes in the regulation reflect EPA's considered judgment of the amount of time that would realistically be needed under normal circumstances for a facility to come into compliance, based on standard engineering practices used throughout the industry. Most facilities will, in fact, be able to comply with the federal criteria within the specified timeframes, and so will not need to seek a compliance schedule. For example, as part of its Dam Safety Assessment program, EPA evaluated all CCR surface impoundments with a dam hazard potential rating of ''high'' or ''significant,'' using criteria that were essentially the same as the technical criteria adopted in the final rule. As of the completion of that program, all units were either rated satisfactory, or were taking steps to ensure the structural stability of the unit. EPA acknowledges that ensuring the structural stability of these units requires continued maintenance and oversight, so past compliance is no guarantee of future compliance. However, our experience from the Assessment Program leads us to expect that the vast majority of CCR surface impoundments will be able to demonstrate compliance with the structural stability requirements in the final criteria within the specified timeframes. Any facility that seeks to justify an extension would have a heavy burden to demonstrate that anything longer than a minor amount of time is needed to implement the structural stability requirements would meet the statutory standard (*i.e.,* be ''reasonable''). Similarly, absent factors beyond the facility's control (i.e, ''Acts of God'') EPA is unable to envision the circumstances that would support a decision that additional time beyond the 30 months already provided in the criteria to comply with the groundwater monitoring requirements would be ''reasonable.''

Third, RCRA section 4005(a) imposes a number of requirements that will further limit both the circumstances in which a compliance schedule may be granted, and the amount of time that states will ultimately be authorized to grant. 42 U.S.C. 6945(a). Section 4005(a) requires that to obtain a compliance schedule, the facility must first demonstrate that it has considered other public or private alternatives to comply with the prohibition on open dumping and is unable to utilize such alternatives.[127] At a minimum, this means that the facility must demonstrate that there are no alternative units that meet the federal requirement, either on-site or off-site, that can be used to dispose of the CCR. EPA also interprets this provision to require the facility to demonstrate that it has made a good faith effort to comply with the criteria, which would include documenting the actions that had been taken, along with the facts demonstrating the reasons that compliance was not feasible within the criteria's timeframes. As has been previously discussed, cost is not a factor that is appropriately considered under sections 1008(a)(3), 4004(a), or 4005(a), and so would not provide an adequate justification for these purposes either.

Further, the statute requires that a schedule for compliance specify ''a schedule of remedial measures, and an enforceable sequence of actions, leading to compliance within a reasonable time.'' Id. This means that any compliance schedule must lay out precisely the activities that remain to be completed, along with clear and enforceable deadlines for each. Again, this will effectively serve to limit the ultimate amount of time that would be granted in any individual case.

Finally, as stated earlier, the statute requires that any schedule to bring an open dump into compliance is to be limited to a ''reasonable time,'' that is not to exceed five years from the date of publication of the federal criteria. Whether a particular period of time is ''reasonable'' depends on the facts of the particular situation, but, generally speaking, it should take into account the technical complexity of the requirement, the activities that remain

[127] Upon promulgation of criteria under sections 1008(a)(3) and 4004(a), the continued use of any unit that does not comply with these criteria is prohibited, as ''open dumping,'' unless a compliance schedule has been established.

to be completed, the reasons for the lack of compliance, and other particular factors such as geology, geography, weather, and engineering circumstances. For example, EPA expects that a significantly lower amount of time would be reasonable for a facility that simply chose to delay implementation than for a facility whose compliance was complicated by factors beyond its control. Overall, to be consistent with the statute, EPA expects that facilities seeking to establish an alternative compliance schedule would need to provide a factual justification that not only documents the reasons that compliance within the criteria's timeframes was not feasible, but carefully documents the facts that would support a determination that any significant extension of time to come into compliance is ''reasonable.''

EPA expects that as part of any revised solid waste management plans, a state would explain the criteria it intended to use to determine whether and how much additional time to comply with the federal criteria should be granted. See 40 CFR 256.04(f) and 256.26. Consistent with the statute's directives, EPA expects that any extension would be limited to the time absolutely necessary to bring a unit into compliance, and that five years would not automatically be granted. Nor would a revised solid waste management plan that granted all ''open dumps'' an additional five years generally meet the regulatory criteria for approval. Id. EPA also expects that states would consider the original timeframes laid out in the criteria. As previously discussed, in developing these time frames EPA sought to achieve a balance between the minimum amount of time that would realistically be needed to properly and adequately implement the technical requirements, and the need to expeditiously address the significant risks associated with CCR units. EPA therefore expects that in granting additional time under compliance schedules, states will be guided by the same considerations. As documented throughout this preamble, CCR disposal units do pose significant risks to public health and the environment; it is therefore critical that actions to implement these criteria be taken expeditiously to address these risks. EPA intends to closely review those portions of a state solid waste management plan that address the processes and criteria for establishing compliance schedules.

In conclusion, EPA believes that the use of the solid waste management plan revision process is the best mechanism available under RCRA subtitle D to address the states' interest in obtaining formal EPA ''approval'' of their solid waste management plans. EPA will continue to work with the states as the rules are implemented to ensure that this process is streamlined and efficient.

X. Risk Assessment

EPA revised and updated the 2010 draft risk assessment using mathematical models to determine the rate at which chemical constituents may be released from different waste management units (WMUs), to predict the fate and transport of these constituents through the environment, and to estimate the resulting risks to human and ecological receptors. Modeling was conducted in a step-wise fashion, with more refined analyses used at each subsequent step. Below, EPA discusses how the risk assessment was revised and updated in response to the various public comments received. The Agency also provides a summary of the analyses conducted as part of the risk assessment and the final conclusions drawn from these analyses. For further discussion, see the revised risk assessment and response to comments documents available in the docket.

A. Response to Public Comments

EPA received numerous, general comments on both the draft risk assessment and subsequent NODAs. These comments tended to express general support or disapproval for the risk assessment methodology, data, or results. However, these comments did not provide any specific technical recommendations or data that could be used to improve the risk assessment. EPA appreciates the overwhelming interest of the public regarding the Agency's risk assessment. However, without any substantive critique that could be acted upon, EPA could not alter the risk assessment in response to these more general comments. To the extent that any commenter mentioned substantive issues regarding a specific aspect of the risk assessment, these comments are further addressed in subsequent sections of this preamble.

1. Comments Related to Fate and Transport Modeling

COMMENT: Commenters wondered how realistic results may be using a risk assessment model that assumes current conditions will be maintained for 10,000 years. Specifically, commenters were concerned about the assumption that constituent concentrations in the leachate remain constant throughout that timeframe. In addition, commenters questioned the assumption that well use and climate conditions will remain constant for 10,000 years.

EPA RESPONSE: EPA acknowledges that the 10,000-year groundwater modeling time horizon required further clarification in the revised risk assessment. Thus, the text in the revised risk assessment has been updated to make it clear that the selection of a *maximum* 10,000-year time horizon does not mean that all model simulations continue for the full 10,000 years. Specifically, Section 4 states:

EPA ran the model until either the observed groundwater concentration of a constituent at the receptor point reached a peak and then fell below a model-specified minimum concentration (10^{-16} mg/L), or the model had been run for a time period of 10,000 years.

Although groundwater concentrations are modeled beyond the observed peak or maximum average concentrations, these post-peak or post-maximum average predictions are not used in estimates of risk. In many cases the leachate plume reaches the receptor point much sooner than 10,000 years. As discussed in Section 5 and appendix K of the revised risk assessment, on a national scale, both unlined and clay-lined surface impoundments consistently pose peak risks within 100 years. Meanwhile, composite liners show much longer peak arrival times, close to 10,000 years for most surface impoundment runs. Peak arrival times are longer for landfills, and more than 10,000 years for composite-lined landfills. Under such timeframes, EPA acknowledges that surface conditions may change significantly, compounding the uncertainty associated with the predicted exposures and risks. However, EPA also notes that the time to first exceedance of selected risk criteria is typically considerably less than the time to the greatest exceedance.

EPA acknowledges that future groundwater use patterns may shift as the number and location of receptors changes, and that it is unknown whether future changes in receptor locations and other surface conditions would result in greater, lesser, or the same risk as predicted in this analysis. However, no known data exist that would allow EPA to do more than speculate about future population dynamics. Thus, the Agency relied on the best available data on the current population to conduct the revised risk assessment. The approach used to place residential groundwater wells is further discussed in Section 4 and appendix B of the revised risk assessment, and the associated uncertainties are discussed in Section 5.

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COMMENT: Comments related to the specifics of the groundwater transport modeling were received from commenters. Issues covered in their comments included the following:

Geochemical Modeling:

• The way that soil and aquifer K_d values were determined and used, including the fact that the risk assessment did not explicitly model oxidation/reduction reactions and precipitation-dissolution processes that may influence the chemical fate and transport.

• Whether hydrogeologic settings were assigned correctly.

Selection of Sorbents:

• The selection of iron oxides, and dissolved organic matter (DOM) and particulate organic matter (POM) to represent all sorbents in soil and aquifer materials.

• The selection of goethite as the iron oxide mineral used to estimate sorption to vadose zone and aquifer materials.

• The treatment of POM and DOM in the MINTEQA2 modeling used to generate the K_d values (sorption isotherms) used in the analysis.

• The adequacy of sensitivity and uncertainty analyses for the MINTEQA2 modeling.

K_d Values:

• The approach used to determine the value of pH in the aquifer for selecting K_d.

• The subsequent calculation of the retardation factor.

Arsenic Speciation:

• The assumption that arsenic III is the only or dominant form of arsenic is too conservative, as arsenic III readily converts to the less mobile arsenic V species under aerobic conditions.

• A commenter requested time to exceedance results for arsenic species and other constituents, as well as distance versus concentration output from EPACMTP.

EPACMTP Assumptions and Simplifications:

—The appropriateness of EPACMTP and its various assumptions and simplifications for groundwater modeling, including:

—Not altering the chemistry of the aquifer receiving leachate.

—Not simulating variable oxidation-reduction potential conditions or multiple chemical species during a model run.

—Not evaluating the potential mobilization of non-waste related metals from soils when exposed to leachate with potentially different geochemistry compared to ambient conditions.

—Not considering the potential occupation of adsorption sites by naturally occurring metals or competition from multiple contaminants.

—Not considering mounding-induced reduction of the unsaturated zone thickness or other cases where the groundwater table is in direct contact with the bottom of the WMU.

—Not considering fractured rock, karst, and other complex hydrogeologic settings.

The comments also addressed the general need for more transparency in the data and methods used in the analysis and the need for validation and/or comparison of model inputs and results to site-specific field data.

EPA RESPONSE: The following is EPA's response broken out by subtopic.

Geochemical Modeling:

EPA recognizes that explicit reactive/geochemical modeling would be more realistic than using linear and nonlinear partitioning coefficients. EPA considered the use of the Objects Representing Chemical Speciation and Transport (ORCHESTRA) model during revisions to the risk assessment because it can account for geochemical interactions, such as aqueous complexation, precipitation, surface complexation, and ion exchange.[128] However, such modeling is not a practical approach for a nationwide analysis because the data collection effort necessary to populate such a model on a nationwide, location-based level would be prohibitively expensive. Even assuming such data were available to populate ORCHESTRA or a similar model, the complexity of the algorithms necessary to account for highly variable geochemical and hydrogeologic conditions nationwide and the time required to run such a model would also be impractical. Furthermore, the use of K_d as a surrogate for dilution/sorption/precipitation processes is a widely used and accepted method in both the scientific literature and the groundwater modeling community, provided the values of K_d used are appropriate to account for the range of potential attenuation processes.[129] Therefore, for a nationwide analysis, the use of K_d is a practical and necessary simplification. EPA has added discussion to the risk assessment to clarify K_d-related issues raised by the commenters. Appendix H of the revised risk assessment displays select percentiles of the K_d values used in the analysis. These values were derived from the isotherm sampling performed by EPACMTP and used in the modeling (including effective K_d values for the unsaturated zone). A listing of all individual K_d values available in the MINTEQA2 isotherms used in these analyses would not be practicable. Instead, the full input and output files are available to the public in the docket.

Some commenters suggested that EPA should focus on the effect of redox potential in the groundwater on fate and transport. While this is possible, it would take significant effort to set up this type of approach for every inorganic constituent considered in the risk assessment, and it was determined not to be necessary. EPA did indirectly account for some of the major effects of redox potential when modeling arsenic and other constituents for which speciation is known to have a significant impact on mobility. For these constituents, a model run was conducted for each species under the assumption that all of the constituent mass was present as that speciation. Therefore, EPA did not evaluate redox, and acknowledges this is a source of uncertainty for the groundwater transport modeling approach. Commenters expressed concern about the assumption of a single speciation, noting that it is likely that constituents will be present as some combination of the different species. EPA acknowledges that this approach is a simplification of real world conditions; however, the Agency believes this approach is useful because it provide bounding estimates that can inform the risk assessment.

Regarding the concern that there were possible errors in hydrogeological assignments, these assignments have been updated in the revised risk assessment based on a more robust and accurate dataset for waste management units (WMU) and facility locations. These data are discussed in Section 3 and appendix B of the revised risk assessment. Because these assignments were based on more complete GIS coverages of soils and aquifers across the U.S., they are more consistent and reliable than the previous ones in representing the spatial variability in hydrogeologic environments needed by the EPACMTP model.

Selection of Sorbents:

In recent years, databases of equilibrium sorption reactions have been compiled in the literature for several of the dominant potential sorbents in the environment, including two common iron oxide minerals: hydrous ferrous oxides (HFO) and

[128] Meeussen, J.C.L. 2003. ORCHESTRA: An Object-Oriented Framework for Implementing Chemical Equilibrium Models. *Environmental Science & Technology* 37(6):1175–1182.

[129] U.S. EPA. 1999. *Understanding Variation In Partition Coefficient, Kd, Values Volume I: The Kd Model, Methods of Measurement, and Application of Chemical Reaction Codes.* EPA 402–R–99–004A. OAR. Washington, DC. August.

goethite.[130] [131] Because of the availability of these data and their prevalence in the environment, these are the sorbent types available for MINTEQ2 modeling used to develop constituent sorption isotherms. Other common hydrous oxides that can sorb chemicals include hydrous oxides of aluminum, manganese, and silicon (Dzombak and Morel, 1990); however, there were insufficient data on these to consider their use. To determine the most appropriate iron oxide sorbent, EPA chose goethite as the most appropriate form of hydrous iron oxide for the risk assessment to avoid an underestimation of risk. While both goethite and HFO are common forms of iron oxide in soils, goethite is a much poorer adsorbent than HFO, thereby leading to relatively greater groundwater plume concentrations. EPA acknowledges that HFOs are common as well and there is the potential for HFOs with greater sorption affinities than goethite to be present at some CCR disposal sites. In reaching this conclusion, EPA consulted experts who published on this subject (specifically, Dr. David Dzombak, Dr. Samir Mathur and Dr. Jerry Allison), developer of MINTEQA2. EPA agrees that this was a necessary assumption.

EPA also recognizes that limiting MINTEQA2 to two types of sorptive materials (iron oxide and organic matter [DOM and POM]) is a simplification given the wide range or soil and aquifer materials that actually adsorb metals (*e.g.,* clay and other soil minerals). However, given that the extensive sorption databases needed to perform MINTEQA2 are available for POM, DOM, and goethite, they are the best representation of subsurface sorption processes active in soils and aquifer materials. This decision and the actual approaches used to model DOM, POM, and goethite are described in detail in MINTEQA2 background documents and the associated Response to Peer Review Comments for those documents.

Finally, with respect to the adequacy of sensitivity and uncertainty analyses for MINTEQA2, EPA notes that the 2009 sensitivity analysis showed that only results for strongly sorbing constituents were sensitive to the K_d values output from MINTEQA2. In contrast, the three risk drivers identified in the revised risk assessment (arsenic, lithium, and molybdenum) all tend to be weakly sorbing, with the exception of arsenic in the pentavalent state. Furthermore, to the extent K_d affects the risks, Section 5 of the revised risk assessment evaluated these effects by examining alternate speciation (*e.g.,* trivalent and pentavalent arsenic) as well as the effect of waste type and waste pH. For these reasons, EPA finds that sufficient sensitivity and uncertainty analyses were conducted.

K_d Values:

The approach adopted in the risk assessment to determine the value of pH in the aquifer (used to select K_d) and the subsequent calculation of the retardation factor assumed that, after entering the aquifer, the leachate plume would thoroughly mix with the ambient, uncontaminated groundwater. One commenter stated that the mixing zone would only be present at the periphery of the groundwater plume. This is consistent with the general conceptual model used in this risk assessment of uniform subsurface flow with recharge. However, EPACMTP requires a constant groundwater pH in each model run to model transport with nonlinear sorption isotherms. EPA assumed full mixing as a more conservative approach to selecting pH because, for most metals, sorption/precipitation tends to increase (*i.e.,* K_d goes up) with higher pH, which is characteristic of much CCR leachate (*i.e.,* assuming full mixing lowers the groundwater pH and, thus, decreases sorption). To characterize the potential effect of this simplifying assumption on calculated risk results, EPA conducted an uncertainty analysis that is presented in Section 5 of the revised risk assessment.

EPA considered comparing the modeled K_d values to available estimates in the published literature, but did not do so for three reasons. First, there are many individual values within each K_d isotherm that depend both on constituent concentrations and MINTEQA2 master variables, such as pH, organic carbon, and iron oxide concentrations. Second, measured values are limited to specific sites where conditions that may not be fully documented, and because such variables can vary from site to site, it can be very difficult to determine exactly how well the collected values represent conditions across the country. Third, field and laboratory methods for measuring K_d vary greatly and are not easy to compare, adding a significant measurement uncertainty to the variability issues mentioned above. Therefore, not only would this comparison be complicated to perform, it would also be subject to its own numerous uncertainties and unknown biases, making it unlikely to provide a basis for definitive conclusions about the representativeness of the current approach.

With respect to comments on the calculation of the retardation factor, EPA points commenters to U.S. EPA (2003) [132] which discusses how EPA uses K_d values to model sorption in the subsurface environment.

Arsenic Speciation:

Commenters also pointed out that literature on arsenic V often shows that it is orders of magnitude less soluble than arsenic III, which appears inconsistent with the results of the 2010 Draft Risk Assessment. The draft assessment found similar exposure concentrations for both arsenic species. As a result of a combination of different updates to the revised risk assessment, the modeled concentrations of arsenic III and V are now generally an order of magnitude different, although the specific results vary between pathways. One cause of this difference is likely the increased distances to receptors in the revised risk assessment. The increased distance would lead to additional arsenic V attenuation because this species sorbs more readily (*i.e.,* has greater K_d values) than arsenic III. Section 5 of the revised risk assessment discusses the uncertainty associated with modeling both species of arsenic. For the specific concentrations at various distances, EPA directs the commenter to review the input and output files available in the docket.

EPA did not model the time to first exceedance of risk criteria, but did conduct a sensitivity analysis for the time to peak groundwater concentration. The time to peak results for arsenic species and other select constituents are presented in Section 5 of the revised risk assessment. The distance to nearest well receptors is also discussed in Section 5 of the revised risk assessment. The relation of distance versus concentration was not explicitly evaluated on a per simulation basis, rather all receptor well locations within one mile from the WMU footprint were included in the analysis to provide a conservative risk estimate.

EPACMTP Assumptions and Simplifications:

Comments on the treatment of dispersivity within EPACMTP highlighted the need for greater transparency about the model's

[130] Dzombak, D.A and F.M.M. Morel. 1990. Wiley-Interscience, New York, 393 pp.

[131] Mathur, Samir S. 1995. *Development of a Database for Ion Sorption on Goethite using Surface Complexation Modeling.* Carnegie Mellon University, M.S. Thesis, Department of Civil and Environmental Engineering.

[132] U.S. EPA (Environmental Protection Agency). 2003. *EPA's Composite Model for Leachate Migration with Transformation Products (EPACMTP).* Technical Background Document. EPA 53–R–03–002. Office of Solid Waste, Washington, DC.

underlying assumptions and input data sources. The documentation for the 2010 Draft Risk Assessment did not include comprehensive tables detailing model input parameters, their values or distributional characteristics, and the sources of the data used. These values are, in many cases, publicly available in the EPACMTP Background and Parameters/Data Background documents.[133] [134] EPA still finds it inappropriate to duplicate this large amount of data. Instead, the revised risk assessment includes an increase in the number of references to these documents, and directs readers to refer to these documents for further information. Additionally, the full input and output files are available to the public in the docket.

With respect to the fundamental questions raised about the assumptions and simplifications built into EPACMTP, EPA acknowledges some limitations within the model. Some simplifications are necessary to complete a large, national scale risk assessment, and the model provides the most appropriate available tool to complete this type of analysis. As discussed in Section 5 of the revised risk assessment, EPACMTP has been thoroughly peer reviewed and tested for application in large-scale risk assessments. This section also provides additional documentation on these internal and external reviews of the model, its limitations, and the associated uncertainties. With respect to particular criticisms levied:

- EPA alters the chemistry of the aquifer receiving leachate by changing the aquifer pH in response to full mixing. Alternatively, EPA conducts an analysis in Section 5 using the alternate assumption of partial mixing;
- EPA evaluates alternative species in separate model runs. As described in the revised risk assessment, EPA believes that presentation of these two results bound the range of possible risks from a constituent. To the extent that EPA does not model oxidation-reduction potential, EPA notes that this would require geochemical modeling, which was not feasible for the reasons discussed above;
- Full mixing of the leachate plume did not demonstrate significant potential to affect aquifer pH. Thus, since pH is one of the most significant factors affecting constituent mobilization EPA does not believe significant constituent mass from the underlying soils will be mobilized in most cases. Instead, it is a site-specific consideration that is not possible to include in a nationwide risk assessment.
- A discussion of sorbent competition as a limitation of the analysis is discussed in Attachment H–1 of appendix H in the revised risk assessment.
- EPA did not consider groundwater mounding, groundwater in contact with the waste management unit, fractured rock, karst, and other complex hydrogeologic settings as these are site-specific considerations that could not be accommodated in a nationwide risk assessment.

COMMENT: Several commenters discuss the use of site-specific analysis to increase confidence in the risk assessment results. They expressed concern that the results are difficult to evaluate given the significant variability and uncertainty associated with the national scope of the analysis, and that validation or calibration of EPACMTP results with actual data is needed, including the potential use of damage cases.

EPA RESPONSE: Commenters expressed concern about validation of the EPACMTP model with actual field data and some commenters suggested that EPA should use actual monitoring data rather than modeling to assess potential risks. EPA recognizes the importance of monitoring data in characterizing specific sites. EPA agrees with the commenters that confidence in the results of an environmental fate and transport model increase significantly when model predictions can be compared favorably with measured field results. However, site-specific modeling involves extensive data collection and detailed modeling (representing site-specific conditions and processes), which was not possible for this large, national-scale risk assessment. Available site-specific data are limited to a relatively small fraction of locations and settings. This risk assessment was intended to represent a broad range of potential conditions. Consequently, EPA validated the model results with actual field data by comparing the results of the national probabilistic, Monte Carlo analysis to proven/potential damage cases from across the United States. These damage cases represent real-world instances of contamination from CCR WMUs that provide the best available comparison for the results of the risk assessment. This comparison is presented in Section 5 of the revised risk assessment. EPA also provided extensive EPACMTP validation results relative to theoretical models and field data in appendix D of the EPACMTP technical background document (U.S. EPA, 2003a,b).[135]

COMMENT: Comments relating to the number of wells contaminated, the realistic risk of exposure, well placement within the plume, distance to receptor wells, identification of surface water receptors, surface water interception modeling, the appropriateness of receiving water reaches (*e.g.* the nearest surface water body), and other receptor or well-related issues were received from public commenters.

Surface Water Interception Modeling:

Regarding surface water interception, many comments were supportive of EPA's approach for simulating the interception of groundwater by surface water bodies, which has been added to the revised risk assessment. However, some commenters indicated that a meaningful allocation of the groundwater plume between a surface water body and a downgradient well receptor can only be determined reliably with assessment of the system at a local scale.

Commenters also raised questions regarding the specific surface water interception methodology, including the base data and algorithms used to calculate stream base flow, net groundwater flow, and the contaminant mass loss to groundwater. Concern was expressed about the large range of possible values used for Monte Carlo sampling without calibrating models to site specific conditions and the potential to mismatch parameters. Additionally, concerns were raised that the assessment assumed transport directly to the nearest water body without reflecting complexities that are often present and could lead to longer transport pathways or to pathways to water bodies other than the nearest.

Commenters noted that the vicinity of many WMUs is serviced by a municipal water supply, and; therefore, there would be no drinking water receptors associated with these WMUs. Comments were also received that the one mile distance considered by the transport model is not sufficient, because actual receptor wells in many cases are further than one mile from facilities. Comments also highlighted the possibility that modeled receptor well concentrations may incorrectly represent actual

[133] U.S. EPA. 2003. *EPA's Composite Model for Leachate Migration with Transformation Products (EPACMTP): Parameters/Data Background Document.* EPA 530–R–03–003. Office of Solid Waste, Washington, DC. April.

[134] U.S. EPA. 2003. *EPACMTP Technical Background Document.* Office of Solid Waste, Washington, DC.

[135] U.S. EPA (Environmental Protection Agency). 2003a. *EPA's Composite Model for Leachate Migration with Transformation Products (EPACMTP).* Technical Background Document. EPA 53–R–03–002. Office of Solid Waste, Washington, DC.

exposures by sampling from a single aquifer depth. Comments on dispersivity noted the need for greater transparency in the report.

Placement of Receptor Wells, EPACMTP Well Inputs and Assumptions:

Comments related to the risk assessment's use of water well distances from MSWLFs and the Agency's belief that these distances would be protective for CCR WMUs. Additional comments focused on the assumption that the wells used in this assessment are contaminated (*i.e.,* located within the plume), even if the well location used reflects a deeper well that may be screened in an uncontaminated aquifer; the manner in which the assessment handles uncontaminated wells, plume characteristics, groundwater-surface water interactions, vertical contaminant concentration across a screened interval in an aquifer; and the values used for plume dispersivity.

EPA RESPONSE: The following is EPA's response broken out by subtopic.

Surface Water Interception Modeling:

In cases where receptor wells are located downgradient from a surface water body that intersects the groundwater table, some or all of the groundwater, along with the mass of constituents contained therein, is intercepted by the water body before it can reach the well. This interception was not modelled in the 2010 Draft Risk Assessment. However, a review of the input database for the 2010 Draft Risk Assessment found that such a water body was present in approximately two-thirds of the Monte Carlo runs. Furthermore, ignoring the loss of constituent mass had the effect of overestimating exposures. Thus, in the revised risk assessment an EPACMTP model post-processor was created to account for surface water interception by removing constituent mass flowing into the water body from the groundwater plume, and leaving only the remaining groundwater available to migrate to a drinking water receptor. The approach used to account for interception is discussed in further detail in Section 4 and appendix J of the revised risk assessment.

While commenters were generally supportive of the proposed approach, some indicated that a meaningful allocation of constituent mass from groundwater into a surface water body required site-specific data. Concerns were raised about the assumption that transport occurred directly to the nearest water body without reflecting complexities that are often present and could lead to longer transport pathways or to pathways to water bodies other than the nearest. EPA acknowledges that local conditions can make groundwater flow conditions complex, and detailed, local-scale assessments would be required to describe these conditions accurately. While EPA agrees that local-scale conditions must be considered for precise estimation for specific systems, it was impractical for EPA to characterize, simulate, and calibrate models for the numerous locations across the nation. Discussion of the uncertainties associated with this approach has been added to Section 5 of the revised risk assessment.

Several questions about the surface water interception methodology were raised by the public. The qBaseflow input parameter was derived from the NHDplus mean recharge parameter (MEAN_RCHRG) [136] and the size of the water body catchment and reach (see appendix B of the revised risk assessment). The approach assumes that all streams intersect the shallow aquifer and that all streams either gain water from the aquifer or do not interact with the aquifer at all (for simplicity and conservatism). As the commenter indicates, qNetflow is a key result calculated by subtracting the stream baseflow from the average groundwater flow upgradient of the stream. The qNetflow value becomes the adjusted groundwater flow beyond the stream, reflecting groundwater losses to the stream. One commenter raised a specific question about how the methodology handles cases where qNetflow is less than zero, but greater than the average groundwater flow. This case does not occur with the methodology adopted by EPA, because qNetflow is always equal to or less than the average groundwater flow (*i.e.* streams are assumed not to be losing). If qNetflow is negative (*i.e.,* a losing stream), all of the groundwater is assumed to migrate to any wells on the opposite side of the stream.

Model Validation/Calibration:

Concern was expressed about the large range of possible values used in the probabilistic analysis for certain parameters and the potential for this to result in a mismatch of input parameters without proper site-specific calibration. EPA notes that the revised risk assessment is not intended to capture the exact risks at each disposal site. Instead, the revised assessment combines the best resolution of site-based, regional and national data available to provide an estimate of potential risks that may occur from current disposal practices. While the assigned data for any given model iteration may not reflect the exact conditions at a real-world site, the resulting sum of all model iterations reflect the range of potential conditions near each WMU, weighted by prevalence, across the conterminous United States.

Placement of Receptor Wells, EPACMTP Well Inputs and Assumptions:

Comments regarding placement of receptor wells in the probabilistic analysis (also known as the appropriateness of receiving water reaches) are the result of a fundamental misinterpretation regarding the constraints placed on groundwater receptor location to be, as described in the 2010 Draft Risk Assessment, ''within the contaminant plume.'' This constraint is more fully explained in Section 4.4.3.6 of the EPACMTP technical background document.[137] A citation referring readers to that document has been placed in Section 4 of the revised risk assessment. Because the comment resulted from a misunderstanding, EPA does not believe the sensitivity analysis suggested by the commenter is necessary.

Some commenters were concerned that many residents in the vicinity of some WMUs may be serviced by a municipal water supply. Because these residents would not be exposed to groundwater, the risk assessment could overestimate exposures. EPA acknowledges that there may be a large percentage of the population that does not rely on groundwater as a source of potable water; however, the aim of the risk assessment is to estimate the magnitude of potential risk to the exposed population. Thus, this does not represent a significant source of uncertainty in the risk assessment.

Comments were also received that the one-mile distance considered by the transport model is not sufficient, because actual receptor wells in many cases are further distant than one mile from facilities. EPA conducted a sensitivity analysis, discussed in Section 5 of the revised risk assessment, which indicates that risks beyond the one-mile distance are appreciably lower than risks within one mile. Given that the highly exposed population was adequately captured by a one-mile radius, the significant additional effort required to extend the analysis further downgradient was unjustified.

[136] Available online at: *water.usgs.gov/GIS/metadata/usgswrd/XML/nhd_recharge.xml.*

[137] U.S. EPA (Environmental Protection Agency). 2003a. *EPA's Composite Model for Leachate Migration with Transformation Products (EPACMTP).* Technical Background Document. EPA 53–R–03–002. Office of Solid Waste, Washington, DC.

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With respect to comments related to the placement of wells within deeper aquifers, EPA has a policy of addressing uncertainty by erring in favor of the protection of human health and environmental quality. Consistent with this practice, wells screened within vulnerable, surficial aquifers (*i.e.,* the top 10 meters of the saturated zone) continue to be the primary focus of the Agency's national-scale modeling efforts. Comments also highlighted the possibility that modeled receptor well concentrations may incorrectly represent actual exposures by sampling from a single aquifer depth. Wells are typically screened across an extended depth, and may capture both contaminated and pristine groundwater. Due to the constraints of EPACMTP, EPA maintained the current approach of modeling exposures at a single depth. A discussion of the uncertainties associated with this approach has been added to Section 5 of the revised risk assessment.

In response to comments on the use of MSW landfill data to predict the distance to private wells, EPA did not use the MSW data in the revised risk assessment. Instead, EPA used synthetic population representations of U.S. Census data to place each household and its occupants at discrete points across the landscape surrounding CCR WMUs. Synthetic populations are realistic representations of households and individual residents and their attributes in a given census area, and are based on methods that identify realistic locations within each block by using LandScan 90-meter night-time population distributions to place each household across the landscape.[138] From these households, a distribution of the distances to the nearest well was created. This approach is discussed in more detail in appendix B of the revised risk assessment. Some commenters suggested that EPA develop site-specific estimates of actual populations around facilities rather than relying on synthetic populations to determine potential receptor locations. The synthetic approach provides the maximum spatial resolution possible for publically available population data from the U.S. Census. More site-specific estimates would be costly, but not necessarily more accurate.

Some commenters were also concerned that the assessment did not consider direct discharges from surface impoundments to surface water. This pathway was outside the scope of the assessment, because it is regulated by the NPDES program. However, this pathway was evaluated in *Environmental Assessment for the Proposed Effluent Limitation Guidelines and Standards for the Steam Electric Power Generating Point Source Category,*[139] which will be revised in support of final effluent limitation guidelines due to be released in September of 2015.

2. Comments Related to Source Modeling

COMMENT: The majority of the public commentary in this subcategory was dominated by the assertion that Toxicity Characteristic Leaching Procedure (TCLP), Synthetic Precipitation Leaching Procedure (SPLP) and other laboratory leachate test data are not applicable to CCR wastes. Comments specifically regarding the use of Leaching Environmental Assessment Framework (LEAF) data for modeling leaching behavior noted that the data should be applied appropriately and pointed out the following: (1) That the range of conditions (*i.e.,* range of pH) encompassed by the LEAF data is broader than those conditions found in the field for CCR disposal; (2) high pH limits the mobility of leaching constituents; (3) the need for validating LEAF leachate concentrations against field data if available; and (4) the reliability of the LEAF data is questionable as a result of inconsistencies identified in the LeachXS Lite™ database.

EPA RESPONSE: Only pore water and impoundment water data were used to characterize surface impoundments. Therefore, the comments received on the use of laboratory leachate data are not relevant for the surface impoundment scenario. For landfills, EPA agrees that TCLP, SPLP and other single pH test methods may not be the most appropriate leachate extraction methods for all waste streams and all disposal scenarios. The 2010 Draft Risk Assessment relied on a hierarchy of dissolved concentration data to characterize leaching from landfills, ranging in order of preference from field leachate data to TCLP. However, new data collected using the LEAF test methods have been made available through a series of EPA reports.[140] [141] [142] LEAF were collected with three LEAF methods, specifically:

- SW–846 Method 1313 (and its predecessor, Method SR02);
- SW–846 Method 1314; and
- SW–846 Method 1316 (and its predecessor, Method SR03).[143]

With the availability of the LEAF data, EPA no longer relied on other data sources to model landfills because the inability to identify trends in leaching behavior from single pH tests made it impossible to link these data together with the LEAF data in the probabilistic analysis. The LEAF data provide information on the leaching behavior of CCR for a range of pH values observed in CCR landfills, as well as the liquid-to-solid ratio of the pore water. The data from these three methods were used in conjunction to characterize landfill leaching. While the natural pH range for any individual sample may be narrower than the full range analyzed with the LEAF methods, many facilities burn a range of coal types under varying operating conditions, and co-dispose with other materials, so the range of pH for a specific CCR sample may be exposed to is wider than the pH estimated based on one sample alone.

EPA agrees that appropriate use of the data is needed to ensure that data represent likely conditions of leaching occurring at range of facilities nationwide taking into account local specific environmental conditions, the geometry of monofill, type of coal, air pollution control, and other factors that affect leaching. Since the NODAs were released, a report comparing leachate from field and laboratory analyses has been completed.[144] The report includes the use of geochemical speciation modeling as needed to reflect site-

[138] Bhaduri, B., E. Bright, P. Coleman, and M. Urban. 2007. LandScan USA: A high resolution geospatial and temporal modeling approach for population distribution and dynamics. *GeoJournal 69:*103–117.

[139] U.S. EPA. 2013. Environmental Assessment for the Proposed Effluent Limitation Guidelines and Standards for the Steam Electric Power Generating Point Source Category. EPA–821–R–13–003. Office of Water. Washington, DC. 20460. April.

[140] U.S. EPA. 2006. *Characterization of Mercury-Enriched Coal Combustion Residues from Electric Utilities Using Enhanced Sorbents for Mercury Control. EPA–600/R–06/008.* Prepared by F. Sanchez, R. Keeney, D. Kosson, and R. DeLapp for the U.S. Environmental Protection Agency, Air Pollution Prevention and Control Division. February.

[141] U.S. EPA. 2008. *Characterization of Coal Combustion Residues from Electric Utilities Using Wet Scrubbers for Multi-Pollutant Control. EPA/600/R–08/077.* Prepared by F. Sanchez, D. Kosson, R. Keeney, R. DeLapp, L. Turner, and P. Kariher for the U.S. Environmental Protection Agency, Air Pollution Prevention and Control Division. July.

[142] U.S. EPA. 2009. *Characterization of Coal Combustion Residues from Electric Utilities—Leaching and Characterization Data.* EPA–600/R–09/151. Office of Research and Development, National Risk Management Research Laboratory, Research Triangle Park, NC. December.

[143] Methods SR02 and SR03 are predecessor methods to SW–846 Methods 1313 and 1316.

[144] U.S. EPA. 2014. *Leaching Test Relationships, Laboratory-to-Field Comparisons and Recommendations for Leaching Evaluation using the Leaching Environmental Assessment Framework (LEAF).* EPA–600/R–14/061. EPA Office of Research and Development, National Risk Management Research Laboratory, Research Triangle Park, NC 27711. November.

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specific factors affecting leaching, and shows that LEAF methods provide realistic predictions of environmental releases across the range of pH.

All three LEAF methods are summarized in appendix C, with the leachate data provided in Attachment C–5 of the revised risk assessment. Additionally, the inter-laboratory validation for these methods are described in U.S. EPA (2012a, b) [145] [146] while Kosson et al. (2002) [147] provides the detailed test methodology for the predecessor methods, SR02 and SR03. The noted discrepancies and classification errors within LeachXS Lite have been corrected.

COMMENT: Public comments focused on the general relevance of the facility data based on age and noted that newer data should be used to more accurately reflect the current state of CCR management. Related comments cited that the grouping of waste and liner types by facility is not representative of current conditions. Another commenter suggested that the outcomes for different liner types were not comparable and should not be used to make relative conclusions about liner performance. It was also suggested that the assumed three-foot clay layer underlying composite liners is too thick, and two feet would be more representative of current practice. Commenters also described existing management controls required in some geographical locations that mitigate potential risks (*e.g.,* liners, leachate collection) and requested that EPA reflect the existence of those controls in their analysis, as well as mismanagement scenarios when these controls are not in place.

EPA RESPONSE: Since the purpose of the risk assessment was to evaluate risks for the universe of currently operating facilities and WMUs, EPA generally agrees with the commenter that the 1995 EPRI and 2006 DOE survey data relied on in the 2010 Draft Risk Assessment may be outdated. Thus, EPA collected data from several new sources of information on the facilities, WMUs, and liners that are present at the time of this analysis. Further discussion of these data sources is available in Section 2 and appendix A of the revised risk assessment.

Regarding the inclusion of mismanagement scenarios, EPA reviewed the high-end pore water concentrations and determined that these data represent actual CCR samples and therefore represent possible high-end risks from current management practices. To better understand which practices may lead to the highest risks, EPA conducted sensitivity analyses that consider the influence of liner type, liner design, waste type and other variables on model results. The results of these analyses are presented in Section 5 of the revised risk assessment.

Several commenters described existing management controls required in some geographical locations that mitigate potential risks (*e.g.,* liners, leachate collection) and requested that EPA reflect the existence of those controls in the final risk analysis. The Agency's analysis reflects the presence of different management scenarios at WMUs to the extent the available data allowed (*e.g.,* WMUs were assumed to have liners if the information indicated such). A key objective of the analysis was to compare the effectiveness of management options (*e.g.,* liners; surface impoundments versus landfills) at preventing potential releases and exposures. Because the population of WMUs considered in the analysis included a range of management controls, the analysis does provide such comparative results between management options. The uncertainties associated with the updated facility, WMU and liner data are discussed in Section 5 of the revised risk assessment.

COMMENT: One commenter suggested that the risk assessment applied risk results for fly ash to bottom ash, FGD sludge, and other CCR wastes, which may result in an incorrect estimate of risks for these other wastes. Other commenters called for EPA to evaluate each CCR waste independently. A public commenter expressed concern about whether the risk assessment adequately considered alternative CCR disposal scenarios. Specifically, it was noted that CCR codisposed with coal refuse generate more acidic conditions (*i.e.,* lower pH) due to higher-levels of sulfide minerals, which may significantly impact the mobility of metals.

EPA RESPONSE: In the revised risk assessment, EPA modeled a combined ash waste types for the majority of surface impoundments and all landfills. Although commenters are correct that different CCR wastes may behave differently when monofilled, the 2009/2010 EPA survey data indicates that the CCR are codiposed in a majority of units. Thus, EPA believes this approach appropriately reflects current disposal practices.

With regard to the evaluation of CCR codisposed with coal refuse, EPA notes that the pore water data used to characterize surface impoundments were broken out separately for this waste type evaluation. These data reflect samples collected in the field and are representative of the pH at which these samples are managed. While some ash and coal refuse samples are highly acidic, others are more neutral or slightly basic (full pH range of 1.7 to 8.2). The development and application of these waste types is discussed in Section 3, Section 4 and appendix H of the revised risk assessment, while the associated uncertainties are discussed in Section 5. For landfills, waste pH, which is the major driver of variations in K_d values used to distinguish waste types, was known with great accuracy for CCR nationwide because U.S. EPA (2009a) [148] compiled a full, nationwide distribution of CCR pH. In this distribution, disposal of ash with coal refuse is reflected is the acidic tail of the distribution. For the national probabilistic analysis, EPA aggregated model runs for ash and coal refuse (surface impoundments) and acidic waste (landfills) with other wastes so that risks reflected the prevalence of these disposal practices. However, EPA also performed sensitivity analyses to understand the extent that the lower pH of co-managed wastes could affect risks, which is discussed in Section 5 of the revised risk assessment.

COMMENT: Commenters stated that it is unclear why EPA chose to approximate infiltration through composite liner systems based on leak detection system flow rates from industrial landfills that use a different construction design than projected for CCR landfills.

EPA RESPONSE: The composite liner leakage rates used for this risk assessment correspond to leakage rates developed for the peer-reviewed Industrial Waste Management

[145] U.S. EPA. 2012. *Interlaboratory Validation of the Leaching Environmental Assessment Framework (LEAF) Method 1314 and Method 1315.* EPA/600/R–12/624. Prepared by A.C. Garrabrants, D.S. Kosson, R. DeLapp, P. Kariher, P.F.A.B. Seignette, H.A. van der Sloot, L. Stefanski, and M. Baldwin for the U.S. EPA Office of Research and Development, Air Pollution Control Division. September.

[146] U.S. EPA. 2012b. *Interlaboratory Validation of the Leaching Environmental Assessment Framework (LEAF) Method 1313 and Method 1316. EPA/600/R–12/623.* Prepared by A.C. Garrabrants, D.S. Kosson, L. Sefanski, R. DeLapp, P.F.A.B. Seignette, H.A. van der Sloot, P. Kariher, and M. Baldwin for the U.S. EPA Office of Research and Development, Air Pollution Control Division. September.

[147] Kosson, D.S., H.A. van der Sloot, F. Sanchez and A.C. Garrabrants. 2002. An integrated framework for evaluating leaching in waste management and utilization of secondary materials. *Environmental Engineering Science 19*(3):159–204.

[148] U.S. EPA. 2009. *Characterization of Coal Combustion Residues from Electric Utilities—Leaching and Characterization Data.* EPA–600/R–09/151. Office of Research and Development, National Risk Management Research Laboratory, Research Triangle Park, NC. December.

Evaluation Model (IWEM).[149] The types of synthetic liners used are likely to be the same, regardless of the type of waste present. EPA is unaware of any factors specific to CCR that would exacerbate leakage rates, nor did the commenter provide any. Thus, in the absence of any information to the contrary, EPA finds these to be the best available data.

Because there is currently no approach for differentiating between flow from unimpacted water released by the consolidation of clay and from contaminated leakage through the liner, EPA excluded data on the subset of composite liners constructed with natural clay from the distribution of composite liner leakage rates. EPA did consider the potential impact of incorporating these additional data into the risk assessment as part of sensitivity analysis, presented in Section 5 of the revised risk assessment.

COMMENT: Concerning the treatment of non-detect values in the risk assessment, one commenter recognized that the use of one half the detection limit in calculations has become an accepted protocol. However, it was suggested that this approach may not be appropriate in all cases, and that newer or more straightforward methods can be applied to improve precision and minimize biasing of the dataset. Another commenter noted that mercury was excluded from the analysis due to the high number of non-detects.

EPA RESPONSE: Additional constituent data measured with lower detection limits have been made available to EPA since completion of the 2010 Draft Risk Assessment. However, the overall CCR constituent database still contains a large number of non-detect data for some constituents. EPA continues to incorporate all available with the use half the reported detection limit as the most appropriate method to account for these non-detects. The commenter is correct that much of the pre-2010 mercury data has high detection limits and a large proportion of non-detects. In this one instance, EPA relied only on the newer data made available to the Agency since the 2010 Risk Assessment, which was collected through newer methods with significantly lower detection limits. A more detailed rationale for this approach is provided in Section 3 of the revised risk assessment, along with further discussion of the uncertainty in Section 5.

[149] U.S. EPA. 2002. *Industrial Waste Management Evaluation Model (IWEM) Technical Background Document.* EPA530–R–02–012. Office of Solid Waste, Washington, DC. August.

COMMENT: Comments received related to the effect of waste compaction in landfills focused on changes to hydrologic properties of waste materials, such as porosity and hydraulic conductivity. These changes may result from compaction, consolidation, hydration or geochemical changes, and have the potential to result in either an underestimation or overestimation of risks.

EPA RESPONSE: EPA acknowledges that the landfill source model does not consider the compaction of CCR waste that may occur over time as a result of anthropogenic activities, gravity or infiltrating water. However, no data on either the rate or degree to which these processes may occur were provided by commenters or identified elsewhere. EPA considered the impacts of this uncertainty in Section 5 of the revised risk assessment.

COMMENT: Public comments focused on assumptions relating to the variability of unlined landfill design, landfill clay liner materials, and construction of landfill cover materials and construction. Specific comments emphasized that the clay liner and cover thickness assumptions (three feet) were too conservative and not conservative enough, respectively. Commenters also questioned why composite covers and leachate collection systems were not considered for clay-lined landfills. Additionally, commenters stated that there was a high degree of variability in the material and design and construction for unlined landfills that was not accounted for in the HELP modeling. One commenter also pointed out that the assessment may overestimate percolation rates from landfills by underestimating the use of engineering controls. In addition, a commenter stated that the assessment assumes that States will require liners in all cases which may not be the case, thereby weakening the regulation.

EPA RESPONSE: For both unlined and clay-lined landfills, EPA used Hydrologic Evaluation of Landfill Performance (HELP) model-derived infiltration rates. These infiltration rates assume that the cap placed on top of the landfill at the end of its useful life will remain intact for the duration of the risk assessment, up to a maximum 10,000 years of modeling. A commenter pointed out that hydraulic conductivity of a clay liner is likely to increase by orders of magnitude due to desiccation resulting from natural temperature cycles. Additionally, commenters stated that there was a high degree of variability in the material and design and construction for unlined landfills that was not accounted for in the HELP modeling. EPA has adopted the use of the HELP model, which was subject to both peer and administrative review, as the source of unlined and clay-lined infiltration rates for landfill for nearly two decades. EPA acknowledges that there are limitations in using HELP. However, the model has been tested and verified as discussed in the EPACMTP Parameter/Data Background Document.[150] To the extent that the performance of the cap will decrease over time, EPA acknowledges that unlined and clay-lined infiltration rates calculated by HELP may be underestimated, however the degree of that underestimate is unknown. Discussion of this uncertainty has been added to Section 5 of the revised risk assessment.

COMMENT: One commenter expressed concern over the fact that the assessment modeled all disposal sites above the water table. The commenter indicated that many surface impoundments and landfills are deep and can come in direct contact with the water table. This will result in an underestimation of peak concentrations, arrival times and risks for these WMUs. Furthermore, the commenter emphasized that the use of the unsaturated zone flow module to calculate infiltration from the bottom of impoundments underestimates true risks in the consolidated sediment, and noted that clogged soil layers should be treated as saturated rather than unsaturated.

EPA RESPONSE: EPA acknowledges that EPACMTP is not designed to handle scenarios where the water table is above the bottom of the landfill. However, EPACMTP can accommodate surface impoundments in direct contact with the water table. If unit geometry and the selected depth to the water table create a scenario where the bottom of the unit is in contact with the water table, then the entire soil column is considered saturated. Otherwise, even for very high infiltration rates, regions beneath impoundments will remain partially saturated when there is sufficient distance between the unit and the water table. EPA has added a discussion of the uncertainties associated with WMU source terms and EPACMTP in Section 5 of the revised risk assessment.

EPA believes the commenter misunderstood how the sediments were modeled for surface impoundments. The EPACMTP unsaturated zone

[150] U.S. EPA. 2003. *EPA's Composite Model for Leachate Migration with Transformation Products (EPACMTP): Parameters/Data Background Document.* EPA 530–R–03–003. Office of Solid Waste, Washington, DC. April.

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module assumes that the 0.2 m of consolidated sediments at the bottom of a surface impoundment are always saturated whereas the 0.5 m of clogged native soil are assumed to be unsaturated when the bottom of the surface impoundment is above the water table.

COMMENT: Public commenters recommended that EPA address the future increase in mercury and NO_X compounds levels in CCR that will result from mercury capture from flue gas under new emission control regulations. Commentary pointed out that the recent Vanderbilt study should provide data that could be used to expand the risk assessment in this area.

EPA RESPONSE: The risk assessment was designed to evaluate the risks associated with current management practices and, as such, draws no conclusions about the potential for future air pollution technologies to alter the composition or leaching behavior of CCR wastes. However, it has been shown that newer mercury pollution control technologies currently in place have the potential to affect leaching behavior.[151] [152] [153] Thus, EPA conducted a sensitivity analysis to evaluate the risks associated with existing units that dispose of this waste; however, the data were too few to allow EPA to draw conclusions about the effect of pollution control technologies on the risks. This sensitivity analysis is presented in Section 5 of the revised risk assessment.

COMMENT: Multiple public commenters noted that additional pore water will improve the risk assessment, but TCLP and SPLP data are not appropriate for use as source concentrations. Additionally, commenters stated that EPA applies the LEAF data to pH conditions that are not realistic to CCR disposal scenarios. Although LEAF provides a more representative and scientifically sound approach, it must be correctly adapted. Alternative statistical methods to represent the input data as a range is certainly feasible and could enhance the risk assessment if the range of data is used as an input to the risk assessment.

Commenters agree that the LEAF data does provide useful information, but point out that it is associated with the potential for leaching and does not represent actual leaching of a specific CCR under actual field conditions. Commenters argues that field leaching data should not be mixed with laboratory data, and that EPA's field leachate dataset (for landfills and impoundments) is not adequate for use in the CCR risk assessment. Specific efforts recommended to properly utilize the LEAF data include: Use of probability density functions for leachate concentrations based on pH and/or L/S ratios in the Monte Carlo process; selection of leachate concentrations based on pH and L/S and tied to the geographic location of the WMU and CCR type; and geochemical modeling to incorporate reactions once leachate impacts groundwater.

A few commenters pointed out that the pore water data are generally representative, although concerns were raised about the highest arsenic concentration (81 mg/L) in the dataset. One commenter believed that although the addition of new data is an improvement, EPA could greatly improve the accuracy of the model's results by removing the extreme and unsubstantiated outlier data driving its high risk cases. Another commenter believed the assumption that concentration of contaminants in the sediment pores (applicable to a post closure scenario) would be equal to the concentration assigned to in the impoundment water would result in underestimated risks. Additionally, commenters noted that EPA should classify the data according to CCR type and coal type.

Overall, commenters support updates to the pore water data and the use of statistical method to normalize the data curve. However, one commenter noted that EPA should not use commenter-submitted CCR pore water data unless it meets requisite applicable data quality requirements. Another commenter stated that EPA needs to provide better clarity on these solicited comments (on the use of older pore water data) and provide these documents in the docket. Without these documents, the reader does not have a complete understanding of co-managed material containing CCR. Another comment noted that properly collected field pore water (freely draining) samples should take priority over any of the laboratory generated data and freely draining pore water is more representative of leachate releases than tightly held pore water.

EPA RESPONSE: The use of pore water data is still considered the most appropriate approach to estimate constituent fluxes to groundwater for CCR surface impoundments. This is because pore water better represents the leachate seeping from the bottom of the impoundment than impoundment water samples. EPA did not use available LEAF data for surface impoundments because a national distribution of pH was not available to allow the Agency to probabilistically assign LEAF concentrations to these units, and because there was no way to account for partitioning of the leachate into wastewater versus porewater. Thus, EPA has continued to rely on pore water data, supplemented with data from the 2010 comments. EPA appreciates commenter support on the use of pore water data and statistical methods for data analysis for surface impoundments. EPA agrees that data available for minefill sites may not be representative of disposal in surface impoundments. Thus, these data were not considered in the revised risk assessment. The specific handling of pore water concentration data with site quartiles, rather than site averages, is discussed in Section 4 and Section 5 of the revised risk assessment report.

EPA agrees that TCLP and SPLP data are less appropriate for CCR disposal scenarios and no longer uses these data in the revised risk assessment. EPA adapted the LEAF methods and data for landfills, as this is the best available approach and data to represent CCR landfill leachates, and does not mix or use field data with LEAF laboratory results for landfill leachate. The LEAF data are considered the most robust and technically defensible data available. As noted in the 2010 Environmental Science and Technology publication,[154] the data represents the largest collection of comprehensive characteristic leaching data to date.

A commenter noted that the LEAF data provide the potential for leaching and not actual leaching of a specific CCR under actual field conditions. The commenter suggests using probability distribution of key factors affecting leaching behavior [*i.e.,* pH and liquid/solid ratio (L/S)] and site specific data tied to the geographic location of the management unit and the type of CCR being managed. In the revised risk assessment, pH is expressed as a

[151] U.S. EPA. 2006. *Characterization of Mercury-Enriched Coal Combustion Residues from Electric Utilities Using Enhanced Sorbents for Mercury Control. EPA–600/R–06/008.* Prepared by F. Sanchez, R. Keeney, D. Kosson, and R. DeLapp for the U.S. Environmental Protection Agency, Air Pollution Prevention and Control Division. February.

[152] U.S. EPA. 2008. *Characterization of Coal Combustion Residues from Electric Utilities Using Wet Scrubbers for Multi-Pollutant Control. EPA/600/R–08/077.* Prepared by F. Sanchez, D. Kosson, R. Keeney, R. DeLapp, L. Turner, and P. Kariher for the U.S. Environmental Protection Agency, Air Pollution Prevention and Control Division. July.

[153] U.S. EPA. 2009. *Characterization of Coal Combustion Residues from Electric Utilities—Leaching and Characterization Data.* EPA–600/R–09/151. Office of Research and Development, National Risk Management Research Laboratory, Research Triangle Park, NC. December.

[154] Thorneloe, S., D. Kosson, F. Sanchez, A. Garrabrants, and G. Helms. 2010. Evaluating the Fate of Metals in Air Pollution Control Residues from Coal-Fired Power Plants. *Environ. Sci. Technol. 44*:7351–7356.

national distribution for selecting leachate concentrations developed to represent CCR nationally, and L/S is considered in estimating washout leachate concentrations based on field data observations. The use of the pH distribution developed in U.S. EPA (2009)[155] does capture the range of potential variability in pH conditions at CCR sites nationwide and is the best approach possible given the current availability of information on site-specific coal ash chemistry. Although leachate concentrations were selected considering pH and L/S conditions that are nationally representative, EPA does not have the detailed and extensive site-specific measurements that would be needed to tie CCR and leachate concentrations to specific WMU locations. Instead, EPA adopted a national probabilistic approach that is site-based and representative of risks to human and ecological health across the country. The revised risk assessment also provides details regarding how the LEAF data are used in combination of geographical specific data such as hydrology, precipitation, fill configuration, CCR type, pH, L/S ratio, and other factors that take the leaching potential as an input to fate and transport models accounting for attenuation and dilution. Additionally, an effort was made to collect CCR samples that characterize the range and quantity of coal usage in the U.S. along with likely air pollution control configurations. While the data is not statistically representative on a site-specific basis, it is adequate to identify trends in leaching behavior that relate to differences in materials types, APC technology, and coal rank. Geochemical speciation modeling was not conducted because the source term as measured and interpreted is conservative, provided that oxidizing conditions occur.

Regarding the number and concentration of pore water samples, EPA reviewed the high-end pore water concentrations and determined that these represent actual CCR samples that therefore represent possible high-end risks if CCR is inadequately regulated and managed. EPA recognizes that more pore water data would potentially improve the representativeness of the dataset, but is convinced that the current dataset adequately captures the possible high end risks that are of most interest in the rulemaking, including risks from the mismanagement of CCR through codisposal with coal refuse.

The assumption that saturated contaminant concentrations in surface impoundment sediments are at equilibrium with the impoundment waters is a conservative assumption that is unlikely to significantly underestimate risks. This assumption is further discussed in Section 5 of the revised risk assessment report.

Regarding commenter-submitted pore water data, EPA conducted a review of the additional datasets provided by the commenters with respect to relevance and data quality. Based on the available information, EPA determined that the selected datasets were relevant and acceptable in terms of data quality requirements. However, EPA does not have sufficient data to distinguish between freely draining and tightly bound pore water data at this time. Overall, EPA agrees that the use of these data introduces some uncertainty into the analysis, which is discussed in Section 5 of the revised risk assessment.

COMMENT: One commenter questioned the assumption that there will be no net addition of waste into a surface impoundment during and after the operational life, noting that impoundments are frequently deepened. Additionally, many surface impoundment wastes are left in place at the time of closure, so that the waste behaves more as a landfill than a surface impoundment (and increasingly, with new landfills being constructed on top of previous surface impoundments). Another commenter questioned why the conceptual model assumes that impoundments are always full during their operating life, which overestimates releases to the subsurface. Additionally, a commenter noted that the assumption of only 0.2 m of sediment accumulation underestimates the amount of sedimentation and subsequently overestimates the amount of percolation to the subsurface. The commenter stated that in actual operation, ash thickness can increase up to 30 feet or more, eventually filling the impoundment, which results in a significant decrease in percolation through the base. Furthermore, the commenter questioned the assumption that post-closure percolation continues at the same rate as during active operations.

EPA RESPONSE: Based on the 2009/2010 EPA surveys, it was assumed that the majority of the surface impoundments are storage impoundments, which are continuously dredged. Because these facilities have other units (whether onsite or offsite) established for disposition, it likely that the majority of waste in the dredged impoundments would be removed by the end of the unit's operating life. Regardless, an uncertainty analysis provided in appendix K demonstrates that the risks during the operating life of surface impoundments are greater because the higher hydraulic head drives leachate into underlying soils with greater force than gravity alone post-closure. Therefore, EPA did not explicitly model the post-closure phase of surface impoundments. The uncertainties resulting from this decision are discussed in Section 5 of the revised risk assessment.

EPA acknowledges that EPACMTP is restricted to modeling flow as steady state with the assumption that an impoundment always has a fixed depth of wastewater. EPA further acknowledges that such an assumption may overestimate infiltration. The surface impoundment conceptual model assumes that sediments are periodically dredged and removed and that the long-term average thickness of the sediment is approximately 0.4 m, with half of that layer consolidated. EPA has used EPACMTP and its predecessor model versions for a longstanding time period and it has undergone multiple rounds of internal and external review. The reviews associated with EPACMTP and its limitations are further discussed in Section 5 of the revised risk assessment report.

COMMENT: Public commenters suggested that risks from operating landfills should be considered along with those that occur post-closure. These commenters questioned whether greater risks may occur during site operations when wastes are uncovered and exposed directly to precipitation. Additional commenters noted that complete leaching of all constituent mass at a constant concentration is overly conservative.

EPA RESPONSE: The landfill source model used in this risk assessment is not able to address landfills during operation because the non-linear sorption isotherms used require a constant, annualized infiltration rate throughout the duration of leaching. Instead, the revised risk assessment assumed that the full footprint of the landfill is filled to capacity with a cap no less permeable than the soil or liner underlying the WMU is present at the start of leaching. EPA acknowledges that this approach introduces some uncertainty into the analysis, the potential impacts of which are discussed in Section 5 of the revised risk assessment.

With respect to comments that complete leaching of all constituent mass is overly conservative, EPA now

[155] U.S. EPA. 2009. *Characterization of Coal Combustion Residues from Electric Utilities—Leaching and Characterization Data*. EPA–600/R–09/151. Office of Research and Development, National Risk Management Research Laboratory, Research Triangle Park, NC. December.

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models landfills using leachable mass as discussed in Section 4 and appendix C of the revised risk assessment. Alternatively, EPA presents a sensitivity analysis of these results compared with the results generated using total mass in Section 5.

3. Comments Related to Exposure Scenarios

COMMENT: The commenter emphasized that the risk assessment does not consider direct discharges to ground and surface water systems other than groundwater infiltration (*e.g.,* direct injection to groundwater, point and nonpoint discharges to surface water systems). It was recommended that EPA consider combining contributions from these sources with CCR groundwater leaching impacts to calculate the full load of CCR constituents to groundwater and surface water systems. The commenter continues by suggesting that the use of liners in impoundments does not reduce overall hazards if direct discharges are considered in the risk assessment.

EPA RESPONSE: RCRA waste disposal risk assessments do not address direct discharges from impoundments to surface waters because they are regulated as permitted point source discharges under the Clean Water Act by EPA's Office of Water. Since this pathway is outside the scope of the risk assessment, the revised risk assessment does not consider these releases. However, this pathway was evaluated in the Environmental Assessment for the Proposed Effluent Limitation Guidelines and Standards for the Steam Electric Power Generating Point Source Category,[156] which will be revised in support of final effluent limitation guidelines (ELG) due to be released in September of 2015. The revised risk assessment was updated to note this fact.

EPA is not aware of any CCR disposal where waste is directly injected into groundwater aquifers, and absent any data on this practice declines to evaluate it.

COMMENT: Public comments were received on the methodology applied to evaluate exposure to fugitive dust during landfill operations (before closure). The majority of these comments focused on the fugitive analysis as presented in *Inhalation of Fugitive Dust: A Screening Assessment of the Risks Posed by Coal Combustion Waste Landfills,*[157] and EPA's proposed approach for refining the analysis. Comments received on the initial fugitive dust analysis methodology and modeling ranged from emphasizing that the approach was overly conservative in some cases to underestimating risk in other cases.

Multiple comments were provided on the proposed methodology for refining the fugitive dust analysis that was applied in the revised risk assessment. One commenter recommended that 2010/2011 EPA survey data should be used to refine the fugitive dust analysis for landfills. Specifically, the current OW data indicate that active portions of the landfills are significantly smaller than the landfills identified in the 1995 EPRI survey. Several comments were received that pointed out that the application of AERSCREEN and AERMOD is appropriate if representative or realistic inputs are used including meteorological data, material silt content, source areas for subcells of ash management units and consideration of common operating and control practices, which are in some cases defined by the states (*e.g.,* Virginia). However, one commenter expressed concern that no previous or current EPA regulatory model; including SCREEN3, AERSCREEN or AERMOD; has been rigorously tested and evaluated for performance in modeling fugitive emissions associated with CCR landfills.

In general, the commenters supported or recommended the use of appropriate AP–42 factors and other techniques to estimate emissions. Others noted that consideration of deposition impacts and constituent-specific modeling is appropriate. One commenter recommended that EPA should conduct a full-scale assessment that considers fugitive dust as well as emissions from landfills and emissions of diesel particulate matter from haul trucks, on-site heavy-duty landfill equipment, and diesel-powered pumps and generators, with potential receptors of interest as residents and sensitive subpopulations living near the power plant, along the transportation route and at the landfill. Another commenter expressed concern over the lack of metal speciation data, while another comment concerned gas emissions from the landfills (*e.g.,* hydrogen sulfide). One final commenter voiced concern that insufficient information was provided on the modeling approach and the model inputs to support evaluation and allow comments on the overall validity or propriety of the suggested modeling.

EPA RESPONSE: The majority of the comments received concerning exposures during landfill operation (before closure) focused on the assessment of fugitive dust. EPA acknowledges that the 2010 Draft Risk Assessment did not evaluate the inhalation pathway, relying instead on the findings of a previous evaluation, *Inhalation of Fugitive Dust: A Screening Assessment of the Risks Posed by Coal Combustion Waste Landfills.*[158] This previous evaluation only considered releases from windblown emissions and the potential to exceed national ambient air quality standards (NAAQS) for particulate matter.

Based on the comments received, EPA updated the screening analysis of fugitive dust. EPA agrees that there are potential risks posed by fugitive emissions from sources beyond wind and revised the analysis to consider emissions from a range of activities, such as vehicular activity, unloading operations and spreading/compacting operations. Emissions from these sources were calculated using techniques that have undergone extensive peer-review, including *AP–42: Compilation of Air Pollutant Emission Factors.*[159] Screening level modeling was performed with a combination of AERSCREEN and AERMOD to estimate dust dispersion and deposition rates. Model inputs were selected to be representative of current landfills, environmental settings (*e.g.,* meteorological conditions) and common dust management practices. Estimated air concentrations were used to screen acute and chronic health risks from inhalation, as well as the potential to exceed NAAQS standards. Furthermore, EPA considered exposures that may result from the offsite deposition on and accumulation in downgradient media. This was done for all relevant metal species. In contrast, EPA did not evaluate emissions of hydrogen sulfide to air as EPA has no data on the extent to which this constituent is present in CCR or released into the surrounding environment. Further discussion of this screening analysis is presented in

[156] U.S. EPA. 2013. Environmental Assessment for the Proposed Effluent Limitation Guidelines and Standards for the Steam Electric Power Generating Point Source Category. EPA–821–R–13–003. Office of Water. Washington, DC 20460. April.

[157] U.S. EPA. 2010. *Inhalation of Fugitive Dust: A Screening Assessment of the Risks Posed by Coal Combustion Waste Landfills.* OSWER. Washington, DC. September.

[158] U.S. EPA. 2010. *Inhalation of Fugitive Dust: A Screening Assessment of the Risks Posed by Coal Combustion Waste Landfills.* OSWER. Washington, DC. September.

[159] U.S. EPA. 1985. *Compilation of Air Pollutant Emission Factors. Volume I: Stationary Point and Area Sources (Fourth Edition).* AP–42. U.S. Environmental Protection Agency, Office of Air and Radiation and Office of Air Quality Planning and Standards, Research Triangle Park, NC. September.

Section 3 and appendix F of the revised risk assessment.

COMMENT: Comments both supported and disagreed with the appropriateness of a screening analysis to eliminate pathways from consideration in the full-scale probabilistic analysis. One commenter pointed out that the EPA conducted a very conservative, but appropriate, screen to identify constituents to include in the full-scale probabilistic analysis. Another commenter emphasized that a full-scale risk assessment should be conducted that assesses exposures concurrently through all pathways (*e.g.,* including surface pathways with inhalation exposure) for all chemical constituents. In particular, they emphasized that inhalation exposures to human carcinogens, such as hexavalent chromium, as well as noncarcinogens may occur through the aboveground pathway. Although the commenters disagreed over the use of a screening approach, both expressed concerns over the use of risk attenuation factors to scale screening risks to the full-scale risks for the subset of constituents that did not pass the screen and were not evaluated under the full scale assessment. Both commenters believe that this approach ignores the unique fate and transport properties of the omitted constituents and that the use of a simplistic, attenuation factor is not an appropriate way to estimate risk.

EPA RESPONSE: By first conducting the screening analysis presented in Section 3 of the revised risk assessment, EPA was able to focus available resources on the characterization of risks for exposure routes and constituents with the greatest potential to pose risks. The screening analysis conducted for the revised risk assessment considered all of the potential exposure routes identified in the conceptual models for surface impoundments and landfills, which included aboveground exposures to ambient air, soil, sediment, produce, and animal products. Each exposure pathway was evaluated for all constituents (and individual species, as appropriate) for which both concentration and toxicity data were available.

The screening analysis was developed to be protective of highly exposed individuals. Due to the conservative nature of the screening, the calculated risks represent a protective, but unlikely, combination of conditions that most likely reflect an upper bound on potential exposures for each individual constituent. The revised screening assessment did not rely on risk attenuation factors to screen out constituents. All constituents that resulted in screening-level risks above human health or ecological criteria, and for which characterization of fate and transport could be refined, were carried forward for further consideration in the probabilistic analysis, described in Section 4 of the revised risk assessment. It is possible that consideration of exposure to multiple constituents through a single pathway or to the same constituent through multiple pathways may have resulted in the retention of some additional constituents. However, it is highly unlikely that these additional constituents would remain risk drivers once more realistic dilution and attenuation in the environment is considered.

COMMENT: Multiple commenters noted that there may be additional constituents present in CCR wastes beyond those quantitatively evaluated in the risk assessment. In particular, multiple commenters referenced organics and radionuclides. Some commenters called on EPA to quantify the risks associated with these additional constituents. Others claimed that these constituents are present in low levels and do not pose risk to receptors.

EPA RESPONSE: In the *Report to Congress: Wastes from the Combustion of Fossil Fuels: Volume 2—Methods, Findings, and Recommendations,*[160] EPA reviewed the available data on organic constituents, such as polyaromatic hydrocarbons and dioxins. These data indicated that concentrations of all organics are near or below analytical detection limits both in CCR and in the leachate released from CCR. Based on the findings of this report, the Agency concluded that organic constituents were not risk drivers and did not require further evaluation. In the absence of additional data that demonstrate the organic composition of CCR wastes have markedly changed, EPA continues to rely on these findings.

EPA acknowledges that, like other inorganic constituents, naturally-occurring radionuclides may be concentrated in CCR waste through the combustion of coal. However, due to a lack of data that could be used to characterize leachate concentrations for individual radionuclides, a quantitative evaluation of risk was not conducted. To address this data gap, EPA has included radionuclides in the list of constituents for groundwater monitoring. Furthermore, potential transport of these constituents downgradient by windblown dust and storm run-off are addressed through requirements for fugitive dust controls and run-on/run-off controls.

4. Comments Related to Human Exposure and Toxicity

COMMENT: Some commenters argued that EPA underestimated risks by not considering combined chemical effects, additive risk and concurrent exposures through multiple pathways. One commenter indicated that EPA should conduct a full scale assessment that considers concurrent exposure from ingestion of fish and groundwater. Commenters also raised concerns that some chemical constituents share a common mechanism of toxicity and may affect the same body organ or system, resulting in greater risks than predicted through the consideration of each constituent separately.

One commenter noted that the combination of risks from different constituents would not change the overall results of the risk assessment. Constituents concentrations found to result in an HQ less than 1 in the screening analysis are unlikely to make a meaningful contribution to overall risk regardless of whether multiple compounds share the same toxicological endpoints. Additionally, the commenter expressed that it would be inappropriate to add the risks from different constituents as modeled because the constituents do not all arrive at a hypothetical receptor at the same time, due to differing mobility in the subsurface environment.

EPA RESPONSE: EPA acknowledges that this risk assessment considered potential risks to human health from individual constituents and individual pathways. EPA acknowledges that not explicitly evaluating cumulative risk is a source of uncertainty that may result in some underestimation of risks. It is possible that an individual could be exposed to risks from drinking contaminated groundwater, as well as eating contaminated fish from a local surface water body, but it is unlikely that these two exposure pathways would occur simultaneously with any appreciable frequency in the real world. It is even more unlikely that a receptor would be exposed to both media at the high-end concentrations modeled. Therefore, the magnitude of the uncertainty introduced into the risk assessment is likely to be small. It is also possible for an individual to be exposed to multiple constituents through a single pathway. This is a more likely scenario because, as demonstrated

[160] U.S. EPA (Environmental Protection Agency). 1999b. Report to Congress: Wastes from the Combustion of Fossil Fuels: Volume 2—Methods, Findings, and Recommendations (EPA 530–R–99–010). Office of Solid Waste and Emergency Response. Washington, DC.

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by the available data, CCR typically leach multiple inorganic constituents. Where exposure to multiple constituents is likely to occur, EPA policy is to assume that the risks resulting from these exposures are additive.[161] The current probabilistic analysis identified individual constituents above risk criteria. Many of the other constituents modeled resulted in risks an order of magnitude or more below risk criteria. Thus, the consideration of additive risk, even with the high-end risks modeled in this risk assessment, is unlikely alter the principal results of the probabilistic analysis. Similarly, because the risks for individual constituents were found to be above levels of concern, consideration of additive risk is unlikely to meaningfully change the results of the analysis. EPA updated the revised risk assessment to include a discussion of the associated uncertainties in Section 5.

COMMENT: Some commenters identified incorrect and inconsistent reporting of toxicity benchmark values and recommended conducting a thorough review of literature to ensure the use of the most current values were used. One commenter expressed concern over the use of the current IRIS value for arsenic carcinogenic effects and believes it underestimates risk. Other commenters emphasized that it would be inappropriate for EPA to consider using the draft oral cancer slope factor (CSF) for arsenic and the oral CSF for hexavalent chromium [chromium (VI)] published by the New Jersey Department of Environmental Protection (NJDEP). Concerning lead, one commenter supported a peer reviewer's recommendation to use the Integrated Exposure Uptake Biokinetic (IEUBK) model to calculate human health risks, especially for young children. Additionally, a commenter requested chemical-specific information on toxicity criteria derivation, as well as information on the relationship between environmental exposures to specific chemicals and adverse health effects. The commenter emphasized that this information would provide an uncertainty discussion regarding toxicity values, facilitate communication with the public, and provide a balanced perspective on risk.

EPA RESPONSE: Human health benchmarks were chosen based on the Office of Solid Waste and Emergency Response hierarchy (OSWER Directive 9285.7–53).[162] EPA reviewed the benchmarks to confirm their accuracy and determine whether newer values have become available from EPA or other sources used by EPA since the CCR draft risk assessment was conducted. The current, updated list of human health benchmarks is provided in appendix E of the revised risk assessment, and the references cited in that appendix provide further information on the potential adverse effects and derivation of toxicity criteria.

For lead, EPA used the drinking water maximum contaminant level (MCL) to estimate risks from drinking water exposure in the draft risk assessment. In the revised risk assessment EPA continued to rely on the MCL, but also used IEUBK model for lead in children as described in Section 5 of the revised risk assessment. While lead failed the screening assessment, risks from lead exposure in the probabilistic assessment were well below the risk criterion, and did not drive risks in either the probabilistic or any sensitivity analyses.

COMMENT: The commenters questioned why the cancer benchmark of 1×10^{-5} was selected while the typical range used by OSWER and EPA guidance is a range from 1×10^{-4} to 1×10^{-6}. The commenters suggested that an explanation is necessary. In particular, one commenter requests clarification on the phrase ''point of departure'' when supporting the use of the cancer benchmark of 1×10^{-5}. Concerning non-cancer criteria, a commenter suggested that non-cancer risks should be report as follows: Worst Case—Assume maximum exposure scenarios including exposure 24-hours/day, 365 days/year for 70 years; High End—95th percentile based on national human activity pattern distributions; Central Tendency—50th percentile (or median) risk based on national human activity pattern distributions. Furthermore, another commenter believed that it is more appropriate to consider 95th percentiles, rather than 90th percentile, of exposure and risk estimates for humans and ecological receptors.

EPA RESPONSE: The rationale for the selected cancer and non-cancer risk criteria, based on Agency policy, is discussed in Section 2 of the revised risk assessment. A citation to the where ''point of departure'' was originally defined is provided for reference. The rationale for use of 90th percentile risk generated by a Monte Carlo simulation is discussed in Section 4 of the revised risk assessment.

COMMENT: Commenters questioned the evaluation of only the reasonable maximum exposure scenario. Specifically, it was noted that the receptor placement downgradient of an unlined management unit does not represent the entire population exposure distribution. One commenter suggested that EPA clearly define the exposed population of interest.

EPA RESPONSE: In risk assessments used to develop regulations under RCRA, EPA has historically assessed potential risks resulting from a reasonable maximum exposure (RME) scenario in order to ensure that the resulting regulation is adequately protective of human health without being excessively conservative. The types of data necessary to define the exact population that relied on groundwater wells as a source of drinking water or consumes fish from impacted water bodies are not available. EPA believes that consideration of RME is a reasonable and protective alternative, given the available data. Uncertainties associated with the revised risk assessment are further discussed in Section 5 of the revised risk assessment.

COMMENT: The commenters questioned the use of data from the 1997 Exposure Factors Handbook in the development of intake rate distributions for various exposures, because more current data are currently available. Commenters recommended that EPA make updates to these parameters using more current sources of information, including the recently released 2011 Exposure Factors Handbook.[163] In addition, some commenters pointed out the potential for the available exposure factor data to underestimate or overestimate exposures. One commenter noted that the risk assessment did not fully account for the dependence of input variables (*e.g.,* the interdependence of body weight and water ingestion rates for children and link between the rate of fish consumed from a water body). Another commenter suggested that a sensitivity analysis of human health exposure factors be conducted to add to the sensitivity analysis conducted by EPA in 2009.

Regarding fish consumption rates, commenters questioned the representativeness of a fixed fish consumption rate drawn from a single

[161] U.S. EPA. 2000. *Supplementary Guidance for Conducting Health Risk Assessment of Chemical Mixtures.* Risk Assessment Forum, Washington, DC. August.

[162] U.S. EPA. 2003. *Human Health Toxicity Values in Superfund Risk Assessments.* Office of Solid Waste and Emergency Response Directive 9285.7–53. December.

[163] U.S. EPA. 2011. *Exposure Factors Handbook: 2011 Edition.* EPA/600/R–090/052F. National Center for Environmental Assessment, Office of Research and Development, Washington, DC. September.

study. It was suggested for transparency that the risk assessment provide the results of the chi-square tests to demonstrate how well the fish consumption rate data fit a log normal distribution. Additionally, it was suggested that fish consumption rates should be determined from other studies and more robust data sets. One commenter suggested the incorporation of fish consumption rates representative of subsistence fishers, such as Native American populations that harvest and consume fish as part of their native traditions and culture.

Regarding drinking water ingestion rates, one commenter voiced concern about the assumption that groundwater is the source of all drinking water. The commenter indicated that this is an overly conservative and atypical assumption, as a majority of individuals will consume liquids from other sources (*e.g.,* milk, juice, sodas, bottled water, sports and energy drinks).

EPA RESPONSE: This revised risk assessment relied on both the 1997 *Exposure Factors Handbook (EFH)* [164] and the 2008 *Child-Specific Exposure Factors Handbook* (*CSEFH*) [165] for information on human exposure factors for the U.S. population. The 2011 *Exposure Factors Handbook* [166] has been completed and updates some of the data from the 1997 EFH. During the finalization of this risk assessment, EPA released *OSWER Directive 9200.1–120.*[167] Although this document provides default exposure factors to use for point estimates, EPA is still in the process of updating the full distributions necessary for probabilistic analysis. Therefore, this risk assessment does not incorporate the data from the 2011 EFH.

Exposure data used for the fish ingestion rates are described in appendix D of the revised risk assessment. Data on site-specific fish consumption rates were not available for use in this analysis. Instead, the full distribution of fish consumption rates were drawn from a study of adult anglers from Maine that fished from streams, rivers, and ponds. Because age-specific data for children were not available, all child cohorts were assumed to consume fish at the same rate as the adult cohort. Data on fish ingestion rates for Native American subsistence fishers are currently limited and can vary widely geographically, to the point that the 2011 EFH makes no recommendation for representative values. EPA acknowledges that these issues introduce uncertainty into the analysis, which are further discussed in Section 5 of the revised risk assessment.

COMMENT: Commenters emphasized the need to update exposure factors for childhood exposures and recommended that updates include data from the 2011 EFH. One commenter stated that the risk assessment appropriately considered the potential fish exposures for children. However, they pointed out that the fish consumption rates for children should be lower than those applied for adults. Another commenter suggested that the risk assessment should provide a clear description of how the exposure duration of child cohorts were used in the risk calculations. Specifically, the commenter questioned whether exposure durations were truncated at the end of each age cohort or aged through the different cohorts.

EPA RESPONSE: The revised risk assessment makes use of the 1997 EFH [168] and the 2008 CSEFH [169] for information on human exposure factors for the U.S. population. Although, as discussed in the preamble sections above, the revised risk assessment does not incorporate data from the recent 2011 EFH,[170] all child data included in this document was derived from the 2008 EFH. In addition to child ingestion of drinking water, EPA's evaluation has been revised to also account for infant exposures that may occur from formula mixed with contaminated groundwater. These data are presented in appendix D of the revised risk assessment. Consistent with the commenter's recommendation for cohort aging, the risk assessment aged receptors through each age cohort using age-specific data for exposure factors and physical characteristics that were weighted proportionally by the corresponding time period and then summed. Specific discussion of truncation values is provided in later in this preamble.

COMMENT: Public commenters recommended updating BCF values with more current references. One commenter questioned why bioconcentration factors were zero for some constituents that are essential nutrients (*i.e.,* cobalt and copper). Another commenter voiced concern that EPA had not fully considered the appropriateness of using BCFs to describe metals bioaccumulation, suggesting that current science (including EPA guidance documents) indicates that BCFs are poor predictors of tissue metal concentrations due to wide variation in uptake patterns governed by several chemical and biological factors. Another commenter recommended the use of an approach that would be more robust than the single BCF approach, establishing and applying distributions of BCFs. This commenter also recommended that the assessment adhere to the EPA policy of using dissolved metals in the calculating the bioconcentration of metals in fish, or should provide the rationale for using a different approach.

EPA RESPONSE: EPA recognizes that the use of BCFs may not represent the most current approaches available to estimate metal bioaccumulation at individual sites, where fish tissue data can be collected. However, as noted by public commenters, BCFs are useful in a screening-level assessment and EPA believes they are also appropriate for a national-level risk assessment, where site-specific data are not available and collection of site-specific data is not viable.

In some cases, insufficient data to determine a BCF value meant that these constituents could not be quantitatively evaluated for this pathway. Regarding the concern expressed with respect to zero BCF values, the commenter did not provide alternative BCFs that EPA could consider for the constituents at issue. Additionally, EPA agrees that, given the latest scientific information, distributions of BAFs/BCFs may be better than single BAFs/BCFs because they account for changes in bioaccumulation/bioconcentration at different water concentrations. EPA is working to develop BAF/BCF distributions for several CCR pollutants of concern but does not yet have a robust enough dataset for use for the final CCR Rule. In lieu of this, EPA is proceeding with the single BAF/BCF approach for the current analysis. EPA does recognize this issue as a limitation for the BCF calculations and considers it as an uncertainty in the risk

[164] U.S. EPA. 1997. *Exposure Factors Handbook, Volume III, Activity Factors.* EPA/600/P–95/002Fa. Office of Research and Development, Washington, DC. August.

[165] U.S. EPA. 2008. *Child-Specific Exposure Factors Handbook.* EPA/600/R–06–096F. National Center for Environmental Assessment, Cincinnati, OH.

[166] U.S. EPA. 2011. *Exposure Factors Handbook: 2011 Edition.* EPA/600/R–090/052F. National Center for Environmental Assessment, Office of Research and Development, Washington, DC. September.

[167] U.S. EPA. 2014. *Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors.* OSWER Directive 9200.1–120. February.

[168] U.S. EPA. 1997. *Exposure Factors Handbook, Volume III, Activity Factors.* EPA/600/P–95/002Fa. Office of Research and Development, Washington, DC. August.

[169] U.S. EPA. 2008. *Child-Specific Exposure Factors Handbook.* EPA/600/R–06–096F. National Center for Environmental Assessment, Cincinnati, OH.

[170] U.S. EPA. 2011. *Exposure Factors Handbook: 2011 Edition.* EPA/600/R–090/052F. National Center for Environmental Assessment, Office of Research and Development, Washington, DC. September.

characterization. Overall, EPA agrees that the use of this older data introduces some uncertainty into the analysis. These uncertainties are discussed in greater detail in Section 5 of the revised risk assessment.

With the exception of mercury, EPA evaluated bioconcentration based on water column concentrations that include contributions from dissolved and solid phases because available BCFs represent contributions from both. Because a BAF based only on dissolved-phase concentrations was available for mercury, EPA evaluated this constituent using only dissolved concentrations. Applying this conservative approach for most constituents ensured protection of human health. Even with this conservative assumption, the 90th percentile risks for the probabilistic analysis (Section 4) did not exceed risk criteria for the fish ingestion pathway. Therefore, this approach is unlikely to have affected the principal findings of the risk assessment.

For the revised risk assessment, EPA reviewed the available literature and identified BCFs for additional constituents that previously had no values. As noted in appendix G of the revised risk assessment, the following source hierarchy was used for fish BCFs:

- Primary literature: These are generally papers focused on a single chemical [171] [172] [173] [174] or may contain data on multiple chemicals.[175] [176]
- U.S. EPA databases/publications: These included ECOTOX [177] and the Mercury Report to Congress.[178]
- Other government agency resources: These included ATSDR Toxicological Profiles [179] and the Hazardous Substances Data Bank.[180]

EPA also finds that the references provided by commenters provided primarily phytotoxicity and accumulation data for terrestrial plants, and were therefore not relevant to EPA's explicit solicitation on whether the bioconcentration factors drawn from Baes et al. (1984) should be considered in the final risk assessment.[181]

5. Comments Related to Ecological Exposure and Toxicity

COMMENT: Public commenters emphasized the potential importance of cumulative ecological risk, whereby an ecological receptor may be exposed to multiple constituents and/or pathways concurrently. For example, amphibians may be subject to both dermal and ingestion exposure. Public commenters noted that ecological risks were underestimated because the following scenarios were not considered for ecological receptors: Aboveground pathways, contaminant transport to nearby uncontaminated environments, and the inclusion of field data in the analysis.

EPA RESPONSE: EPA acknowledges that cumulative effects can be important for ecological receptors. However, just as EPA did not consider cumulative human health risks from exposures to groundwater (discussed in the previous sections of this preamble), they were not modeled for ecological receptors. In the national, probabilistic analysis (Section 4 of the revised risk assessment), risks for all constituents fell below the ecological criteria. Even the sum of modeled risks for all constituents fell below the ecological criteria. In sensitivity analyses (Section 5 of the revised risk assessment), which considered different subsets of national disposal practices that may drive risks, boron and cadmium were the two constituents found to result in risks above ecological criteria. To the extent that cumulative exposures were not evaluated, EPA acknowledges that ecological risk could be underestimated to some degree. However, these uncertainties are unlikely to affect the principal findings of the risk assessment. In addition, EPA also notes that all surface water risks are orders of magnitude lower than the risks resulting from direct discharges modeled in U.S. EPA (2013).[182]

In contrast to the surface water and sediment exposures, ecological risks for individual constituents were appreciably above risk criteria for direct exposure to impoundment wastewater. As a result, it is clear that CCR disposal in surface impoundments have the potential to pose risk to ecological receptors, even without consideration of cumulative exposures.

COMMENT: Public commenters stated that the risk assessment does not consider sensitive habitats or species. Commenters requested additional consideration of threatened and endangered species and the inclusion of ecological field data.

EPA RESPONSE: EPA did not evaluate these sensitive habitats and sensitive/endangered ecological receptors because these are inherently site-specific issues for which data on potential impacts are often not available and can be difficult to quantify, even on a site-specific basis. EPA acknowledges that the inability to quantitatively evaluate the potential for these adverse effects represents a source of uncertainty. Discussion of these uncertainties is presented in Section 5 of the revised risk assessment.

COMMENT: Public commenters were concerned that a more conservative approach was needed to derive the ecological benchmarks. Multiple commenters also stated that the use of risk attenuation factors to scale the screening risks to full-scale risks was inappropriate. Several commenters noted that the ecological boron benchmark used for surface water exposures contained incorrect units based on an incorrect transcription in the peer-reviewed article. Another commenter noted that the ecological

[171] Eisler, R. 1989. *Molybdenum Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review.* Contaminant Hazard Reviews, Report No. 19, Biological Report 85(1.19). Laurel, MD. August.

[172] Kumada, H., et al. 1973. Acute and chronic toxicity, uptake and retention of cadmium in freshwater organisms. Bull. *Freshwater Fish.* Res. Lab. 22: 157

[173] Lemly AD. 1985. Toxicology of selenium in a freshwater reservoir: implications for environmental hazard evaluation and safety. *Ecotoxicology and Environmental Safety.* 10(3): 314–338.

[174] Murphy, B.R., G.J. Atchison, and A.W. McIntosh. 1978. Cadmium and zinc in muscle of bluegill (Lepomis macrochirus) and largemouth bass (Micropterus salmoides) from an industrially contaminated lake. *Environmental Pollution* 17:253–257.

[175] Barrows ME, Petrocelli SR, Macek KJ, Carroll JJ. 1980. Bioconcentration and elimination of selected water pollutants by bluegill sunfish (Lepomis macrochirus). In: Haque R, ed. Dynamics, exposure and hazard assessment of toxic chemicals. Ann Arbor, Michigan, U.S.A.: American Chemical Society. p. 379–392.

[176] Stephan, C.E. 1993. Derivation of Proposed Human Health and Wildlife Bioaccumulation Factors for the Great Lakes Initiative. Draft. Environmental Research Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, Duluth, MN. March.

[177] U.S. EPA (Environmental Protection Agency). 2009b. EC*OTOX User Guide: ECOTOXicology Database System.* Version 4.0. Available online at *www.epa.gov/ecotox/.*

[178] U.S. EPA (Environmental Protection Agency). 1997d. *Mercury Study Report to Congress. Volume III—Fate and Transport of Mercury in the Environment.* EPA 452/R–97/005. Office of Air Quality Planning and Standards and Office of Research and Development, Washington, DC.

[179] ATSDR (Agency for Toxic Substances and Disease Registry). 2008. Minimal Risk Levels (MRLs) for Hazardous Substances. Available at *www.atsdr.cdc.gov/mrls.html.*

[180] U.S. NLM (National Library of Medicine). 2011. *Hazardous Substances Data Bank (HSDB).* Available online at: *toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB.*

[181] Baes, C.F., III, R.D. Sharp, A.L. Sjoreen, and R.W. Shor. 1984. *A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides Through Agriculture.* ORNL–5786. Oak Ridge National Laboratory, Oak Ridge, TN. September.

[182] U.S. EPA. 2013. Environmental Assessment for the Proposed Effluent Limitation Guidelines and Standards for the Steam Electric Power Generating Point Source Category. EPA–821–R–13–003. Office of Water. Washington, DC 20460. April.

cadmium benchmark used for direct contact with surface water was incorrect.

EPA RESPONSE: Ecological benchmarks were obtained for CCR constituents when available and compared with the modeled media concentrations (*e.g.,* surface water, sediment) to estimate the HQs used to characterize ecological risk. These benchmarks represent the best available estimates of receptor responses based ''no effects'' (NOAEL) or ''lowest effects'' (LOAEL) study data. In some scenarios, these benchmarks may represent species not actually present in the field. In others, these benchmarks may not capture the most sensitive possible receptor at every site or for each constituent. While some benchmarks have factors of safety included to account for these or other uncertainties, there remains the potential for these ecological benchmarks to underestimate risks for the specific species and communities that live in surface waters impacted by CCR WMUs. The magnitude of this uncertainty is unknown. Consideration of any additional sensitive species not captured by the current benchmarks may result in some additional constituents above risk criteria in the probabilistic analysis. EPA notes that ecological risks to some of these additional sensitive receptors may be reflected in damage cases. However, this site-specific uncertainty is unlikely to affect the national conclusions of the risk assessment.

Regarding incorrect benchmark values, an updated boron benchmark was used in the revised risk assessment. The units in the fish study from which the previous SCV was derived [183] had been erroneously transcribed in Suter and Tsao (1996) [184] as µg/L instead of mg/L. The updated SCV was recalculated using the corrected units. The revised value has been corroborated with the authors. Additionally, a continuous criteria concentration (CCC) was used for the cadmium surface water benchmark in the revised risk assessment, replacing the previous value. The updated values are presented in appendix E of the revised risk assessment report.

[183] Hamilton, S.J. 1995. Hazard assessment of inorganics to three endangered fish in the Green River, Utah. *Ecotoxicol Environ Saf 30:*134–142.

[184] Suter, G.W., and C.L. Tsao. 1996. *Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Revision.* U.S. Department of Energy, Oak Ridge National Laboratory, Oak Ridge, TN. June.

6. Comments Related to the Monte Carlo Analysis Approach

COMMENT: While some public commenters stated that the human health probability distributions appeared appropriate, others expressed concern regarding a conservative bias in input parameter probability distributions used and the resulting potential for overestimation of risks. These commenters noted that the ideal approach would be to estimate the actual risk and associated uncertainty rather than weighting the results conservatively.

EPA RESPONSE: The revised risk assessment conducted a full-scale, probabilistic Monte Carlo analysis to quantify human and ecological risks. EPA agrees it would be ideal to produce best estimates of actual risk. All input data distributions (*e.g.,* aquifer data, soil type, WMU data, climate data, distance to groundwater wells, distance to surface water bodies, constituent concentrations, water flow data, human exposure factors) were developed in line with this objective. However, these distributions were developed from available data and are subject to the limitations of these data. In cases where data were not sufficient to fully characterize the input distribution, conservative values and assumptions were used to fill data gaps to remain protective of human health and the environment. Further discussion of these uncertainties has been added to Section 5 of the revised risk assessment.

COMMENT: Public commenters pointed out that the risk assessment does not formally differentiate variability from uncertainty or show confidence limits for risk results, which makes it challenging to identify opportunities to reduce uncertainty. One commenter requested that EPA discuss the implications of the relatively wide risk distributions, including the reasons why some risk distributions are larger than others based on the Monte Carlo results.

EPA RESPONSE: EPA acknowledges it would be ideal to separate variability from uncertainty when possible in a probabilistic risk assessment. EPA was able to reduce a substantial number of the uncertainties in the revised risk assessment through the acquisition of additional data on facilities, environmental parameters, and constituent concentrations. Variability and uncertainty are still comingled in a large number of cases due to remaining data gaps; however, EPA conducted multiple sensitivity analyses to determine the potential for different inputs to affect risk results. Additional discussion of the differences between parameter variability, data uncertainty, and model error, as well as discussions of the sensitivity and uncertainty analyses, is presented in Section 5 of the revised risk assessment.

EPA disagrees that there are wide risk distributions. While the commenter correctly points to other risk assessments that had closer central tendency and high-end results, those were either site-specific assessments or involved no fate or transport modeling. National-scale risk assessments will necessarily have wider variability in their results compared to risk assessments that are specific to a single site. Thus, the ''wider'' risk distributions simply reflect the fact that different sites with different CCR can have very disparate impacts on human health and the environment.

7. Miscellaneous Comments

COMMENT: Some commenters stated that the documentation is incomplete and that an independent reviewer could not reproduce the analysis. Another commenter performed an independent review and cancer risk estimate and noted that the EPA used a reasonable approach for calculating cancer cases in the risk assessment.

EPA RESPONSE: EPA acknowledges that the documentation of the inputs and intermediate outputs could have been more transparent for the 2010 Draft Risk Assessment. In the revised risk assessment, many of the inputs EPA used are directly discernible from the appendices. A summary of the data available in each appendix is presented in Section 1 of the revised risk assessment. EPA also acknowledges that the additions and discussions of inputs in the document were not sufficient for complete duplication of the results. Thus, the input and output files for the draft risk assessment were made available in the docket of the proposed rule via an FTP site,[185] and final input and output files are being placed in the docket for the final rule.

COMMENT: Commenters requested improvement on the graphical presentation of risk results. Additionally, commenters requested further explanation of the minimum and maximum truncating values, as truncated values may reduce risk estimates.

EPA RESPONSE: While EPA did not provide a graphical presentation of the risk results, this information is more clearly discernible from the full input and output files. For discussion of the

[185] Available online at: *ftp://ftp.epa.gov/coal-combustion-residues*.

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full inputs and outputs files, see the responses in the preamble section above. With regard to truncation, EPA no longer manually truncates input distributions for the human exposure factors. Instead, exposure factor distributions in the revised risk assessment were generated with the @ Risk software (Palisade Co., Newfield, NY),[186] as described in appendix D. EPA has also added further discussion of the cohorts to revised risk assessment, with tables comparing each cohort's risk presented in Section 5 of the revised risk assessment.

COMMENT: Commenters requested more complete documentation of the sensitivity analysis. Other comments included a request to add human health exposure factor variables to the sensitivity analysis, and to conduct additional sensitivity analyses on different topics (*e.g.,* well distance distribution).

EPA RESPONSE: EPA acknowledges the omission of the original sensitivity analysis from the docket. EPA updated the sensitivity analysis [187] so that it clearly describes the methodology that underlies the results summarized in Section 5 of the revised risk assessment. This sensitivity analysis was placed in the docket for the proposed rule.

Human health exposure factor variables were not evaluated in the sensitivity analysis. Human exposure factor variables have well-established, peer-reviewed, national distributions that are regularly used in probabilistic risk analyses conducted by EPA based on Agency policy. Therefore, the contribution of variability in the exposure factors to the variability in risk was not particularly useful for understanding the aspects of CCR disposal practices that may drive risk. Additional sensitivity analyses such as leachate duration versus leachable content and liner performance by thickness were conducted in the revised risk assessment and are summarized in Section 5.

B. Summary of Risk Assessment and Results

1. Problem Formulation

EPA first developed conceptual models to illustrate a general layout of surface impoundments and landfills, the chemical constituents that may be released from these WMUs, the routes through which these constituents may migrate through environmental media, and the types of exposures that may result. These conceptual models were used as the basis for all subsequent data collection efforts. EPA first collected data on the coal-fired power plants and CCR WMUs located across the United States. EPA then collected regional and national data to characterize the environment and receptor population surrounding each WMU. The data assembled represent the most current and comprehensive information available to the Agency at the time this risk assessment was conducted. Using the data collected, EPA first conducted a simplified hazard identification to determine which constituents warranted further evaluation. At this stage, EPA considered the presence of a constituent in CCR waste, combined with the availability of at least one toxicity benchmark, sufficient evidence of hazard potential. Table 1 presents a summary of the different chemical constituents retained as constituents of potential concern (COPCs) for further analysis.

TABLE 1—LIST OF CHEMICAL CONSTITUENTS EVALUATED IN THE CCR RISK ASSESSMENT

Aluminum
Ammonia
Antimony
Arsenic
Barium
Beryllium
Boron
Cadmium
Calcium
Chloride
Chromium
Cobalt
Copper
Fluoride
Iron
Lanthanum
Lead
Lithium
Magnesium
Manganese
Mercury
Molybdenum
Nickel
Nitrate/Nitrite
Selenium
Silicon
Silver
Sodium
Strontium
Sulfate
Sulfide
Thallium
Uranium
Vanadium
Zinc

All risks identified in subsequent analyses were compared against risk criteria of cancer risk greater than 1×10^{-5} or a noncancer hazard quotient (HQ) greater than 1. EPA typically relies on a risk range to determine the point at which regulation is appropriate. EPA uses as an initial cancer risk ''level of concern'' a calculated risk level of 1×10^{-5} (one in one hundred thousand) or an HQ above 1.0 for any noncarcinogens. For example, waste streams for which the calculated high-end individual cancer-risk level is 1×10^{-5} or higher generally are considered candidates for regulation. Waste streams whose 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 regulated. 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 noncarcinogens, generally will be considered not to pose a substantial present or potential hazard to human health and the environment and generally will not regulated. See 59 FR 66075–66077, December 22, 1994.

2. Screening Analysis

EPA conducted separate screening analyses for each exposure pathway to identify which COPCs are most likely to pose risk to receptors. The results of this screening generally do not provide a precise characterization of individual risks that may occur, but rather identify those COPCs that are most likely to exceed risk criteria. In cases where well established, post-construction management practices (''controls'') have been shown to minimize releases from WMUs, EPA considered exposures for both an uncontrolled and controlled management scenario.

This screening analysis identified potential risks to human and ecological receptors resulting from the releases of particulate matter and the chemical constituents contained therein through wind and run-off. Under an uncontrolled management scenario, risks to human receptors resulted from the inhalation of windblown particulates in ambient air and the ingestion of soil and animal products (*i.e.,* meat and dairy), while risks to ecological receptors resulted from exposures to soil and sediment. Under a controlled management scenario, which consisted of fugitive dust controls and run-on/run-off controls, all risks associated with these exposure pathways decreased to below the criteria. Due to the conservative nature of the screening, there is a great deal of uncertainty surrounding the specific risks calculated for these exposure pathways. These risks represent a protective, but unlikely, combination of conditions that reflect at least an upper

[186] Available online at: *www.palisade.com/risk/.*

[187] U.S. EPA. 2009. *Sensitivity Analysis for the Coal Combustion Waste Risk Assessment.* Draft Technical Report. Prepared by RTI International for U.S. EPA, Office of Solid Waste, Washington, DC.

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bound on potential exposures. Thus, the cumulative effect of these uncertainties results in an overestimation of nationwide risks to most or all receptors. Therefore, EPA makes no direct findings concerning the magnitude of the risks that may occur under either an uncontrolled or controlled management scenario, but concludes with a high degree of confidence that the reductions achievable with standard management practices are sufficient to be protective even under this conservative screening assessment. Based on these lines of evidence, EPA concluded that no further characterization was warranted for these exposure pathways.

These screening analyses identified potential risks to human and ecological receptors from leaching of chemical constituents from CCR waste into surrounding environmental media. Risks to human health resulted from ingestion of groundwater and fish, while risks to ecological receptors resulted from exposure to surface water. There was no simple method to estimate the effect controls may have for these pathways. However, considerable dilution and attenuation may occur before COPCs reach downgradient private wells and surface water bodies. Therefore, EPA retained all of the COPCs found to be above risk criteria in groundwater and surface water for further characterization. In addition, EPA used the uncontrolled screening results for the above ground sediment pathway as a conservative proxy for the groundwater to surface water sediment pathway. As a result, sediment exposures of four COPCs were retained for further characterization. Table 2 presents a summary of the chemical constituents retained as COPCs for each pathway.

TABLE 2—LIST OF CHEMICAL CONSTITUENTS RETAINED FOR PROBABILISTIC ANALYSIS

Human health		Ecological	
Ingestion of groundwater	Ingestion of fish	Surface water exposure	Sediment exposure
Antimony	Arsenic	Aluminum	Antimony
Arsenic	Cadmium	Arsenic	Arsenic
Boron	Mercury	Barium	Silver
Cadmium	Selenium	Beryllium	Vanadium
Cobalt	Thallium	Boron	
Fluoride		Cadmium	
Lead		Chloride	
Lithium		Chromium	
Molybdenum		Cobalt	
Thallium		Copper	
		Iron	
		Lead	
		Molybdenum	
		Nickel	
		Selenium	
		Silver	
		Vanadium	
		Zinc	

These screening analyses also identified potential risks to ecological receptors from direct exposure to impoundment wastewater. Unlike the other exposure pathways, no dilution or attenuation will occur within impoundment wastewater prior to ecological exposures. Thus, the direct exposures considered in the screening analysis provide a reasonable estimate of the relative magnitude of risks. Based on the screening analyses, EPA concluded that HQs for ecological receptors exceeded 1 for the following constituents (listed from highest to lowest potential): Arsenic (100), barium (50), aluminum (30), boron (30), selenium (20), cadmium (10), vanadium (10), beryllium (2), chloride (2) and chromium (2). Because the screening analysis provides sufficient characterization of these exposures, this pathway was not carried forward for further analysis.

3. Probabilistic Analysis

EPA conducted a national-scale, probabilistic analysis to better characterize the potential risks to human and ecological receptors associated with leachate released from surface impoundments and landfills. The specific exposure routes evaluated for these releases were human ingestion of groundwater used as a source of drinking water and fish caught from freshwater lakes or streams, as well as ecological contact with and ingestion of surface water and sediment. A combination of models was used to predict COPC fate and transport through the environment, receptor exposures, and the resulting risks. Site-specific data were used, supplemented by regional and national data sets, to capture the national variability of disposal practices, environmental conditions and receptor behavior. EPA modeled risks for both highly exposed individuals (90th percentile risks) and more moderately exposed individuals (50th percentile risks). In instances where the speciation of a COPC has been shown to greatly affect fate and transport, EPA modeled multiple species to provide a bounding on potential exposures.

Table 3 shows the 90th percentile human health risks to the most sensitive age cohorts for constituents that exceeded the risk criteria. Risks are presented for arsenic modeled entirely as two different species (III and V) to provide a bounding on potential risks. Values that exceed the selected risk criteria are shown in bold. No 90th percentile risks above ecological criteria were identified for either surface impoundment or landfills. No 50th percentile risks above human health or ecological criteria were identified for either surface impoundment or landfills.

TABLE 3—90TH PERCENTILE NATIONWIDE PROBABILISTIC RISK RESULTS

COPC	Ingestion of groundwater	
	Surface impoundments	Landfills
Cancer Risks		
Arsenic III	2×10^{-4}	5×10^{-6}
Arsenic V	1×10^{-5}	7×10^{-8}
Noncancer Risks		
Arsenic III	5	0.1
Arsenic V	0.4	<0.01
Lithium	2	([a])
Molybdenum	2	<0.01

[a] Leachate data were not available to model this COPC for landfills.

• Surface Impoundments:

Ingestion of groundwater was the only exposure pathway that resulted in risks above 1×10^{-5}. 90th percentile cancer risks above 1×10^{-5} were identified for arsenic III (2×10^{-4}). The 90th percentile noncancer risks above an HQ of 1 were identified for arsenic III (5), lithium (2), and molybdenum (2).

• Landfills:

All 90th percentile cancer and non-cancer risks were below human health criteria.

High-end risks identified for surface impoundments are consistently higher than those for landfills. These results are attributed to the higher infiltration rates through surface impoundments, which are driven by the hydraulic head of the ponded water. Median risks for both surface impoundments and landfills were substantially lower than both the high-end risks in this risk assessment and the median risks modeled in the 2010 Risk Assessment. This decrease is attributed primarily to the interception of groundwater by surface water bodies, which is accounted for in the revised risk assessment to provide a more accurate mass balance of constituent mass during transport. It is common for coal-fired utilities to be located near water bodies, which are used as a source of cooling water and conveyance of waste. As a result, in the majority of model iterations, the interception of groundwater by surface water bodies resulted in negligible downstream well concentrations.

Based on the results of the probabilistic analysis, EPA concludes that leaching from CCR waste management units has the potential to pose risk to receptors. Arsenic, lithium, and molybdenum are the chemical constituents found to pose the greatest risks from surface impoundments, while arsenic posed the greatest risks from landfills. Available toxicological profiles indicate that risks from arsenic ingestion are linked to an increased likelihood of cancer in the skin, liver, bladder and lungs, as well as nausea, vomiting, abnormal heart rhythm, and damage to blood vessels; [188] risks from lithium ingestion are linked to neurological and psychiatric effects, decreased thyroid function, renal effects, cardiovascular effects, skin eruptions, and gastrointestinal effects; [189] and risks from molybdenum ingestion are linked to higher levels of uric acid in the blood, gout-like symptoms, and anemia.[190]

4. Sensitivity and Uncertainty Analysis

The modeled probabilistic risks capture the range of current, nationwide CCR disposal practices. However, because of the broad scope of the analysis, there are a number of sources of variability and uncertainty present. Therefore, to confirm the results of the probabilistic analysis and to better understand whether any particular subset of disposal practices drives the risks identified, EPA conducted additional sensitivity and uncertainty analyses.

EPA reviewed the models used, as well as the data and assumptions input into these models, to better understand the sources of variability and uncertainty inherent in the probabilistic analysis. The Agency then qualitatively and, to the extent possible, quantitatively analyzed these sources to understand the potential effects each may have on the modeled risk results. During this review, specific attention was focused on the parameters shown to have the greatest influence on model results. As a further method of validation, EPA compared the results of the sensitivity and uncertainty analyses with proven and potential damage cases. Together these analyses and comparisons show that there is a high degree of confidence in the principal findings of the probabilistic analysis. However, the review of sensitive parameters revealed some specific disposal practices that may result in greater risks than identified in the probabilistic modeling.

Through these additional sensitivity and uncertainty analyses, which explored different subsets of national disposal practices, EPA identified the potential for higher risks than those identified in the broader, national analysis. In particular, consideration of different waste pH values showed higher risks for arsenic at more acidic and basic pH values, as well as additional risks for boron, cobalt, fluoride and mercury at these more extreme pH values. Consideration of specific liner types showed that groundwater risks are driven by disposal in unlined units and, in particular, unlined surface impoundments. For these units, EPA identified higher risks for arsenic, lithium, and molybdenum, as well as additional risks for thallium. Clay-lined units were found to pose lower risks than unlined units. Composite-lined units were found to be the most protective disposal practice, resulting in risks far below all criteria identified in this risk assessment.

C. Conclusions

Based on the analyses presented in this document, EPA concludes that current management practice of placing CCR waste in surface impoundments and landfills poses risks to human health and the environment within the range that OSWER typically regulates. On a national scale, surface impoundments presented higher risks than landfills. Risks to ecological receptors were identified from exposures to aluminum, arsenic, barium, beryllium, boron, cadmium, chloride, chromium, selenium and vanadium through direct exposure to impoundment wastewater. Risks to residential receptors were identified primarily from exposures to arsenic, lithium, and molybdenum in groundwater used as a source of drinking water, but additional risks from boron, cadmium, cobalt, fluoride, mercury and thallium were identified for specific subsets of national disposal practices.

Sensitivity analyses on liner type indicate that disposal of CCR wastes in unlined surface impoundments and landfills presents the greatest risks to human health and the environment. As modeled, the national risks from clay-lined units are lower than those for unlined units, but such units can exceed risk criteria at individual sites. Composite liners were the only liner type modeled that effectively reduced risks from all pathways and constituents far below human health and ecological criteria in every sensitivity analysis conducted. Sensitivity analyses on waste type indicate that the acidic conditions that result from codisposal of CCR waste with coal refuse and the basic conditions that result from disposal of FGD waste result in higher

[188] Profile for arsenic available online at: *www.epa.gov/iris/subst/0278.htm* and *www.atsdr.cdc.gov/toxprofiles/tp2.pdf*.

[189] Profile for lithium available online at: *hhpprtv.ornl.gov/issue_papers/Lithium.pdf*.

[190] Profile for molybdenum available online at: *www.epa.gov/iris/subst/0425.htm*.

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risks from arsenic and other constituents than CCR waste disposed alone.

The risk results are consistent with the groundwater damage cases compiled by EPA. These damage cases were primarily associated with unlined units and were most frequently associated with releases of arsenic. Recent surveys of the industry indicate the majority of newly constructed units are lined, and that that the practice of codisposal with coal refuse has declined. However, this risk assessment presents a static snapshot of current disposal practices. While newer units may be managed in a more protective manner, older units, which still comprise the majority of current units, continue to operate in a manner that poses risks to human health and the environment that OSWER typically regulates.

XI. Summary of Damage Cases

EPA has a long history of considering damage cases in its regulatory decisions under RCRA. As discussed earlier in this preamble, the statute specifically directs EPA to consider ''documented cases in which danger to human health and the environment from surface run-off or leachate has been proved,'' in reaching its Regulatory Determination for these wastes, demonstrating that such information is to carry great weight in decisions under this section. 42 U.S.C. 6982(n)(4). Damage cases, even if only potential damage cases, are also relevant under the third Bevill factor: ''potential danger, if any, to human health and the environment from the disposal and reuse of such materials.'' 42 U.S.C. 6982(n)(4). In addition, damage cases are among the criteria EPA must consider under its regulations for determining whether to list a waste as a ''hazardous waste.'' See 40 CFR 261.11(a)(3)(ix). Damage cases generally provide extremely potent evidence in hazardous waste listings. In this regard, EPA notes that the number of damage cases collected for this rulemaking (157) is by far the largest number of documented cases in the history of the RCRA program.

EPA considers that both proven and potential damage cases provide information directly relevant to this rulemaking. First, damage cases provide evidence of both the extent and nature of the potential risks to human health and the environment. The primary difference between a proven and a potential damage case is whether the contamination has migrated off-site of the facility. But the mere fact that groundwater contamination has not yet migrated off-site does not change the fact that a potentially harmful constituent has leached from the unit into groundwater. Whether the constituent ultimately causes further damage by migrating into drinking water wells does not diminish the significance of the environmental damage caused to the groundwater under the site, even where it is only a future source of drinking water. As EPA explained in the preamble to the original 1979 open dumping criteria, which are currently applicable to these facilities, EPA is concerned with groundwater contamination even if the aquifer is not currently used as a source of drinking water. Sources of drinking water are finite, and future users' interests must also be protected. (See 44 FR 53445–53448.) (''The Act and its legislative history clearly reflect Congressional intent that protection of groundwater is to be a prime concern of the criterion. . . . EPA believes that solid waste activities should not be allowed to contaminate underground drinking water sources to exceed established drinking water standards. Future users of the aquifer will not be protected unless such an approach is taken.'')

In the June 21, 2010 proposed rule, EPA presented for public comment an assessment of CCR damage cases, and requested comments and other information related to damage cases EPA had previously received from industry, environmental groups, and citizen groups. EPA later requested public comment on additional damage case information in a Notice of Data Availability (NODA) published in the **Federal Register** on October 12, 2011 (76 FR 63252). As discussed in Section IV of this preamble, the Agency is deferring making a Bevill determination; however, EPA is still presenting its findings with regard to damage cases (including information submitted during the comment periods for the June 2010 proposal and the October 2011 NODA) because as described above, this information supports actions taken in the present final rule.[191]

A. Damage Cases Presented in June 21, 2010 Proposed Rule

In the June 2010 proposed rule, the Agency summarized its database on damage cases that had expanded since the May 2000 Regulatory Determination.[192] This summary included two cases of CCR slurry spill caused by surface impoundment dike failures (the 2005 Martins Creek, Pennsylvania, and the 2008 TVA Kingston, Tennessee), and two cases involving structural fill (the use, between 1995–2007, of CCR in the reclamation of two sand and gravel pits in Gambrills, Maryland; and for contouring the Battlefield Golf Course, in Chesapeake, Virginia, in the early 2000s). In the June 2010 proposed rule, the Battlefield Golf Course site was designated as a potential damage case, whereas the other three sites were designated as proven damage cases.[193]

B. Additional Information and Studies

Shortly prior to the publication of the June 2010 proposed rule and immediately thereafter, several stakeholder groups provided the Agency with new information on damage cases. In November 2009, the Electric Power Research Institute (EPRI) issued a two-volume draft report[194] analyzing the 24 proven and 43 potential damage cases established in EPA's 2007 damage case report[195] accompanying the August 2007 Notice of Data Availability (NODA).[196] EPRI claimed that in the great majority of damage cases there is no record of primary MCL contaminants migrating off-site that would justify designating them as proven damage cases. EPRI also disagreed with several ecologic damage cases that had been predicated on fish advisories in Texas, on the grounds that the selenium toxicity standard that triggered these fish advisories was later revised by the state, and subsequently the fish advisories were rescinded. In February and August 2010, The Environmental Integrity Project (EIP), jointly with other citizen groups, issued two reports, identifying 70 alleged damage cases.[197] [198] Fifty of these cases were submitted to EPA for the first time.

[191] Damage Case Compendium (Technical Support Document on Damage Cases), U.S. EPA, December 2014.

[192] See June 21, 2010 **Federal Register**—Appendix to the Preamble: Documented Damages from CCR Management Practices (75 FR 35230).

[193] See 75 FR at 35131 for definitions of ''proven'' and ''potential'' damage cases.

[194] *Evaluations of CCP Damage Cases:* These two volumes were finalized in July and September 2010, respectively: *http://my.epri.com/portal/server.pt?open=512&objID=413&&PageID=230509&mode=2&cached=true.*

[195] *Coal Combustion Waste Damage Case Assessments,* July 9, 2007. EPA–HQ–RCRA–2006–0796–0015.

[196] Notice of Data Availability on the Disposal of Coal Combustion Wastes in Landfills and Surface Impoundments, 72 FR 49714, August 29, 2007.

[197] *In Harm's Way: Lack of Federal Coal Ash Regulations Endangers Americans and Their Environment.* Environmental Integrity Project, Earthjustice, and Sierra Club: *http://www.environmentalintegrity.org/news_reports/08_26_10.php.*

[198] *Out of Control: Mounting Damages from Coal Ash Waste Sites.* Environmental Integrity Project and EarthJustice: *http://www.environmentalintegrity.org/news_reports/news_02_24_10.php.*

In response to EPRI's report, EPA reassessed the 24 proven damage cases identified in EPA's 2007 Damage Case report, as well as three additional proven damage cases cited in the proposed rule. In addition, in response to EIP's reports, the Agency assessed the 70 alleged damage cases, to independently confirm the allegations in the report. In reviewing [199] these alleged damage cases, EPA took a number of measures. First, to the extent the information was available, EPA consulted tabulated monitoring well data to validate the exceedance data presented in comments; and studied well- and waste-unit location maps, geohydrologic studies, and groundwater potentiometric maps to validate both whether the wells were up-gradient or down-gradient wells and instances of groundwater mounding. EPA also contacted state regulators to confirm the reports' claims of contamination, particularly contamination exceeding state or federal water quality standards, and conducted internet research (focusing on state regulatory information) pertaining to the sites in question. EPA also thoroughly assessed state comments submitted to EPA in response to the June 2010 proposed rule and the October 2011 NODA. Third, EPA identified state or federal administrative measures applied to utilities (*e.g.,* consent orders, notices of violation, penalties for non-compliance, etc.) and/or legal motions (*e.g.,* law-suits, motions for injunctive relief, and out-of-court settlements) filed by the states or citizen groups in order to identify any instances of non-compliance by the utilities that have resulted in documented impacts to water resources.

EPA's review confirmed that 13 of the 27 damage cases previously designated as proven did meet the criteria used by EPA for identifying proven damage cases; however, EPA also found that six of the 27 cases only meet the criteria for a potential damage case, while the remaining eight cases were altogether rejected (*i.e.,* EPA determined that a damage case has not occurred, and/or test of proof criteria were not satisfied, and/or CCR was not the only or predominant waste component). Regarding the 70 alleged damage cases in the two EIP reports, EPA concluded that ten of them qualify as proven damage cases, 45 as potential damage cases, and the remainder were either rejected or, due to the lack of adequate information, defined as indeterminate.

[199] See *Assessment of Previously Identified Proven Damage and Recently Alleged Damage Cases,* October 2010.

In November 2011, the Utility Solid Waste Activities Group (USWAG) submitted to the docket of the October 2011 NODA a critical review of EIP's 70 alleged damage cases from 2010. USWAG's review concluded that ''the overwhelming majority of the allegations regarding the 70 sites . . . fail to provide the requisite 'test of proof' documentation necessary for EPA to characterize virtually any of the sites as proven damage cases.'' Also, in November 2011 EIP submitted to the docket of the October 2011 NODA a report alleging 20 new damage cases.[200]

Following review of the comments on the proposed rule and the October 2011 NODA, EPA has revisited some of its earlier damage case findings. Our post-proposal studies have resulted in: (1) Rejection of 17 of the previously-established and newly-alleged damage cases, either due to inappropriate scope (*e.g.,* oil combustion waste, non-utility CCR, or CCR disposed-off in abandoned coal mine pits), co-mingling with non-CCR waste, or inadequate information to ascertain that contaminants are derived from CCR; (2) two of the damage cases that had been previously designated as 'rejected' in EPA's 2007 damage case report were re-categorized as proven damage cases and six others were re-categorized as potential damage cases; and (3) one damage case site reported in *Risky Business* occurred next to a site that had already been previously reported.

In summary, at the present time the Agency has established 40 proven and 113 potential damage cases. In addition, the rulemaking docket contains four additional, state-endorsed damage cases from Wisconsin. While EPA has insufficiently-detailed information (including the extent, if any, that the contaminants have migrated off site) to designate these four additional sites as potential or proven, because the state has identified them to us as damage cases, we have included them in our overall total of 157.

C. Stakeholder Comments on Damage Cases

All of the comments submitted by stakeholders to the dockets of the proposed rule and the October 2011 NODA, as well as EPA's responses, are included in the Technical Support Document to CCR Damage Cases which is available in the RCRA docket supporting this rule. The following is a summary of the salient comments submitted by the various stakeholder groups.

[200] EPA–HQ–RCRA–2011–0392–0259. Nineteen of the cases involve groundwater impact, and one involves soil contaminated by the placement of coal ash and clinkers from train engine boilers for railroad tracks bed. A hard copy of the report, *Risky Business: Coal Ash Threatens America's Groundwater Resources at 19 More Sites,* was issued on December 12, 2011.

1. Utility Industry's Comments

EPA received several comments from utilities arguing that an incident should not be considered to be a ''damage case'' if the environmental damage has been addressed or is no longer occurring and/or if the State Director is satisfied that no further action is required. (Note: For those damage cases known to the Agency prior to EIP's 2010 reports, remediation is completed or underway at *all* sites where remediation was known to be required.) These commenters also argued that EPA should disregard cases in which there are no downstream contaminant receptors to be harmed by the contamination. These commenters also alleged that only ''proven'' damage cases should be considered to be relevant as only these are ''*documented cases in which danger to human health or the environment from surface runoff or leachate has been proved,*'' 42 U.S.C. 6982(n)(4).

Industry commenters also made a number of other points. They stated that most damage cases occurred in older facilities commissioned before current state landfill regulations were promulgated, where most waste units lack liners and leachate collection systems, and that in most cases, exceedances of state or federal water quality standards were contained on site, and these exceedances are mostly for constituents (*e.g.,* sulfate and boron) that do not have federal, health-based drinking water quality standards. These commenters also claimed that the number of proven damage cases is very sparse: Of the 24 proven damage cases in EPA's 2007 report,[201] they argued that only three had documented off-site groundwater exceedances of health-based MCLs that can be attributed to CCR impacts. They also claimed that of the 70 alleged damage cases in EIP's 2010 reports (*In Harm's Way* and *Out of Control*), 64 did not meet EPA's ''test of proof'' criteria for characterizing the site as a proven damage case. For the remaining six sites, where the allegations on their face arguably met EPA's definition of a proven damage case, these commenters claimed that these cases should be discounted because they involved sites that are either no longer active or where the damages had been already remediated

[201] *Coal Combustion Waste Damage Case Assessments,* ibid.

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or are undergoing remediation with federal/state oversight. These commenters also said that 12 of the 70 EIP-alleged damage cases were previously addressed in EPA's 2007 Damage Case report, and of these, five sites had been rejected by the EPA due to lack of evidence of damage or lack of evidence of damage uniquely associated with CCR, and seven sites had been characterized as indeterminate due to insufficient information. According to these commenters, no new information regarding these 12 sites was contained in the two EIP reports that warrants their designation as proven damage cases.[202]

2. Individual State Comments

EPA also received a significant number of comments from individual states. In their comments, many of the states addressed selected damage cases that occurred within their jurisdiction, subject to their authority. Several states agreed with EPA's assessment of the damage cases; for instance, Wisconsin and Michigan complimented EPA's database of damage cases. Other commenters agreed with some of the newly alleged damage cases' reports of groundwater contamination exceeding regulatory standards, but disagreed with EIP's conclusions that enforcement was inadequate, tardy, or absent. According to some state commenters, enforcement was not necessary or appropriate in those instances. For example, some states (*e.g.,* North Carolina, Oklahoma, Tennessee, and Florida) argued that the contamination did not pose public health risks because the contaminants were confined to state-established Compliance Boundaries (known also as Groundwater Mixing Zones)[203] and/or because there was no evidence the contamination had migrated off-site. Several other states (*e.g.,* Maryland, Virginia, and Texas) confirmed EPA's established damage cases as well as some of the newly alleged damage cases, but claimed that these cases were associated with presently outdated practices, and that regulatory requirements have since been revised to prohibit such practices. Two states (South Dakota and Pennsylvania) confirmed that contamination above federal or state regulatory standards had occurred, but attributed the contaminant(s) to sources other than CCR units, *e.g.,* coal mining pits associated with coal refuse; and/or nearby, up-gradient unlined MSWLFs, cooling water evaporation ponds, or natural background soil compositions. For certain cases, the states explained that required assessment monitoring was still ongoing to establish the source, scope, and extent of the contamination, and so had reached no conclusions about the specific allegations (North Carolina, North Dakota, and Tennessee). Finally Ohio acknowledged that the extent of groundwater contamination risk within the state is poorly-documented due to the scarcity of monitoring wells down gradient from unlined disposal units.

3. State Association Comments

The Association of State and Territorial Solid Waste Management Officials (ASTSWMO) argued that the 24 proven damage cases reported in EPA's 2007 Damage Case report do not reflect current land disposal practices, and so are irrelevant to the proposed rule. For example, disposal ''units'' involved in several damage cases included five sand and gravel pits, two quarries, and one lake impoundment. ASTSWMO commented that half of these sites began operating in 1970 or earlier, including at least six sites that began operating in the early 1950s. ASTSWMO claimed that much of the information cited in the two EIP 2010 alleged damage case reports is incomplete, incorrect and/or misleading. For example, their comments alleged that EIP failed to provide pertinent information on specific monitoring wells, sample/analytical dates, and hydrogeological data. ASTSWMO also claimed that many of the assumptions about groundwater flow were based on a topographic maps rather than on potentiometric maps that are based on subsurface groundwater flow data. They also claim that data in state files contradicted claims in the reports, and that EIP's reports contained numerous technical errors, such as reporting values for naturally occurring constituents as contamination, reported data without distinguishing between down-gradient and up-gradient wells, ignoring the potential contribution from sources other than CCR-related units (*e.g.,* coal mining legacy), and claims that information provided by state program staff was misconstrued/misrepresented.

4. Citizens Group Comments

Citizen groups generally argued that the fact that damage has occurred should be part of the weight of evidence documenting the potential for harm at all CCR disposal sites, without regard to whether the damage cases were categorized as ''proven'' or ''potential.'' These commenters also raised a number of arguments in direct response to the comments provided by the utilities and the states. For example, these commenters argued that the presence of downstream receptors is a valid factor to consider when setting priorities for mitigating damage, but does not justify allowing contamination to migrate off of the disposal site. These commenters claimed that about one-fifth of EPA's damage cases preceding the 2010 EIP reports show evidence of contamination of private and public drinking water wells. In addition, these commenters allege that state regulatory agencies have done little to respond to contamination from CCR disposal sites, and, even in those cases where action has been taken, rarely is any action taken beyond assessment monitoring. According to these commenters, off-site monitoring has only occurred at a limited number of sites, and mostly such monitoring was performed voluntarily by the utilities and was not reported to state regulators. These commenters also claimed that although less than half of EPA's damage cases preceding the 2010 EIP reports involve active landfills, almost three-quarters of the newly alleged damage cases (EIP's 2010 reports) involve active landfills. They further alleged that a large majority of EPA's surface impoundment damage cases preceding the 2010 EIP reports are active sites, indicating that the absence of liners is contributing to the contamination problems. They noted that one quarter of the damage cases in EIP's 2010 reports involved units with liners, indicating that the mere presence of any liner provides no assurance that migration of contaminated groundwater from a waste unit is not occurring. Overall, they claimed that surface impoundments remain ''woefully unregulated'' when compared to landfills. Over one third of EIP's alleged groundwater damage cases show migration of contamination off-site. Also, a quarter of EPA's damage cases preceding the 2010 EIP reports involve contamination of surface water, and 15 percent of these damage cases show ecologic damage. Finally, these commenters note that several of the Secondary Contaminant Maximum Levels (SMCLs) constituents still might

[202] EPA–HQ–RCRA–2011–0392–0211, ibid.

[203] A Zone of Discharge or Zone of Mixing is a three dimensional region containing groundwater being managed to mitigate impairment caused by the release of contaminants from a waste disposal site; by definition, it is inside the detection boundary area, hence it is exempt from compliance with MCL and SMCL standards (*e.g.,* in Florida, Illinois, South Carolina, Tennessee, North Carolina, and Pennsylvania).

cause harm to recipients residing next to CCR disposal sites.[204]

D. Response to Key Stakeholder Comments

In many instances EPA did not have access to information that would either substantiate or refute the claims in EIP's reports. In many instances public commenters submitted information that clarifies, rebuts or otherwise calls into question some of the allegations contained in the various damage case reports. For example, there are instances in which claims were made that a contaminant plume had migrated offsite even though there were no offsite monitoring wells to confirm the claim. Due to the dearth of groundwater monitoring on facilities' boundaries (or beyond) EPA could not identify offsite plume migration for most sites, except in the rare instances drinking water wells had been contaminated. Consequently, only 10 of the 70 alleged cases submitted by EIP in 2010 were designated as proven damage cases.

In addition, factual errors were identified in certain instances; for example, certain allegations of groundwater contamination were based on surface water standards (rather than groundwater standards). Corrections or updated facts are reflected in EPA's damage case assessment. Nevertheless, EPA was able to validate a significant number of EIP's claims; for example, as of 2011, EPA was able to confirm that a significant portion of the damage cases in EIPs 2010 report involved both landfills and surface impoundments, most of which involved units with either no liner or a substandard liner system. And for many of EIP's damage cases, EPA was able to confirm sufficient details to classify them as potential damage cases.

However, EPA disagrees with most of the arguments minimizing the significance of the damage case record. First, cases where contamination has been remediated remain relevant to this rulemaking. EPA is relying on the damage cases to evaluate the extent and nature of the risks associated with particular CCR management practices. Facts demonstrating the consequences from particular activities therefore remain relevant, particularly (although not solely) where the management practices continue to occur. In other words, what matters in this regard are facts that provide information on the reasons that unit leaked, the particular contaminants that were present, the levels of those contaminants, and the nature of any impacts caused by that contamination. None of these facts are affected by whether the damage is ultimately mitigated or remedied. This is entirely consistent with RCRA section 8002(n), which requires EPA to evaluate the ''potential danger, if any, to human health and the environment from the disposal and reuse of such materials'' in addition to ''documented'' damage cases. 42 U.S.C. 6982(n)(3)–(4). Accordingly, the fact that any contamination has subsequently been remediated is not a basis for disregarding a damage case. Moreover, EPA is not relying on these damage cases to evaluate the adequacy of state programs, although it may ultimately provide information relevant to such findings. Therefore the adequacy of the state's response, or the lack thereof, is also not relevant to whether particular damage cases are appropriately considered as part of this rulemaking.

EPA also disagrees that only the presence of receptors within the impact sphere of a contaminating facility merits consideration of a particular damage case. EPA's longstanding and consistent policy across numerous regulatory programs has been that groundwater contamination is a significant concern that merits regulatory action in its own right, whether or not the aquifer is not currently used as a source of drinking water. Sources of drinking water are finite, and future users' interests must also be protected. The absence of current receptors is therefore also not an appropriate basis on which to discount damage cases. And for all of the reasons discussed above, EPA also disagrees that only exceedances of health-based standards of contaminants that have migrated off-site (*i.e.,* only proven damage cases) should be accounted for as part of this rulemaking.

The Agency also disagrees with the claims that the number of damage cases is ''sparse,'' the majority of which involve only ''outdated CCR management practices'' in older facilities, and therefore are not relevant to determining the current risks from CCR mismanagement. Even assuming that only ''proven'' damage cases were relevant, to date, EPA has confirmed a total of 40 proven damage cases, which is hardly ''sparse.'' And when ''potential'' damage cases are considered, the totals rise to 157; this is the largest number of damage cases in the history of the RCRA program. Further, these numbers likely underestimate the true number of cases in which CCR units are contaminating groundwater. In reality, the damage case record represents only a subset of those CCR waste units that have effective groundwater monitoring. As discussed in Unit IV.A of this document, a significant portion of CCR surface impoundments still lack groundwater monitoring, and only approximately 80% of the recently commissioned impoundments (*i.e.,* since about 1994) have groundwater monitoring.

In addition, under many state programs existing impoundments are exempt from groundwater monitoring and once monitoring is put in place, new damage cases quickly emerge. This is illustrated by two lines of evidence: First, in the wake of the 2008 TVA Kingston CCR spill two states required utilities for the first time to install groundwater monitoring. Illinois required facilities to install groundwater monitoring down gradient from their surface impoundments. As a result, within only about two years, Illinois detected seven new instances of primary MCL exceedances and five additional instances with exceedances of SMCLs. The data for all twelve sites were gathered from onsite; it appears none of these facilities had been required to monitor groundwater off-site, so whether the contamination had migrated off-site is currently unknown.[205] Similarly, North Caroline required facilities to install additional down gradient wells. In January 2012, officials from the North Carolina Department of Environment and Natural Resources disclosed that elevated levels of metals have been found in groundwater near surface impoundments at all of the State's 14 coal-fired power plants.[206]

Second, states with effective programs for groundwater monitoring tend to have a larger record of damage cases (*e.g.,* Wisconsin, nationally ranked as the 32nd CCR disposer in 2011, has 14 damage cases) as compared to states with less stringent groundwater

[204] Examples include boron's One-Day and Ten-Day Health Advisory (3.0 mg/L) and the Longer Term Health Advisory (2.0 mg/L) levels for children; manganese's Long Term Health Advisory (LTHA: 0.3 mg/L) level; and sulfate's Drinking Water Advisory (DWA: 500 mg/L) level in groundwater have been exceeded each in between over 60 and close to 80 of both the alleged and damage case sites and those sites preceding the 2010 EIP reports.

[205] See EIP's December 2011 *Risky Business: Coal ash Threatens America's Groundwater Resources at 19 More Sites,* docket document EPA–HQ–RCRA–2011–0392–0259, appendix A3. *www.environmentalintegrity.org/.../121311EIPThirdDamageReport.pdf* and *Illinois EPA's Ash Impoundment Strategy Progress Reports,* February 10 and October 2011, accessed Online July 15, 2014: *http://www.epa.state.il.us/water/groundwater/publications/ash-impoundment-progress.pdf and http://www.epa.state.il.us/water/ash-impoundment/documents/ash-impoundment-progress-102511.pdf.*

[206] Groundwater Monitoring Data for Coal Ash Ponds, NC DENR: *http://portal.ncdenr.org/web/wq/hot-topics/coalashregulation/gwatermonitoring.* Accessed Online July 15, 2014.

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monitoring requirements (*e.g.,* Texas, nationally ranked as the second largest CCR disposer in 2011, has only three confirmed, potential damage case).

Nor is it accurate that the majority of these damage cases involve older units that no longer reflect current management practices or state requirements. The commenters point to the fact that the majority of cases involve units constructed before current state landfill regulations were promulgated, and thus lack liners and leachate collection systems. EPA agrees that the majority of cases do involve such units, but this hardly reflects ''outdated'' or irrelevant management practices. As discussed in Unit IV.A of this document, the majority of CCR continues to be managed in older (*i.e.,* constructed pre-1994) units that lack liners and leachate collection systems, and will in fact continue to be managed in such units for at least the near future.

Approximately six percent of the waste units associated with groundwater impacts have been constructed from 1990 onwards. Considering there is a lag time between the construction of many of the disposal units and the first detection of their groundwater impact by subsequently installed groundwater monitoring wells, the absence of damage cases associated with newer units is neither unexpected nor dispositive as to the level of risk such units pose.

Finally, a number of other factors support the conclusion that the current number of damage cases likely underestimate the current risks. First, the combined effect of a number of current state regulatory provisions is to decrease the instances in which off-site contamination will be detected (or on-site contamination will need to be remediated). For example, several states have adopted ''buffer zones'' where certain standards may not apply; Florida designates certain areas as a ''Zone of Discharge'' (ZOD), in which numerical primary and secondary drinking water standards do not apply; this exemption extends even beyond the ZOD, unless ordered specifically by the state. In addition, secondary maximum contaminant levels (SMCLs) are not applicable to existing industrial facilities discharging to groundwater in the state.[207] In other instances, states grant waivers to certain facilities that exceed health-based standards several-fold.[208] Certain states (*e.g.,* Indiana) consider surface impoundments as temporary storage facilities as long as they are dredged on a periodic basis (*e.g.,* annually). Under these states' rules, such impoundments are exempt from any solid waste regulations that would require groundwater monitoring, and from requirements for corrective action.[209] Such requirements are likely to decrease the instances in which contamination above an MCL has migrated off-site will be detected. Second, the record documents several instances where, once the contaminant plume has migrated off-site and impacted private water wells, the utility has purchased these properties, thereby rendering the off-site contamination, ''on-site.'' At times, this practice (which is condoned by the state) has expanded the ZOD to well beyond its original boundary. Once the status of the contaminant plume changes from off-site migration, which typically requires remedial action, back to onsite containment, this can affect the kind of corrective action the state requires of the utility (or indeed whether any will be required).

E. Characterization of Impacts Associated With CCR Units

1. CCR Waste Unit Types Associated With Damage Cases

EPA's documented record of confirmed damage cases is dominated by wet-disposal and treatment modes: Surface impoundments, cooling ponds, and artificial wetlands constitute close to half of the total number of implicated waste units. In comparison, dry disposal modes such as landfills, sand and gravel pits, storage piles for coal ash and FGD, and certain structural fills account for about one third of the confirmed damage cases.[210] Sand and gravel pits and quarries as well as structural fills, comprise about ten percent of all the unit types that are associated with damage cases.

2. Contaminants of Concern (COCs)

Because the list of constituents to be monitored in groundwater varies from permit to permit and among states, accurate estimates of the frequency of constituents associated with groundwater impacts nationwide cannot be made with confidence. Based on the available monitoring records, the most prevalent contaminant among the primary MCLs identified in damage cases is arsenic, whereas the most prevalent contaminants identified among the secondary MCLs are sulfate and boron. Similarly, disparities from one permit to another as to which constituents are monitored in NPDES discharges from CCR impoundments limit EPA's ability to identify trends associated with contaminants of concern. Based on the Agency's record of all of the confirmed damage cases, it can be only established that the most prevalent COCs with respect to Primary Water Quality Criteria (WQCs) exceedances in surface water, and/or of cleanup standards in sediments and soils are selenium and arsenic, and for Secondary WQCs or cleanup standard exceedances, are boron and iron.[211]

The high mobility of boron and sulfate explains the prevalence of these constituents in damage cases that are associated with groundwater impacts. Damage cases impacting surface water that have also a documented ecologic impact comprise the largest subset of proven damage cases (over 40 percent). The most prevalent COC here is selenium, the bioaccumulative effects of which have caused abnormal mortality rates and sublethal effects such as histopathological changes and damage to reproductive and developmental success, adversely impacting aquatic populations and communities of fish and amphibians. Such impacted communities, residing both in lentic (*e.g.,* cooling water lakes) and lotic (*e.g.,* small to medium-size streams) settings that receive regulated (*i.e.,* via permitted outfalls) and unregulated (*i.e.,* via seepage) discharge from CCR impoundments were documented and rather extensively studied in several sites (*e.g.,* in Texas, North Carolina, and South Carolina).[212] [213]

[207] Illinois uses a similar concept: Groundwater Mixing Zone; North Carolina waives any compliance requirements for constituents in exceedance of the state's groundwater standards that are confined to monitoring wells within the Compliance Boundary; and in Pennsylvania and Tennessee, state laws do not require state response to onsite exceedances of secondary MCLs.

[208] The observations cited in the following pertain to groundwater quality. Regarding surface water quality, NPDES permits in many states commonly have very limited requirements for monitoring discharge constituents, excluding all or most of the heavy metals.

[209] E.g., Duke Energy's Gibson Generating Station, Princeton, Indiana, a proven damage case.

[210] Facilities with both wet and dry disposal waste units are implicated in less than twenty percent of the cases.

[211] For a list of the key metals found in CCR wastewater and examples of the environmental concerns associated with them, see *Steam Electric Power Generating Point Source Category: Final Detailed Study Report;* EPA 821–R–09–008, October 2009: *http://water.epa.gov/scitech/wastetech/guide/steam-electric/upload/Steam-Electric_Detailed-Study-Report_2009.pdf.*

[212] In validation of the findings of the Risk Assessment accompanying this rule, EPA has documented numerous damage cases where selenium in CCR wastewater discharge into surface waters triggered the issuance of fish-consumption advisories as well as selenium MCL exceedances in groundwater, suggesting that selenium concentrations in CCR wastewater constitute a human health risk.

[213] According to the draft Steam Industry's Effluent Guidelines EA, the steam electric power

There are fewer recorded instances of surface water damage cases involving the heavy metal COCs such as antimony, beryllium, mercury, and thallium than of groundwater damage cases. It is unclear whether this genuinely reflects lower potential risks via this route of exposure. Intrinsic differences between the chemical and physical parameters of surface water and groundwater (*e.g.,* the higher redox potential and the larger flow-rate of the former) would accelerate the removal of many metals from surface water through precipitation and/or adsorption and facilitate a greater dilution. However, as noted, NPDES permits in many states commonly have very limited requirements for monitoring discharge constituents, excluding all or most of the heavy metals, so this cannot be ruled out as at least a contributing factor.[214]

3. Failure/Impact Modes

The CCR damage case record shows the following prevalent impact modes (more than one possible impact type per generating facility site is possible): Slightly over half of the recorded impact cases are associated with groundwater; about ten percent are associated with surface water, which quite frequently is also accompanied by documented ecological impacts and/or with the contamination of soils and/or river sediments; over one third are associated with both groundwater and surface water impacts; and about four percent are associated with catastrophic surface impoundment failures.

The established damage case record includes ten sites involving exceedances of primary MCLs that have impacted drinking water wells. In all of these cases, the implicated utility provided alternative potable water to well water users.[215] Three of the damage cases were listed on the National Priority List as Superfund sites,[216] and one is a Superfund Alternative (SA) site.[217] In the course of reassessing the pre-EIP 2010 damage cases and vetting EIP's alleged damage cases, the Agency rejected two other Superfund damage cases, because in addition to CCR, these site had also accepted large volume of non-CCR waste.[218]

Four major releases of CCR sludge associated with surface impoundment dike or pipe failure resulted in significant coal slurry releases,[219] causing fish kills and other ecologic damage, and in some instances damage to infrastructure. In the Clinch River spill, for instance, it was estimated that 217,000 fish were killed in a 90-mile stretch of the river in Virginia and Tennessee. The Clinch River plant coal ash had a high free lime content, which reacted with water in the settling pond to form an alkaline calcium hydroxide. As a result, during the release, pH was elevated to levels as high as 12.7. The high-toxicity shock also decimated benthic macro-invertebrate populations for a distance of over three miles below the spill site, and snails and mussels were eliminated for over 11 miles below the Clinch River power plant.

As demonstrated in the aftermath of the 2008 coal ash spill in TVA Kingston, Tennessee, large impoundment dike breach incidents result in impacts to soil and river sediments. In a study conducted few months after the spill, Emory River's downstream sediments showed high mercury concentrations similar to those detected in the coal ash (115–130 μg/kg).[220] According to this study, the ecological effects of mercury in the coal ash and sediments depend on the chemical mobility of mercury in the solids and the potential for mercury methylation in the impacted area. Previous studies have shown that sulfate addition can promote methylation in freshwater ecosystems by stimulating sulfate reducing bacteria, the primary organisms responsible for producing methylmercury in the environment. In coal-ash-containing waters, a 10- to 20-fold increase in SO_4^{-2} concentrations was observed in the Emory River Cove area relative to unaffected upstream sites. Therefore, the methylation potential of mercury from this material could be high because the coal ash also provides an essential nutrient (SO_4^{-2}) that encourages microbial methylation. In addition, leaching of contaminants from the coal ash caused contamination of surface waters in areas of restricted water exchange and slight elevation down gradient. The accumulation of arsenic-rich fly ash in bottom sediment in the Emory River's aquatic system could cause fish poisoning via both food chains and decrease of benthic fauna that is a vital food source. Another recent study estimates that the damage to fish and other wildlife incurred by both permitted and unpermitted CCR effluent discharge at some 22 sites amounts to over $2.3 billion.[221]

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sector is responsible for a significant fraction of the toxic pollutants reported to be discharged in industrial National Pollutant Discharge Elimination System (NPDES) permits.

[214] This issue is illustrated by the very limited monitoring record on mercury exceedances in surface water as compared to the extensive documentation of mercury impacts revealed in studied surface water that receive steam industry effluents. These studies have documented fish and invertebrates exposed to mercury from CCR wastewater exhibiting elevated levels of mercury in their tissues and developing sublethal effects such as reduced growth and reproductive failure. For an excellent summary of surface water ecologic and human health risks and impacts study results, see the cited Steam Electric Power study report.

[215] These proven damage cases include eight cases where the utility was directed by the state to provide an alternative water supply (NIPSCO Yard 520, IN; Constellation Energy Gambrills, MD; Don Frame Trucking, NY; Bruce Mansfield, PA; Trans Ash Landfill, TN; VEPCO Chisman Creek, VA; Stoneman, WI; and WEPCO Highway 59, WI); and two instances in which the utility provides substitute water to residents on a voluntary basis (Gibson Station, IN, and Colstrip, MT). In three additional, potential damage cases (Oak Creek, WI; Battlefield Golf Course, VA; and Joliet Station 9, IL), the utilities provide substitute water—out of abundance caution—to adjacent residential properties whose water wells were impacted by secondary MCL exceedances, and in two additional cases, the electrical utility was instructed by state regulators to provide substitute water to residential properties which either have had their drinking water wells impacted by trace amounts of thallium, within the State and the federal standards (Asheville, NC) or by exceedances of boron (Sutton, NC). Finally, in one case (Belews Creek, NC) the electric utility agreed to co-fund upgrading of potable water treatment plants in two municipalities to eliminate trihalomethanes, a carcinogenic by-product of power plant scrubber, bromide-containing river water subject to water treatment employing chlorine.

[216] OU–12, Oak Ridge, Tennessee (an NPL site between 1989 and 1997); VEPCO, Chisman Creek, Virginia (an NPL site between 1983 and 1988); and the Lemberger Landfill, Wisconsin (1986 to present).

[217] Town of Pines Groundwater Plume, Indiana (SA: 2003–Present): *http://www.epa.gov/region5/superfund/npl/sas_sites/INN000508071.htm*. The Site is not listed on the National Priority List (NPL) although it qualifies for such listing. The SA approach uses the same investigation and cleanup process and standards that are used for sites listed on the NPL, while it can potentially save the time and resources associated with listing a site on the NPL. As long as a PRP enters into an SA approach agreement with EPA, there is no need for EPA to list the site on the NPL.

[218] These are the formerly proven damage case of Salem Acres, Massachusetts (originally addressed in the 2007 *Coal Combustion Waste Damage Case Assessments* Report), and Industrial Excess Landfill, Uniontown, Ohio, an alleged damage case submitted by EIP in *In Harm's Way,* 2010.

[219] These catastrophic releases involved the release of 1.1×10^9, 2.7×10^8, 1.3×10^8, and 1×10^8 gallons of CCR slurry at the spills of the 2008 Kingston TVA, Tennessee; the 2014 Dan River, North Carolina; the 1967 Clinch River, Virginia; and the 2005 Martins Creek, Pennsylvania, respectively.) In addition, the possible ecologic impacts of two consecutive, 30 million gallons each, of CCR slurry releases (in 2007 and 2008) by the Eagle Valley power plant in Indiana have not been assessed.

[220] *Survey of the Potential Environmental and Health Impacts in the Immediate Aftermath of the Coal Ash Spill in Kingston, Tennessee.* Laura Ruhl et al., Environ. Sci. Technol. Published online on May 4, 2009. Volume *43* (16), pp 6326–6333: *http://pubs.acs.org/doi/abs/10.1021/es900714p*.

[221] A. Dennis Lemly and Joseph P. Skorupa: *Wildlife and the Coal Waste policy Debate: Proposed Rules for Coal Waste Disposal Ignore Lessons from 45 Years of Wildlife Poisoning.* Environ. Sci. Technol., 27 July, 2012.

a. Construction Year and First Detection Year

Slightly over half of the CCR waste units identified as the source of groundwater contamination in the damage cases were commissioned in the 1970s and 1980s, two boom decades of coal-fueled power generation growth in the U.S. Whereas the majority of the CCR waste units associated with damage cases were constructed before 1990, approximately six percent of the units in the damage cases (where the commissioning date is known) became operational after 1990. For 61 units with known commissioning dates, the median lag time between commissioning and the first detection of impact to groundwater is about 20 years. However, considering the large range of lag time values (between less than one year and 50 years) the recorded median lag time most probably reflects additional variables. Possible variables include monitoring wells that were installed after many of the waste units were already well into their operating stage, and the variable hydraulic conductivity of the impoundment's substrate (including the effectiveness of its liner, if any), both of which will determine how quickly groundwater contamination is first detected. Overall, the evidence about the lag time between the commissioning of a waste unit and the first detection of the impact of its leakage implies that most likely there are prospective damage cases that have not yet been identified, challenging industry's claims that the damage cases represent the legacy of a bygone regulatory regime.

b. Liners

Of the waste units implicated in damage cases to groundwater with information on liners, over 90 percent have either no liners, some sort of ash-based liners (*e.g.,* Poz-O-Tec, an FGD/lime-conditioned liner), or only partial- or high-permeability (*e.g.,* concrete) liners. The majority of the remaining CCR waste units is either clay-lined and/or has a recognizably-failed liner. Considering that over a half of CCR waste units associated with groundwater impacts were constructed in the 1970s and 1980s, historic information on liner prevalence and composition is highly pertinent. According to the February 1988 Report to Congress on coal combustion wastes (''RTC I''), before 1975 less than 20 percent of all generating facility units managed their CCR in lined disposal units, and in generating facility units constructed since 1975, the share of lined units grew to over 40 percent.[222] However, as late as in the mid-1980s, about three-quarters of all CCR units (87 percent of surface impoundments and 39 percent of landfills) were still unlined.[223]

In the mid-1990s, the estimated prevalence of unlined landfills still ranged between 43–57 percent, and between 71–72 percent for surface impoundments.[224] According to the March 1999 Report to Congress on wastes from the combustion of fossil fuels (RTC II), the most prevalent liner type was compacted clay (about one-half of all lined landfills, and about 80-percent of all lined surface impoundments). Composite and/or synthetic liners were significantly more prevalent in landfills than in surface impoundments. Based on recent EPA data,[225] the use of liners is still more prevalent in landfills than in surface impoundments.

c. Geographic Distribution

Close to 70 percent of all the established damage cases occur in EPA Regions 5, 4, and 3 (in descending frequency, Region 5: 34 percent; Region 4: 28 percent; and Region 3: seven percent).[226] This distribution correlates well with the regional distribution of *unlined* CCR units in the mid-1980s.[227]

d. Current CCR Waste Unit Status

As of mid-2011, close to half of the combined (proven and potential) damage case CCR waste units were still active; about a quarter were inactive due to either closure of the individual disposal unit, a fuel switch (*e.g.,* from coal to gas) by the generating facility, or the decommissioning of the facility. Another quarter or so represented power generating facilities where CCR waste units (primarily impoundments) that failed to comply with state requirements had been closed and replaced by other, new disposal units, and/or the generating facilities switched from wet- to dry disposal. Since mid-2011, the percentage of inactive CCR units associated with groundwater damage cases has further increased, due to the continued drop in power demand during the economic recession, which has resulted in power station temporary removal from active service (*i.e.,* mothballing) and closures, combined with an increasing switch by many facilities to a more cost-effective fossil fuel (*i.e.,* natural gas).

F. Conclusions

EPA now has a significantly better understanding of CCR damage cases than when the proposed rule was issued. First, damage cases are more numerous than previously contemplated and as more monitoring well systems are installed, the number of damage cases is likely to increase. Second, the CCR damage case record corroborates the findings of the risk analysis by demonstrating the greater vulnerability of groundwater (and surface water) to wet disposal (*i.e.,* surface impoundments). Third, the damage cases show a direct correlation between the absence of liners and groundwater impacts, and illustrate that whereas in general the design of waste units—particularly surface impoundments—has improved over time, a notable portion of CCR impoundments constructed in the last two decades still lack a protective liner, thus presenting a potential threat to groundwater. Finally, a recent CCR spill incident[228] demonstrates that inactive surface impoundments that have not been properly decommissioned (*i.e.,* by breaching, dewatering, and capping or by clean-closing) continue to pose a

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[222] Wastes from the Combustion of Coal by Electric Utility Power Plants (First Report to Congress), EPA/530–SW–88–002, February, 1988, pages 4–30 to 4–33: *http://www.epa.gov/osw/nonhaz/industrial/special/fossil/coal-rtc.pdf.*

[223] These statistics are based on about 42 percent of the total CCR units at that time, for which liner information was available. RTC I attributes this low percentage to the common practice of disposal in off-site units, for which liner information was not available.

[224] Based on three different partial surveys cited in the Second Report to Congress (RTC II, 1999): *Wastes from the Combustion of Fossil Fuels, Volume 2—Methods, Findings, and Recommendations* (Second Report to Congress), EPA 530–R–99–010, March 1999: *http://www.epa.gov/osw/nonhaz/industrial/special/fossil/volume_2.pdf.*

[225] EPA compiled the baseline use of bottom liners by CCR landfills and surface impoundments from the following sources: (1) Impoundment data from EPA/OSWER's 2009–2011 impoundment dam integrity site inspections; *http://www.epa.gov/waste/nonhaz/industrial/special/fossil/surveys2/index.htm*; (2) Impoundment data from ORCR's 2009 Information Collection Request (ICR) addressing power plants with impoundments; *http://www.epa.gov/waste/nonhaz/industrial/special/fossil/coalashletter.htm*; and (3) Landfill and impoundment data from EPA Office of Water's 2010 ICR addressing power plants to be affected by the Steam Electric Power Generating Effluent Guidelines: *http://water.epa.gov/scitech/wastetech/guide/steam_index.cfm#point6.*

[226] See *http://www.epa.gov/aboutepa/#regional* for a list of states covered by each EPA Regional office.

[227] According to the Report to Congress I (1988), in the mid-1980s, the distribution of unlined CCR waste units across EPA regions was as follows: For surface impoundments: 31.7 percent (Region 4); 18.6 percent (Region 5); 6.2 percent (Region 7); and 3.5 percent (Region 3). For landfills: 11.1 percent (Region 5); 2.9 percent (Region 3); and 2.4 percent (Region 4).

[228] The Duke Energy's Dan River, North Carolina, February 2, 2014 CCR slurry spill.

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significant risk to human health and the environment.

XII. Summary of Regulatory Impact Analysis

EPA estimated the costs and benefits of the final rule. The Regulatory Impact Analysis (RIA) is available to the public in the docket for this action.

A. Costs of the Final Rule

The estimated costs of the final rule are summarized in Table XII–A below. These are the incremental costs above the ''baseline.'' *i.e.,* the current costs for managing CCR absent this regulation. The baseline takes into account existing state regulations for managing CCR now and into the future. To the extent that some states may have granted waivers or variances for certain provisions of State requirements, or in other instances may have added extra pollution control requirements above existing regulatory requirements to some specific permits issued to electric utility plants for operating CCR management units, the RIA did not take those actions into account.

EPA used the following data sources to create a model for the RIA that estimates the costs and benefits of the rule: (1) 2012 DOE EIA–923 database; (2) ORCR's 2009–2012 CCR impoundment site inspections; (3) impoundment data from ORCR's 2009 mail survey to plants with CCR impoundments; (4) landfill and impoundment data from EPA Office of Water's 2010 mail survey to power plants in support of the 2013 proposed Steam Electric Power Generating Effluent Limitation Guidelines; (5) Integrated Planning Model (IPM) v. 5.13 (for the future projection of coal consumption by electric utility plants); and (6) the 1995 Electric Power Research Institute (EPRI) Co-management Survey.

TABLE XII–A—ESTIMATED COST OF POLLUTION CONTROLS REQUIRED BY THE CCR FINAL RULE

[Millions 2013$]

CCR pollution control	@ 3% discount rate		@ 7% discount rate	
	Annualized values	Present values	Annualized values	Present values
1. Groundwater monitoring	$4.79	$151	$2.80	$39.9
2. Bottom liners	491	15,500	297	4,230
3. Leachate collection system (landfills only)	51.6	1,630	18.4	263
4. Fugitive CCR dust controls	7.09	224	3.36	48.0
5. Stormwater run-on/run-off controls	18.8	594	13.0	186
6. Location restrictions	43.6	1,380	20.0	285
7. Closure capping	20.1	630	12.0	171
8. Post-closure groundwater monitoring (30 years)	0.08	2.40	0.04	0.61
9. Impoundment structural integrity requirements	10.9	344	11.1	158
10. Corrective action (CCR contaminated groundwater cleanup)	19.0	600	19.1	273
11. Reporting and recordkeeping	26.3	831	27.3	389
12. Conversion to dry CCR handling	29.0	916	57.3	818
13. Inactive impoundments (dewater and closure cap)	12.0	380	26.7	381
14. Subtotal industry costs (1+...+13)	734	23,200	508	7,240
State Agency Burden Costs				
15. Impoundment structural integrity requirements	0.22	6.88	0.22	3.16
16. Corrective action	0.38	12.0	0.38	5.45
17. Reporting and recordkeeping	0.53	16.6	0.55	7.78
18. Subtotal State agency burden costs (15+16+17)	1.12	35.5	1.15	16.4
19. Total cost (14+18)	735	23,200	509	7,260

B. Benefits of the Final Rule

The RIA contains two categories of benefits (1) benefits that are monetized and (2) non-monetized benefits. The RIA estimates 11 categories of expected future human health and environmental benefits for the CCR rule. These include reduced future CCR impoundment structural failure releases; reduced future CCR groundwater contamination; improved air quality from reduced power plant air pollution; and surface water quality benefits. The estimated value of each of the 11 monetized benefits is presented in Table XII–B below.

TABLE XII–B—EPA ESTIMATED MONETIZED BENEFITS FOR THE CCR FINAL RULE

[Millions 2013$ over 100-year period of analysis 2016–2114]

	3% discount rate		7% discount rate	
	Annualized	Present value	Annualized	Present value
1. Reduced CCR impoundment structural failure releases	$156	$4,910	$143	$2,040
2. Reduced CCR landfill & impoundment groundwater contamination	12.8	405	9.86	141
3. Induced increase in future annual CCR beneficial uses	117	3,130	79.0	1,120
4. Reduced incidence of cancer from CCR exposure	<0.1	0.17	<0.1	<0.1
5. Avoided IQ losses from mercury in CCR	0.28	8.80	<0.1	0.35
6. Avoided IQ losses from lead in CCR	0.186	5.87	<0.1	0.23
7. Reduced need for specialized education (associated with 5 & 6 above)	<0.1	<0.1	<0.1	<0.1
8. Non-market surface water quality benefits	2.26	71.4	1.89	27.0

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TABLE XII–B—EPA ESTIMATED MONETIZED BENEFITS FOR THE CCR FINAL RULE—Continued

[Millions 2013$ over 100-year period of analysis 2016–2114]

	3% discount rate		7% discount rate	
	Annualized	Present value	Annualized	Present value
9. Protection of threatened & endangered species near CCR impoundments	0.91	28.7	0.76	10.8
10. Improved air quality from induced changes to power plant emissions	4.66	147	2.04	29.1
11. Reduced power plant groundwater withdrawals	<0.1	<0.1	<0.1	<0.1
12 Total monetized benefits (1 + . . . + 11)	294	8,710	236	3,360

In addition to the monetized benefit categories, the RIA describes 11 additional non-monetized benefit categories. Due to uncertainties and weaknesses in supporting documentation for quantifying and monetizing these benefits, the RIA presents these benefits separately from the benefits listed above, and does not include them in the quantified comparison of benefits and costs. These non-monetized benefits include:

1. Financial market benefits
2. Reduced community dread of CCR impoundment structural failure releases
3. Reduced health and property nuisance impacts from CCR fugitive dust
4. Cancer and non-cancer human health benefits from reduced CCR contamination of fish consumed by recreational anglers and subsistence fisher households in surface waters near power plants (additional to monetized avoided health effects)
5. Cancer and non-cancer human health benefits from reduced CCR exposure by other recreational users of surface waters near power plants (additional to monetized avoided health effects)
6. Avoided CCR contamination of sediments in surface waters near power plants
7. Water quality benefits from avoided CCR contamination treatment costs for use of surface waters for drinking and irrigation water supply
8. Commercial fisheries benefit in surface waters near power plants
9. Increased participation in water-based recreation near power plants
10. Avoided fish impingement and entrainment mortality from power plant water intakes (induced conversion to dry CCR handling reduces future water demand for CCR sluicing)
11. Increased property values surrounding electric utility plants (from closure capping and re-vegetation of CCR surface impoundments)

The total monetized benefits less the total costs of the rule provide the net monetized benefits of the rule. Table XII–C summarizes the total costs and benefits as well as the net benefits of the rule.

TABLE XII–C—EPA ESTIMATED INCREMENTAL COSTS & BENEFITS OF THE CCR RULE

[Millions 2013$ over 100-year period of analysis 2015–2114]

	3% discount rate	7% discount rate
A. Annualized Values.		
A1. Total Costs	$735	$509
A2 Total monetized benefits	294	236
A3. Net Benefits (A2–A1)	(441)	(273)
A4. Benefit to Cost Ratio (A3/A1)	0.40	0.46
B. Present Value.		
B1. Total Costs	23,200	7,260
B2 Total monetized benefits	8,710	3,360
B3. Net Benefits (B2–B1)	(14,490)	(3, 900)
B4. Benefit to Cost Ratio (B2/B1)	0.38	0.46

XIII. Uniquely Associated Wastes

By way of this rule, EPA is codifying in § 261.4(b)(4) a list of low volume waste that when co-disposed with CCR are not subject to hazardous waste regulations. These wastes are also referred to as uniquely associated wastes. However, these uniquely associated wastes are subject to hazardous waste regulations when they are not co-disposed with CCR.

In a letter to EPA dated October 10, 1980 the Utility Solid Waste Activities Group (USWAG) suggested interpretive language that EPA should adopt regarding the amendments to the Solid Waste Disposal Act Amendments of 1980 which address fossil fuel combustion wastes. EPA replied to USWAG by letter dated January 13, 1981 (known as the 1981 Dietrich letter), and addressed, among other issues, other associated wastes generated in conjunction with the burning of fossil fuels.[229] EPA stated that ''We believe it is appropriate, in the light of Congressional intent, to interpret the § 261.4(b)(4) exclusion to include other wastes that are generated in conjunction with the burning of fossil fuels and mixed with and co-disposed or co-treated with fly ash, bottom ash, boiler slag and flue gas emission control wastes.'' When amendments to the 1980 Solid Waste Disposal Act were introduced, Congressmen Bevill and Rahall stated, respectively:

> It is the sponsor's intention that this list of waste materials in the amendment be read broadly, to incorporate the waste products generated in the real world as a result of the combustion of fossil fuels. We do not believe that these terms should be narrowly read and thus impose regulatory burdens upon those who seek to assist the Nation by burning coal. EPA should recognize that these ''waste streams'' often include not only the

[229] See letter from Gary N. Dietrich to Paul Elmer, USWAG, available in the docket for this rule.

byproducts of the combustion of coal and other fossil fuels, but also relatively small proportions of other materials produced in conjunction with the combustion, even if not derived directly from these fuels. EPA should not regulate these waste streams because of the presence of these materials, if there is no evidence of any substantial environmental danger from these mixtures. *(126 Cong. Rec. H1102).*

In the real world, these waste materials do not include solely fly ash, bottom ash, slag, or scrubber sludge. Quite often, other materials are mixed with these large volume waste streams, with no environmentally harmful effects, and often with considerable benefit-as when, for example, boiler cleaning-acids are neutralized by being mixed with alkaline fly ash. These appear to me to be environmentally beneficial practices, which EPA should encourage. At the very least, however, the Agency should take no steps to discourage them until it has developed a full factual understanding of the situation. This amendment would assure that EPA allows all persons burning coal to avoid unnecessary regulation of the byproducts produced by that combustion, as those byproducts are currently being managed in the real world, by real people, with real sense. *(126 Cong. Rec. H1104).*

As such, EPA interpreted 40 CFR 261.4(b)(4) (the Bevill exemption) to mean that wastes produced in conjunction with the combustion of fossil fuels, which are necessarily associated with the production of energy, and which traditionally have been, and which actually are, mixed with and co-disposed or co-treated with fly ash, bottom ash, boiler slag, or flue gas emission control wastes from coal combustion are not hazardous wastes. In the Deitrich letter EPA stated that these other associated wastes include, but are not limited to the following wastes: (1) Boiler cleaning solutions; (2) boiler blowdown; (3) demineralizer regenerant; (4) pyrites; and (5) cooling tower blowdown.

In a February 1988 Report to Congress on Wastes from the Combustion of Coal by Electric Utility Power Plants EPA listed the following low-volume wastes commonly produced in conjunction with the burning of fossil fuels to produce electricity: (1) Boiler blowdown; (2) coal pile run-off; (3) cooling tower blowdown; (4) demineralizer regenerants and rinses; (5) metal and boiler cleaning wastes; (6) pyrites; and (7) sump effluents. Presented for each type of low-volume waste is a brief description of how the waste is generated, typical quantities produced, and the physical and chemical composition of the waste.[230] The source of this information was primarily an August 1981 USWAG/Edison Electric Institute report in response to a request for information in the 1981 Dietrich letter.

In an August 1, 1993 Regulatory Determination the Agency emphasized that co-management of low-volume wastes and large-volume wastes (fly ash, bottom ash, boiler slag, or flue gas emission control wastes from coal combustion) makes the combined waste stream a remaining waste that would be subject to a subsequent Regulatory Determination and provided the list below of management practices that result in combined waste streams that are remaining wastes.[231]

- Discharge of boiler blowdown to a large-volume waste impoundment,
- Discharge of demineralizer regenerant to a large-volume waste impoundment,
- Discharge of metal cleaning wastes to a large-volume waste impoundment,
- Discharge of boiler chemical cleaning wastes to a large-volume waste impoundment,
- Discharge of plant wastewater treatment effluent to a large-volume waste impoundment,
- Discharge of coal mill rejects to a large-volume waste impoundment,
- Disposal of oil ash in a large-volume waste landfill or impoundment,
- Disposal of plant wastewater treatment sludge in a large-volume waste landfill.

In a 1999 Report to Congress on wastes from the combustion of fossil fuels[232] EPA stated that low-volume wastes are generated as a result of supporting processes that are ancillary to, but a necessary part of, the combustion and power generation processes and provided the following list of low-volume wastes.

- Coal pile run-off
- Coal mill rejects/pyrites
- Boiler blowdown
- Cooling tower blowdown and sludge
- Water treatment sludge
- Regeneration waste streams
- Air heater and precipitator washwater
- Boiler chemical cleaning waste
- Floor and yard drains and sumps
- Laboratory wastes
- Wastewater treatment sludge

The concept of uniquely associated wastes with respect to CCR was first introduced in the May 22, 2000 Regulatory Determination. Prior to this, these wastes were referred to as other wastes, remaining wastes, or low-volume wastes, that are generated in conjunction with the burning of fossil fuels and mixed with and co-disposed or co-treated with fly ash, bottom ash, boiler slag and flue gas emission control wastes. For the May 22, 2000 Regulatory Determination, the Agency proposed the uniquely associated wastes concept with the intent of being consistent with other wastes covered under the Bevill Amendment (a.k.a., the Bevill exemption), such as mining and mineral processing wastes that the Agency refers to as uniquely associated wastes, and under the Bentsen Amendment for oil and gas exploration and production wastes which are referred to as associated wastes. The Agency recognized that determining whether a particular waste is uniquely associated with fossil fuel combustion involves an evaluation of the specific facts of each case. In the Agency's view, the following qualitative criteria should be used to make such determinations on a case-by-case basis:

(1) Wastes from ancillary operations are not ''uniquely associated'' because they are not properly viewed as being ''from'' fossil fuel combustion.

(2) In evaluating a waste from non-ancillary operations, one must consider the extent to which the waste originates or derives from the fossil fuels, the combustion process, or combustion residuals, and the extent to which these operations impart chemical characteristics to the waste.

EPA proposed the following list of wastes that the Agency considered to be uniquely associated wastes (*i.e.,* uniquely associated with the combustion of coal for the generation of electricity at electric utilizes and independent power producers and, therefore, covered by the Bevill exemption).

- Coal Pile Run-off
- Coal Mill Rejects and Waste Coal
- Air Heater and Precipitator Washes
- Floor and Yard Drains and Sumps
- Wastewater Treatment Sludges
- Boiler Fireside Chemical Cleaning Wastes

EPA also proposed the following list of wastes that would not be considered uniquely associated wastes.

- Boiler Blowdown
- Cooling Tower Blowdown and Sludges
- Intake or Makeup Water Treatment and Regeneration Wastes
- Boiler Waterside Cleaning Wastes
- Laboratory Wastes
- General Construction and Demolition Debris

[230] See *http://www.epa.gov/osw/nonhaz/industrial/special/fossil/coal-rtc.pdf,* pages 3–41 to 3–62. This report addressed wastes generated from the combustion of coal by electric utility power plants, and did not address comanaged utility coal combustion wastes, other fossil fuel combustion wastes, and wastes from non-utility boilers.

[231] *http://www.epa.gov/osw/nonhaz/industrial/special/mineral/080993.pdf.*

[232] *http://www.epa.gov/osw/nonhaz/industrial/special/fossil/volume_2.pdf.*

• General Maintenance Wastes

EPA requested comments on these proposed lists and received several comments from states, industry, and the environmental community. Industry opposed the ''uniquely associated'' waste framework, and favors retaining the 1981''Dietrich Policy.''

Many commenters argued that the Dietrich policy has provided clear guidance on the scope of the Bevill exemption for the past 20 years, and that appropriate waste management practices have been implemented for these wastes. The Dietrich Policy has proven itself effective in furthering congressional intent to recognize certain historic co-management practices provided they are not environmentally harmful. The Association of State and Territorial Solid Waste Management Officials recommended that EPA contact States that have management programs for fossil fuel combustion wastes to determine how to best manage the waste that are uniquely associated or not uniquely associated with fossil fuel combustion wastes. The Hoosier Environmental Council opposed exempting coal wastes and stated that ''coal mill rejects and coal pile run-off would not be uniquely associated wastes . . . because neither of these wastes is derived from coal combustion.''

EPA acknowledges that the Deitrich letter has been longstanding policy with regard to CCR uniquely associated wastes and that the Agency has not sought input from States on the issue. Moreover, as evident from the Congressional Record, the Congressional intent was to ''include not only the byproducts of the combustion of coal and other fossil fuels, but also relatively small proportions of other materials produced in conjunction with the combustion, even if not derived directly from these fuels.'' These other materials would include many of those listed in the Dietrich letter as well as many of those listed in the May 2000 Regulatory determination.

After considering the 1981 Dietrich letter, a copy of which is included in the docket for this rule, the proposed guidance in the May 2000 Regulatory Determination, comments received on the May 2000 Regulatory Determination and the July 2010 proposed rule, EPA has concluded that the 1981 Dietrich letter accurately reflects the intent of Congress when they exempted CCR from hazardous waste regulations. EPA also believes that many of the wastes listed as uniquely associated wastes in the May 22, 2000 Regulatory Determination are also consistent with the Congressional intent. Therefore, the Agency is finalizing the following list of uniquely associated wastes that includes materials from both the Dietrich letter and the May 2000 Regulatory Determination.

• Coal pile run-off
• Boiler cleaning solutions
• Boiler blowdown
• Process water treatment and demineralizer regeneration wastes
• Cooling tower blowdown
• Air heater and precipitator washes
• Effluents from floor and yard drains and sumps, and
• Wastewater treatment sludges

This list is being codified in 40 CFR 261.4(b): Solid wastes which are not hazardous wastes.

XIV. Statutory and Executive Order Reviews

A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review

Under section 3(f)(1) of Executive Order 12866 (58 FR 51735, October 4, 1993), this action is an ''economically significant regulatory action'' because it is likely to have an annual effect on the economy of $100 million or more. The total annual cost of this final rule is estimated to be $509 million a year using a 7% discount rate. Accordingly, EPA submitted this action to the Office of Management and Budget (OMB) for review under Executive Orders 12866 and 13563 (76 FR 3821, January 21, 2011) and any changes made in response to OMB recommendations have been documented in the docket for this action.

In addition, EPA prepared an analysis of the potential costs and benefits associated with this action. The Regulatory Impact Analysis (RIA) estimated the costs and benefits for this action. The RIA estimated 12 regulatory costs: (1) Groundwater monitoring; (2) bottom liner installation; (3) leachate collection system installation and management; (4) fugitive dust controls; (5) rain and surface water run-on/run-off controls; (6) disposal unit location restrictions (including water tables, floodplains, wetlands, fault areas, seismic zones, and karst terrain); (7) closure capping to cover units; (8) post-closure groundwater monitoring requirements; and (9) impoundment structural integrity requirements; (10) corrective actions (CCR contaminated groundwater cleanup); (11) paperwork reporting/recordkeeping; and (12) impoundment closures and conversion to dry handling. Using a 7% discount rate, the annualized costs are estimated at $509 million, and using a 3% discount rate, annualized costs are estimated to be $735 million. Using a 7% discount rate, the total present value costs are estimated at $7.3 billion, and using a 3% discount rate the present value of estimated costs is $23.2 billion.

The RIA estimated 11 monetized benefits: (1) CCR impoundment release prevention; (2) CCR landfill & impoundment groundwater contamination prevention; (3) induced increase in CCR beneficial uses (*e.g.,* concrete, wallboard); (4) reduced incidence of cancer from CCR exposure; (5) avoided IQ losses from mercury; (6) avoided IQ losses from lead; (7) reduced need for specialized education; (8) non-market surface water quality benefits; (9) protection of threatened & endangered species near CCR impoundments; (10) improved air quality from induced changes to power plant emissions and (11) reduced power plant groundwater withdrawals. The annualized monetized benefits are estimated at $294 million (@ 3% discount rate) and $236 million (@ 7% discount rate). The total present value monetized benefits are estimated at $8.7 billion (@ 3% discount rate) and $3.4 billion (@ 7% discount rate).

B. Paperwork Reduction Act (PRA)

The information collection activities in this rule will be submitted for approval to the Office of Management and Budget (OMB) under the PRA. The Information Collection Request (ICR) document that the EPA prepared has been assigned EPA ICR number 1189.25, OMB control number 2050–0053. You can find a copy of the ICR in the docket for this rule, which will be available in the docket once the ICR has been submitted to OMB for review, and it is briefly summarized here. The information collection requirements are not enforceable until OMB approves them.

These regulations, promulgated under subtitle D of RCRA, constitute national minimum criteria with which facilities must comply without oversight or intervention by a federal or state authority. To address concerns about the absence of regulatory oversight under a subtitle D regulation, EPA has developed a combination of mechanisms, including recordkeeping, notification, and maintaining a publicly accessible Internet site. The increased transparency resulting from these requirements will minimize the potential for owners or operators to abuse the self-implementing system established in this rule. In addition, these requirements provide interested parties the information necessary to determine whether the owner or operator is operating in compliance with the requirements of the rule and thus will facilitate enforcement by States and private citizens. EPA has consolidated the recordkeeping, notification, and Internet posting requirements into a single section of the regulations in an effort to make these requirements easier to follow. It is important to note that EPA will not be collecting any information under this rule—instead, facilities must keep records, notify the state, and post information on a publicly available Web site. EPA has taken steps to minimize the burden to the regulated community while at the same time achieving the transparency needed to ensure proper implementation of this rule. In addition to the burden to owner and operators of CCR landfills, in an effort to ease implementation, EPA has reporting and recordkeeping requirements for certain beneficial uses and states. For beneficial use that meets the fourth criteria, the user must maintain records and provide documentation upon request. For states, states are encouraged to voluntarily adopt at least the federal minimum criteria through the revision of SWMPs. In addition, EPA estimated the burden on state government agencies associated with the receipt of various notification requirements in the rule.

The respondents/affected entities are the owners/operators of electric utilities and independent power producers that fall within the NAICS code 221112. Specifically, these regulations apply to owners and operators of new and existing landfills and new and existing surface impoundments, including lateral expansions that of all landfills and surface impoundments that dispose or otherwise engage in solid waste management of CCR generated from the combustion of coal at electric utilities. The rule also applies to CCR units located off-site of the electric utilities' or independent power producers' facilities that receive CCR for disposal. The rule applies to certain inactive CCR surface impoundments at active electric utilities' or independent power producers' facilities, if the CCR unit still contains CCR and liquids. Finally, the rule applies to certain beneficial users of CCR. The rule may also impact States that choose to revise their SWMPs.

Respondents are obligated to keep records, make the required notifications, and maintain the publicly available Internet site. These requirements are part of the minimum federal criteria under 40 CFR part 257 and promulgated under the authority of sections 1006(b), 1008(a), 2002(a), 3001, 4004, and 4005(a) 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 (HAS), 42 U.S.C. 6906(b), 6907(a), 6912(a), 6944, and 6945(a).

Respondents/affected entities: EPA estimates the total number of respondents to be 486. This number represents the estimated number of coal-fired electric utility plants that will be affected by the rule.

Respondent's obligation to respond: The recordkeeping, notification, and posting are part of the minimum national criteria being promulgated under Sections 1008, 4004, and 4005(a) of RCRA.

Estimated number of respondents: 486.

Frequency of response: The frequency of response varies.

Total estimated burden: EPA estimates the total annual burden to respondents to be approximately 358,957 hours with a three year total estimated burden of 1,076,871 hours. Burden is defined at 5 CFR 1320.3(b).

Total estimated cost: The total estimated annual cost is approximately $64,007,121; this is composed of approximately $22,894,608 in annualized labor costs and $41,112,513 in annualized capital or operation and maintenance costs. The three year total estimated costs are $192,021,364 composed of $68,683,824 in labor costs and $123,337,540 in operations and maintenance.

In addition, developing a state SWMP (see Unit IX of this preamble) is not a requirement under this rule, however, EPA is encouraging states to develop these plans and has developed a burden estimate associated with this activity. The estimate for this one-time activity has been annualized over the three-year period covered by the ICR. The total estimated annual burden (for the 47 states and Puerto Rico where CCR are generated) is approximately 10,880 hours, and approximately $429,414 in annualized labor costs; this estimate assumes no annualized capital or operations and maintenance costs.

An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for the EPA's regulations in 40 CFR are listed in 40 CFR part 9. When OMB approves this ICR, the Agency will announce that approval in the **Federal Register** and publish a technical amendment to 40 CFR part 9 to display the OMB control number for the approved information collection activities contained in this final rule.

C. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities (SISNOSE). Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of this rule on small entities, small entity is defined as: (1) A small business, based on the U.S. Small Business size standard for NAICS code 221112 (fossil fuel electric utility plants), with fewer than 750 employees; (2) a small government jurisdiction, based on the RFA/SBREFA's definition (5 U.S. Code section 601(5)), is the government of a city, county, town, township, village, school district, or special district with population under 50,000; (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

After considering the economic impacts of this final rule on small entities, I certify that this action will not have a significant economic impact on a substantial number of small entities.

The small entities directly regulated by this final rule consist of one small county, 31 small cities, 32 small companies, and 13 small cooperative owner entities that own at least one coal-burning power plant. There are 91 coal-burning power plants that are owned by the 77 small owner entities. Those plants fall into the following categories: One small county plant, 31 small city plants, 42 plants owned by small companies, and 17 small cooperative plants.

The RIA estimated CCR compliance costs as a percentage of revenues for each entity and found that for almost all small entities affected by the rule the estimated annualized costs were less than 1% of revenues.

Although this final rule will not have a significant economic impact on a substantial number of small entities, EPA nonetheless has tried to reduce the impact of this rule on small entities.

D. Unfunded Mandates Reform Act (UMRA)

Title II of the Unfunded Mandates Reform Act of 1995 (UMRA), 2 U.S.C. 1531–1538, requires Federal agencies, unless otherwise prohibited by law, to assess the effects of their regulatory actions on state, local, and tribal governments and the private sector. This rule contains a federal mandate that may result in expenditures of $100 million or more for state, local, and tribal governments, in the aggregate, or the private sector in any one year. Accordingly, EPA has prepared under section 202 of the UMRA a written statement which is summarized below.

The RIA estimates the rule may affect 414 coal-fired electric utility plants, and may have a nationwide average annualized cost of approximately $509 million per year (at a 7% discount rate). Of this amount, average annualized costs to State/local governments total $36 million, and the average annualized cost to the private sector totals approximately $436 million per year (the remainder of the total costs are the costs associated with compliance at federally-owned electric utility plants.)

Consistent with the intergovernmental consultation provisions of section 204 of the UMRA, EPA initiated pre-proposal consultations with governmental entities affected by this rule. In developing the regulatory options for the CCR rule, EPA consulted with small governments according to EPA's UMRA interim small government consultation plan developed pursuant to section 203 of UMRA. EPA's interim plan provides for two types of possible small government input: Technical input and administrative input. According to this plan, and consistent with section 204 of UMRA, early in EPA's 2009 process for developing the CCR rule, EPA implemented a small government consultation process consisting of two consultation components: (1) A series of meetings in 2009 for purposes of acquiring technical input from State government officials, and (2) letters to 10 organizations representing elected State and local government officials to inform and seek input for the rule's development, as well as to invite them to a meeting held September 16, 2009 in Washington DC to provide input on the rule. Following are the meetings held with state officials in 2009: (1) February 27 with the Association of State and Territorial Solid Waste Management Officials (ASTSWMO) Coal Ash Workgroup (Washington DC), (2) March 22–24 with the Environmental Council of States (ECOS) Spring Meeting (Alexandria VA), (3) April 15–16 with the ASTSWMO Mid-Year Meeting (Columbus OH), (4) May 12–13 with the EPA Region IV State Directors Meeting (Atlanta, GA), (5) June 17–18 with the ASTSWMO Solid Waste Managers Conference (New Orleans, LA), (6) July 21–23 with the ASTSWMO Board of Directors Meeting (Seattle, WA), and (7) August 12 with the ASTSWMO Hazardous Waste Subcommittee Meeting (Washington DC). ASTSWMO is an organization with a mission to work closely with the EPA to ensure that its state government members are aware of the most current developments related to state waste management programs. ECOS is a national non-profit, non-partisan association of state and territorial environmental agency leaders. As a result of these meetings EPA received letters in mid-2009 from 22 state governments as well as a letter from ASTSWMO expressing their stance on CCR regulatory options.

On August 24, 2009 letters were mailed to the following 10 organizations, which include representation from small government elected officials, to inform and seek input for the rule development, as well as to invite them to a meeting held September 16, 2009 in Washington DC: (1) National Governors Association, (2) National Conference of State Legislatures, (3) Council of State Governments, (4) National League of Cities, (5) U.S. Conference of Mayors, (6) County Executives of America, (7) National Association of Counties, (8) International City/County Management Association, (9) National Association of Towns and Townships, and (10) Environmental Council of the States. These 10 organizations representing State and local government officials are identified in EPA's November 2008 Federalism guidance as the ''Big 10'' organizations appropriate to contact for purpose of consultation with small government elected officials.

Consistent with section 205, EPA identified and considered a reasonable number of regulatory alternatives in the June 2010 proposed rule, and is adopting the least-costly approach (*i.e.* a modified version of the ''D Prime'' least costly approach presented in the 2010 proposed CCR rule).

This rule is not subject to the requirements of section 203 of UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments. The threshold amount established for determining whether regulatory requirements could significantly affect small governments is $100 million annually. The RIA estimates a $1.2 million annual cost for state/local government implementation of the rule and $36 million in annual direct compliance costs on 57 state or local governments. These estimates are well below the $100 million annual threshold established under UMRA. However this rule does have over a $100 million dollar impact on industry. EPA selected one of the lower industry cost options for the final rule by selecting a RCRA subtitle D rule instead of a RCRA subtitle C rule.

E. Executive Order 13132—Federalism

The EPA has concluded that this action may have federalism implications because it imposes substantial direct compliance costs on state or local governments, and the Federal government will not provide the funds necessary to pay those costs. Based on the estimates in EPA's RIA for this action, the final rule, if promulgated, may impose a $1.2 million annual cost for state/local government implementation of the rule and $36 million in annual direct compliance costs on 57 state or local governments. This amount exceeds the $25 million per year ''substantial compliance cost'' threshold defined in section 1.2(A) (1) of EPA's November 2008 ''Guidance on Executive Order 13132: Federalism.'' There are 57 State and local governments which own 68 coal-burning power plants or 16% of the 414 electric utility plants expected to be affected by this rule. These 57 local governments consist of 7 state governments, 31 small municipality governments, 18 non-small municipal governments and 1 (small) county government owner.

The EPA provides the following federalism summary impact statement. The EPA consulted with state and local officials early in the process of developing the proposed action to permit them to have meaningful and timely input into its development. In developing the regulatory options described in this final action, EPA consulted with 10 national organizations representing state and local elected officials to ensure meaningful and timely input by state/local governments, consisting of two consultation components. This consultation is described and summarized in the UMRA section above.

In the spirit of Executive Order 13132, and consistent with EPA policy to promote communications between EPA and state and local governments, EPA specifically solicited comment on the proposed action from state and local officials. EPA received comments from over two hundred (200) entities representing state and local governments. The comments submitted primarily addressed the issue presented in the proposal of which approach to regulating CCR was appropriate—a regulation under subtitle C or under subtitle D of RCRA. The state and local government commenters overwhelming voiced their opposition to a regulation under subtitle C, citing impacts to state programs if EPA were to bring such a large number of facilities and a large volume of waste into the subtitle C universe. State governments were very concerned with the resources which would be required to issue subtitle C permits to these facilities and to develop and obtain EPA approval of revisions to their authorized RCRA subtitle C programs. They also expressed concerns about the limits in the existing hazardous waste disposal capacity in the United States to absorb such a large volume of new wastes, also citing the financial burden and potential liability problems for cities and towns that operate landfills or use landfills to dispose of waste that might include coal ash.

In addition, states and local governments expressed concern that a subtitle C rule would have a negative effect on beneficial use of CCR and on state beneficial use programs. State and local governments fully supported continued beneficial use of CCR and continuation of the Bevill exemption for CCR beneficial use. They requested that EPA establish standards to ensure that beneficial uses are protective of human health and the environment and ensure consistency in management of these materials throughout the country. They specifically cited the use of CCR in cement and concrete applications, highway construction projects and wallboard manufacture (among other uses) and the impacts to municipalities through increased costs and potential job loss if CCR is classified as a hazardous waste. They also noted an expectation that utility rates would rise as a result of CCR being disposed of in landfills rather than being used for beneficial purposes, due to limited availability of commercial hazardous waste disposal facilities and costs of transporting high volumes of CCR to these facilities. State Departments of Transportation expressed particular concern that a subtitle C rule would negatively affect the use of CCR in road bed. Commenters further supported continued beneficial use of CCR to reduce the need for mining for substitute products in cement and concrete. Finally, should CCR be classified as a hazardous waste, they indicated the need for EPA to clarify that products made using CCR are new products and not considered hazardous wastes, and may be treated in the same manner as similar products made without CCR.

Since EPA is promulgating this regulation under subtitle D, the concerns over the potential effect of a subtitle C regulation on beneficial use are moot. Moreover in this final rule, EPA has established a definition for beneficial use which we believe makes clear the distinction between beneficial use and disposal. This is fully discussed in Unit VI of this document.

While States supported a rule under subtitle D, they also voiced concern about the need for flexibility to address site-specific situations, as would be available under a state permitting program, and concern about potential inconsistencies between the new federal requirements and existing State programs. States suggested that regulation under subtitle D should embrace the existing state permitting programs—allowing state permitting programs as the foundation for regulating CCR disposal—and requested financial incentives to implement federal criteria through state solid waste programs. They also emphasized the need to allow time for states to make necessary changes in existing state rules and statutes to incorporate federal criteria. A few expressed the desire that financial assurance for closure, post closure care, and corrective action should be included in the final rule as a mechanism to ensure that funds will be provided by owners and operators to carry out these activities.

As fully explained earlier in this document, EPA is promulgating this rule under subtitle D of RCRA. As such, these regulations constitute the minimum federal requirements which apply to CCR units. States are not required to adopt these regulations or to revise their state programs to incorporate the new federal requirements. As fully discussed in Unit V of this document, ''Development of the RCRA Subtitle D Regulatory Approach,'' sections 1008(a), 4004, and 4005(a) of RCRA (*i.e.,* subtitle D) does not provide EPA with the ability to require states to issue permits, to approve state programs to operate in lieu of the federal program, or to enforce any of the requirements addressing the disposal of CCR. Consequently EPA designed the final rule to ensure protection of public health and the environment within these limitations. In addition, to help address potential implementation challenges that this statutory and resulting regulatory structure impose, as fully set out in Section IX of this document, EPA is encouraging states to revise their Solid Waste Management Plans and to submit these to EPA for approval.

A complete list of the comments from state and local governments has been provided to the Office of Management and Budget and has been placed in the docket for this rulemaking. In addition, the detailed response to comments from these entities is contained in EPA's response to comments document on this rulemaking.

As required by section 8(a) of Executive Order 13132, EPA included a certification from its Federalism Official stating that EPA had met the Executive Order's requirements in a meaningful and timely manner when it sent the draft of this final action to OMB for review pursuant to Executive Order 12866. A copy of this certification is included in the public version of the official record for this final action.

F. Executive Order 13175—Consultation and Coordination With Indian Tribal Governments

Subject to the Executive Order 13175 (65 FR 67249, November 9, 2000) EPA may not issue a regulation that has tribal implications, that imposes substantial direct compliance costs, and that is not required by statute, unless the Federal government provides the funds necessary to pay the direct compliance costs incurred by tribal governments, or EPA consults with tribal officials early in the process of developing the proposed regulation and develops a tribal summary impact statement.

EPA has concluded that this action may have tribal implications. However, it will neither impose substantial direct compliance costs on tribal governments, nor preempt Tribal law. As identified in EPA's Regulatory Impact Analysis for this action, there are no known tribal owner entities of the coal-fired electric utility plants affected by this action. Although there are three of the 414 coal-fired electric utility plants (in operation as of 2012) which are located on tribal lands, they are not owned by tribal governments. These are: (1) Navajo Generating Station in Coconino County, owned by the Arizona Salt River Project; (2) Bonanza Power Plant in Uintah County, Utah, owned by the Deseret Generation and Transmission Cooperative; and (3) Four Corners Power Plant in San Juan County, New Mexico owned by the Arizona Public Service Company. The Navajo Generating Station and the Four Corners Power Plant are on lands belonging to the Navajo Nation, while the Bonanza Power Plant is located on the Uintah and Ouray Reservation of the Ute Indian Tribe.

EPA consulted with tribal officials early in the process of developing this regulation to permit them to have meaningful and timely input into its development.

G. Executive Order 13045: Protection of Children From Environmental Health Risks and Safety Risks

This action is subject to E.O. 13045 (62 FR 19885, April 23, 1997) because it is an economically significant regulatory action as defined by E.O. 12866, and EPA believes that the environmental health or safety risks addressed by this action may have a disproportionate effect on children. Accordingly, we have evaluated the environmental health or safety effects of Coal Combustion Residual constituents of potential concern on children. The results of this evaluation are contained in the *Human and Ecological Risk Assessment of Coal Combustion Wastes* available in the docket for this action.

As ordered by E.O. 13045 Section 1–101(a), EPA identified and assessed environmental health risks and safety risks that may disproportionately affect children in the revised risk assessment. Pursuant to U.S. EPA's Guidance on Selecting Age Groups for Monitoring and Assessing Childhood Exposures to Environmental Contaminants, children are divided into seven distinct age cohorts: 1 to <2 yr, 2 to <3 yr, 3 to <6 yr 6 to <11 yr, 11 to <16 yr, 16 to <21 yr, and infants (<1 yr). Using exposure factors for each of these cohorts, EPA calculated cancer and non-cancer risk results in both the screening and probabilistic phases of the assessment. In general, risks to infants tended to be higher than other childhood cohorts, and also higher than risks to adults. However, for drinking water cancer risks, the longer exposures for adults led to the highest risks. Screening risks exceeded EPA's human health criteria for children exposed to contaminated air, soil, and food resulting from fugitive dust emissions and run-off. Similarly, 90th percentile child cancer and non-cancer risks exceeded the human health criteria for the groundwater to drinking water pathway under the full probabilistic analysis (Table 5–17 in the *Human and Ecological Risk Assessment of Coal Combustion Wastes*). As ordered by E.O. 13045 Section 101(b) EPA has ensured that the standard addresses disproportionate risks to children that result from environmental health risks. The results of the screening assessment finds that risks fell below the criteria when wetting and run-on/runoff controls required by the rule are considered. Under the full probabilistic analysis, composite liners required by the rule for new waste management units showed the ability to reduce the 90th percentile child cancer and non-cancer risks for the groundwater to drinking water pathway to well below EPA's criteria. Additionally, the groundwater monitoring and corrective action required by the rule will reduce risks from current waste management units. Thus, EPA believes that this rule will be protective of children's health.

In general, because the pollution control requirements under the CCR rule will reduce health and environmental exposure risks at all coal-fired electric utility plants, the CCR rule is not expected to create additional or new risks to children.

H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

Executive Order 13211 (66 FR 28355 (May 22, 2001)) requires EPA to prepare and submit a Statement of Energy Effects to the Administrator of the Office of Information and Regulatory Affairs, Office of Management and Budget (OMB), for actions identified as ''significant energy actions.'' This action, which is a significant regulatory action under Executive Order 12866, is not likely to have a significant adverse effect on the supply, distribution, or use of energy based on the results of the electricity price impact estimates of the Regulatory Impact Analysis (RIA) for this action. We have prepared a Statement of Energy Effects for this action.

According to Executive Order 13211, the statement should address (i) any adverse effects on energy supply, distribution, or use, (including a shortfall in supply, price increases, and increased use of foreign supplies) should the proposal be implemented, and (ii) reasonable alternatives to the action with adverse energy effects and the expected effects of such alternatives on energy supply, distribution, and use.

The potential impact of the final CCR rule on electricity prices is analyzed relative to the ''in excess of one percent'' threshold which is one of nine alternative numerical indicators established by OMB for defining ''significant adverse effect'' under Executive Order 13211.[233] The integrated planning model (IPM) estimates potential increases in wholesale electricity prices for 22 National Energy Modeling System (NEMS) regions. In addition, the analysis focuses on potential changes in electricity prices in 2020, 2025, and 2030. The analysis focuses on these relatively early year in the analytic time horizon examined in the RIA to minimize uncertainty in the estimated electricity price impacts. In addition, under the provisions of the rule, the year 2018 is when impoundments begin to undergo closure or wet/dry conversion if they are found to be leaking. Therefore, 2020, 2025, and 2030 represent high-cost year relative to other years in the analytic time horizon, and the analysis presented here will likely yield conservative estimates of the rule's impact on electricity prices.

Using IPM, the weighted average nationwide potential increase in the wholesale price of electricity is not expected to exceed one percent (between .18% and 0.19% in the years 2020 through 2030). However, for one of the 22 NEMS regions (AZNM), the RIA projects a potential price increase above one percent (between 0.78% and 1.05% in the years 2020 through 2030).

Finally, any retail electricity price increases, if they occur, would have the effect of offsetting a portion of the compliance costs to electric utilities estimated in the RIA, as the utilities would be recovering costs through price increases to customers. Therefore, these impacts are not additive to total rule costs, but would instead offset costs to utilities estimated in the RIA.

Only one region may slightly exceed a one percent electricity price increase, which the RIA estimated without considering the potential reduction in such impact with the compliance deadline flexibility of this action for CCR surface impoundments. Thus all regions are likely to experience less than one percent electricity price impacts of this action. Therefore, this statement does not address reasonable alternatives to the action because EPA does not expect this action to have adverse energy effects as defined by OMB.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 (''NTTAA''), Public Law 104–113, 12(d) (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (*e.g.,* materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. NTTAA directs EPA to provide Congress, through OMB, explanations when the Agency decides not to use

[233] OMB defines nine alternative numerical indicators of ''significant adverse effect'' on energy supply, distribution, or use in Section 4 of its ''Memorandum for Heads of Executive Departments and Agencies, and Independent Regulatory Agencies,'' M–01–27, July 13, 2001.

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available and applicable voluntary consensus standards.

This rulemaking involves technical standards. EPA has decided to use the following technical standards in this rule: (1) RCRA Subpart D, Section 257.70 liner design criteria for new CCR landfills and any lateral expansion of a CCR landfill includes voluntary consensus standards developed by ASTM International and EPA test methods such as SW–846, (2) Section 257.71 liner design criteria for existing CCR surface impoundments include voluntary consensus standards developed by ASTM International and EPA test methods such as SW–846, (3) Section 257.72 liner design criteria for new CCR surface impoundments and any lateral expansion of a CCR surface impoundment include voluntary consensus standards developed by ASTM International and EPA test methods such as SW–846, and (4) Section 257.73 structural stability standards for new and existing surface impoundments use the ASTM D 698 and 1557 standards for embankment compaction.

J. Executive Order 12898: Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order (E.O.) 12898 (59 FR 7629, Feb. 16, 1994) establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

EPA has determined that this final rule will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it increases the level of environmental protection for all affected populations without having any disproportionately high and adverse human health or environmental effects on any population, including any minority or low-income population.

EPA's risk assessment for this action did not separately evaluate either minority or low income populations. However, to evaluate the demographic characteristics of communities that may be affected by the CCR rule, the RIA compares the demographic characteristics of populations surrounding coal-fired electric utility plants with broader population data for two geographic areas: (1) One-mile radius from CCR management units (*i.e.,* landfills and impoundments) likely to be affected by groundwater releases from both landfills and impoundments; and (2) watershed catchment areas downstream of surface impoundments that receive surface water run-off and releases from CCR impoundments and are at risk of being contaminated from CCR impoundment discharges (*e.g.,* unintentional overflows, structural failures, and intentional periodic discharges).

For the population as a whole 24.8% belong to a minority group and 11.3% falls below the Federal Poverty Level. For the population living within one mile of plants with surface impoundments 16.1% belong to a minority group and 13.2% live below the Federal Poverty Level. These minority and low-income populations are not disproportionately high compared to the general population. The percentage of minority residents of the entire population living within the catchment areas downstream of surface impoundments is disproportionately high relative to the general population, *i.e.,* 28.7%, versus 24.8% for the national population. Also, the percentage of the population within the catchment areas of surface impoundments that is below the Federal Poverty Level is disproportionately high compared with the general population, *i.e.,* 18.6% versus 11.3% nationally.

Comparing the population percentages of minority and low income residents within one mile of landfills to those percentages in the general population, EPA found that minority and low-income residents make up a smaller percentage of the populations near landfills than they do in the general population, *i.e.,* minorities comprised 16.6% of the population near landfills versus 24.8% nationwide and low-income residents comprised 8.6% of the population near landfills versus 11.3% nationwide. In summary, although populations within the catchment areas of plants with surface impoundments appear to have disproportionately high percentages of minority and low-income residents relative to the nationwide average, populations surrounding plants with landfills do not. Because landfills are less likely than impoundments to experience surface water run-off and releases, catchment areas were not considered for landfills.

Because the CCR rule is risk-reducing, with reductions in risk occurring largely within the surface water catchment zones around, and groundwater beneath, coal-fired electric utility plants, the rule will not result in new disproportionate risks to minority or low-income populations.

K. Congressional Review Act

The Congressional Review Act, 5 U.S.C. 801 *et seq.,* as added by the Small Business Regulatory Enforcement Fairness Act of 1996, generally provides that before a rule may take effect, the agency promulgating the rule must submit a rule report, which includes a copy of the rule, to each House of the Congress and to the Comptroller General of the United States. EPA will submit a report containing this rule and other required information to the U.S. Senate, the U.S. House of Representatives, and the Comptroller General of the United States prior to publication of the rule in the **Federal Register**. A Major rule cannot take effect until 60 days after it is published in the **Federal Register**. This action is a ''major rule'' as defined by 5 U.S.C. 804(2). This rule will be effective 180 days after its publication in the **Federal Register**.

List of Subjects

40 CFR Part 257

Environmental protection, Beneficial use, Coal combustion products, Coal combustion residuals, Coal combustion waste, Disposal, Hazardous waste, Landfill, Surface impoundment.

40 CFR Part 261

Environmental protection, Hazardous waste, Recycling, Reporting and recordkeeping requirements.

Dated: December 19, 2014.

Gina McCarthy,

Administrator.

For the reasons set out in the preamble, title 40, chapter I, of the Code of Federal Regulations is amended as follows:

PART 257—CRITERIA FOR CLASSIFICATION OF SOLID WASTE DISPOSAL FACILITIES AND PRACTICES

■ 1. The authority citation for part 257 continues to read as follows:

Authority: 42 U.S.C. 6907(a)(3), 6912(a)(1), 6944(a); 33 U.S.C. 1345(d) and (e).

■ 2. Section 257.1 is amended by:

■ a. Adding a sentence at the end of paragraph (a) introductory text;

■ b. Revising paragraphs (a)(1) and (2); and

■ c. Adding paragraph (c)(12).

The revisions and additions read as follows:

§ 257.1 Scope and purpose.

(a) * * * Unless otherwise provided, the criteria in §§ 257.50 through 257.107 are adopted for determining which CCR landfills and CCR surface impoundments pose a reasonable probability of adverse effects on health or the environment under sections 1008(a)(3) and 4004(a) of the Act.

(1) Facilities failing to satisfy any of the criteria in §§ 257.1 through 257.4 or §§ 257.5 through 257.30 or §§ 257.50 through 257.107 are considered open dumps, which are prohibited under section 4005 of the Act.

(2) Practices failing to satisfy any of the criteria in §§ 257.1 through 257.4 or §§ 257.5 through 257.30 or §§ 257.50 through 257.107 constitute open dumping, which is prohibited under section 4005 of the Act.

* * * * *

(c) * * *

(12) Except as otherwise specifically provided in subpart D of this part, the criteria in subpart A of this part do not apply to CCR landfills, CCR surface impoundments, and lateral expansions of CCR units, as those terms are defined in subpart D of this part. Such units are instead subject to subpart D of this part.

■ 3. Section 257.2 is amended by adding in alphabetical order definitions for ''CCR landfill'' and ''CCR surface impoundment'' to read as follows:

§ 257.2 Definitions.

* * * * *

CCR landfill means an area of land or an excavation that receives CCR and which is not a surface impoundment, an underground injection well, a salt dome formation, a salt bed formation, an underground or surface coal mine, or a cave. For purposes of this subpart, a CCR landfill also includes sand and gravel pits and quarries that receive CCR, CCR piles, and any practice that does not meet the definition of a beneficial use of CCR.

CCR surface impoundment means a natural topographic depression, man-made excavation, or diked area, which is designed to hold an accumulation of CCR and liquids, and the unit treats, stores, or disposes of CCR.

* * * * *

■ 4. Part 257 is amended by:

■ a. Adding and reserving subpart C; and

■ b. Adding subpart D.

The additions read as follows:

Subpart C—[Reserved]

Subpart D—Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments

General Provisions

Sec.

Location Restrictions

Design Criteria

Operating Criteria

Groundwater Monitoring and Corrective Action

Closure and Post-Closure Care

Recordkeeping, Notification, and Posting of Information to the Internet

Subpart D—Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments

§ 257.50 Scope and purpose.

(a) This subpart establishes minimum national criteria for purposes of determining which solid waste disposal facilities and solid waste management practices do not pose a reasonable probability of adverse effects on health or the environment under sections 1008(a)(3) and 4004(a) of the Resource Conservation and Recovery Act.

(b) This subpart applies to owners and operators of new and existing landfills and surface impoundments, including any lateral expansions of such units that dispose or otherwise engage in solid waste management of CCR generated from the combustion of coal at electric utilities and independent power producers. Unless otherwise provided in this subpart, these requirements also apply to disposal units located off-site of the electric utility or independent power producer. This subpart also applies to any practice that does not meet the definition of a beneficial use of CCR.

(c) This subpart also applies to inactive CCR surface impoundments at active electric utilities or independent power producers, regardless of the fuel currently used at the facility to produce electricity.

(d) This subpart does not apply to CCR landfills that have ceased receiving CCR prior to October 19, 2015.

(e) This subpart does not apply to electric utilities or independent power producers that have ceased producing electricity prior to October 19, 2015.

(f) This subpart does not apply to wastes, including fly ash, bottom ash, boiler slag, and flue gas desulfurization materials generated at facilities that are not part of an electric utility or independent power producer, such as manufacturing facilities, universities, and hospitals. This subpart also does not apply to fly ash, bottom ash, boiler slag, and flue gas desulfurization materials, generated primarily from the combustion of fuels (including other fossil fuels) other than coal, for the purpose of generating electricity unless the fuel burned consists of more than fifty percent (50%) coal on a total heat input or mass input basis, whichever results in the greater mass feed rate of coal.

(g) This subpart does not apply to practices that meet the definition of a beneficial use of CCR.

(h) This subpart does not apply to CCR placement at active or abandoned underground or surface coal mines.

(i) This subpart does not apply to municipal solid waste landfills that receive CCR.

§ 257.51 Effective date of this subpart.

The requirements of this subpart take effect on October 19, 2015.

§ 257.52 Applicability of other regulations.

(a) Compliance with the requirements of this subpart does not affect the need for the owner or operator of a CCR landfill, CCR surface impoundment, or lateral expansion of a CCR unit to comply with all other applicable federal, state, tribal, or local laws or other requirements.

(b) Any CCR landfill, CCR surface impoundment, or lateral expansion of a CCR unit continues to be subject to the requirements in §§ 257.3–1, 257.3–2, and 257.3–3.

§ 257.53 Definitions.

The following definitions apply to this subpart. Terms not defined in this section have the meaning given by RCRA.

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

Active facility or *active electric utilities or independent power producers* means any facility subject to the requirements of this subpart that is in operation on October 14, 2015. An electric utility or independent power producer is in operation if it is generating electricity that is provided to electric power transmission systems or to electric power distribution systems on or after October 14, 2015. An off-site disposal facility is in operation if it is accepting or managing CCR on or after October 14, 2015.

Active life or *in operation* means the period of operation beginning with the initial placement of CCR in the CCR unit and ending at completion of closure activities in accordance with § 257.102.

Active portion means that part of the CCR unit that has received or is receiving CCR or non-CCR waste and that has not completed closure in accordance with § 257.102.

Aquifer means a geologic formation, group of formations, or portion of a formation capable of yielding usable quantities of groundwater to wells or springs.

Area-capacity curves means graphic curves which readily show the reservoir water surface area, in acres, at different elevations from the bottom of the reservoir to the maximum water surface, and the capacity or volume, in acre-feet, of the water contained in the reservoir at various elevations.

Areas susceptible to mass movement means those areas of influence (*i.e.,* areas characterized as having an active or substantial possibility of mass movement) where, because of natural or human-induced events, the movement of earthen material at, beneath, or adjacent to the CCR unit results in the downslope transport of soil and rock material by means of gravitational influence. Areas of mass movement include, but are not limited to, landslides, avalanches, debris slides and flows, soil fluctuation, block sliding, and rock fall.

Beneficial use of CCR means the CCR meet all of the following conditions:

(1) The CCR must provide a functional benefit;

(2) The CCR must substitute for the use of a virgin material, conserving natural resources that would otherwise need to be obtained through practices, such as extraction;

(3) The use of the CCR must meet relevant product specifications, regulatory standards or design standards when available, and when such standards are not available, the CCR is not used in excess quantities; and

(4) When unencapsulated use of CCR involving placement on the land of 12,400 tons or more in non-roadway applications, the user must demonstrate and keep records, and provide such documentation upon request, that environmental releases to groundwater, surface water, soil and air are comparable to or lower than those from analogous products made without CCR, or that environmental releases to groundwater, surface water, soil and air will be at or below relevant regulatory and health-based benchmarks for human and ecological receptors during use.

Closed means placement of CCR in a CCR unit has ceased, and the owner or operator has completed closure of the CCR unit in accordance with § 257.102 and has initiated post-closure care in accordance with § 257.104.

Coal combustion residuals (CCR) means fly ash, bottom ash, boiler slag, and flue gas desulfurization materials generated from burning coal for the purpose of generating electricity by electric utilities and independent power producers.

CCR fugitive dust means solid airborne particulate matter that contains or is derived from CCR, emitted from any source other than a stack or chimney.

CCR landfill or landfill means an area of land or an excavation that receives CCR and which is not a surface impoundment, an underground injection well, a salt dome formation, a salt bed formation, an underground or surface coal mine, or a cave. For purposes of this subpart, a CCR landfill also includes sand and gravel pits and quarries that receive CCR, CCR piles, and any practice that does not meet the definition of a beneficial use of CCR.

CCR pile or pile means any non-containerized accumulation of solid, non-flowing CCR that is placed on the land. CCR that is beneficially used off-site is not a CCR pile.

CCR surface impoundment or impoundment means a natural topographic depression, man-made excavation, or diked area, which is designed to hold an accumulation of CCR and liquids, and the unit treats, stores, or disposes of CCR.

CCR unit means any CCR landfill, CCR surface impoundment, or lateral expansion of a CCR unit, or a combination of more than one of these units, based on the context of the paragraph(s) in which it is used. This term includes both new and existing units, unless otherwise specified.

Dike means an embankment, berm, or ridge of either natural or man-made materials used to prevent the movement of liquids, sludges, solids, or other materials.

Displacement means the relative movement of any two sides of a fault measured in any direction.

Disposal means the discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid waste as defined in section 1004(27) of the Resource Conservation and Recovery Act into or on any land or water so that such solid waste, or constituent thereof, may enter the environment or be emitted into the air or discharged into any waters, including groundwaters. For purposes of this subpart, disposal does not include the storage or the beneficial use of CCR.

Downstream toe means the junction of the downstream slope or face of the CCR surface impoundment with the ground surface.

Encapsulated beneficial use means a beneficial use of CCR that binds the CCR into a solid matrix that minimizes its mobilization into the surrounding environment.

Existing CCR landfill means a CCR landfill that receives CCR both before and after October 14, 2015, or for which construction commenced prior to October 14, 2015 and receives CCR on or after October 14, 2015. 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 a continuous on-site, physical construction program had begun prior to October 14, 2015.

Existing CCR surface impoundment means a CCR surface impoundment that receives CCR both before and after October 14, 2015, or for which construction commenced prior to October 14, 2015 and receives CCR on or after October 14, 2015. 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 a continuous on-site, physical construction program had begun prior to October 14, 2015.

Facility means all contiguous land, and structures, other appurtenances, and improvements on the land, used for treating, storing, disposing, or otherwise conducting solid waste management of CCR. A facility may consist of several treatment, storage, or disposal operational units (*e.g.,* one or more landfills, surface impoundments, or combinations of them).

Factor of safety (Safety factor) means the ratio of the forces tending to resist the failure of a structure to the forces tending to cause such failure as determined by accepted engineering practice.

Fault means a fracture or a zone of fractures in any material along which strata on one side have been displaced with respect to that on the other side.

Flood hydrograph means a graph showing, for a given point on a stream, the discharge, height, or other characteristic of a flood as a function of time.

Freeboard means the vertical distance between the lowest point on the crest of the impoundment dike and the surface of the waste contained therein.

Free liquids means liquids that readily separate from the solid portion of a waste under ambient temperature and pressure.

Groundwater means water below the land surface in a zone of saturation.

Hazard potential classification means the possible adverse incremental consequences that result from the release of water or stored contents due to failure of the diked CCR surface impoundment or mis-operation of the diked CCR surface impoundment or its appurtenances. The hazardous potential classifications include high hazard potential CCR surface impoundment, significant hazard potential CCR surface impoundment, and low hazard potential CCR surface impoundment, which terms mean:

(1) *High hazard potential CCR surface impoundment* means a diked surface impoundment where failure or mis-operation will probably cause loss of human life.

(2) *Low hazard potential CCR surface impoundment* means a diked 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.

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

Height means the vertical measurement from the downstream toe of the CCR surface impoundment at its lowest point to the lowest elevation of the crest of the CCR surface impoundment.

Holocene means the most recent epoch of the Quaternary period, extending from the end of the Pleistocene Epoch, at 11,700 years before present, to present.

Hydraulic conductivity means the rate at which water can move through a permeable medium (*i.e.,* the coefficient of permeability).

Inactive CCR surface impoundment means a CCR surface impoundment that no longer receives CCR on or after October 14, 2015 and still contains both CCR and liquids on or after October 14, 2015.

Incised CCR surface impoundment means a CCR surface impoundment which is constructed by excavating entirely below the natural ground surface, holds an accumulation of CCR entirely below the adjacent natural ground surface, and does not consist of any constructed diked portion.

Indian country or *Indian lands* means:

(1) All land within the limits of any Indian reservation under the jurisdiction of the United States Government, notwithstanding the issuance of any patent, and including rights-of-way running throughout the reservation;

(2) All dependent Indian communities within the borders of the United States whether within the original or subsequently acquired territory thereof, and whether within or without the limits of the State; and

(3) All Indian allotments, the Indian titles to which have not been extinguished, including rights of way running through the same.

Indian Tribe or *Tribe* means any Indian tribe, band, nation, or community recognized by the Secretary of the Interior and exercising substantial governmental duties and powers on Indian lands.

Inflow design flood means the flood hydrograph that is used in the design or modification of the CCR surface impoundments and its appurtenant works.

In operation means the same as *active life.*

Karst terrain means an area where karst topography, with its characteristic erosional surface and subterranean features, is developed as the result of dissolution of limestone, dolomite, or other soluble rock. Characteristic physiographic features present in karst terranes include, but are not limited to, dolines, collapse shafts (sinkholes), sinking streams, caves, seeps, large springs, and blind valleys.

Lateral expansion means a horizontal expansion of the waste boundaries of an existing CCR landfill or existing CCR surface impoundment made after October 14, 2015.

Liquefaction factor of safety means the factor of safety (safety factor) determined using analysis under liquefaction conditions.

Lithified earth material means all rock, including all naturally occurring and naturally formed aggregates or masses of minerals or small particles of older rock that formed by crystallization of magma or by induration of loose sediments. This term does not include man-made materials, such as fill, concrete, and asphalt, or unconsolidated earth materials, soil, or regolith lying at or near the earth surface.

Maximum horizontal acceleration in lithified earth material means the maximum expected horizontal acceleration at the ground surface as depicted on a seismic hazard map, with a 98% or greater probability that the acceleration will not be exceeded in 50 years, or the maximum expected horizontal acceleration based on a site-specific seismic risk assessment.

New CCR landfill means a CCR landfill or lateral expansion of a CCR landfill that first receives CCR or commences construction after October 14, 2015. A new 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 a continuous on-site, physical construction program had begun after October 14, 2015. Overfills are also considered new CCR landfills.

New CCR surface impoundment means a CCR surface impoundment or lateral expansion of an existing or new CCR surface impoundment that first receives CCR or commences construction after October 14, 2015. A new 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 a continuous on-site, physical construction program had begun after October 14, 2015.

Operator means the person(s) responsible for the overall operation of a CCR unit.

Overfill means a new CCR landfill constructed over a closed CCR surface impoundment.

Owner means the person(s) who owns a CCR unit or part of a CCR unit.

Poor foundation conditions mean those areas where features exist which indicate that a natural or human-induced event may result in inadequate foundation support for the structural components of an existing or new CCR unit. For example, failure to maintain static and seismic factors of safety as required in §§ 257.73(e) and 257.74(e) would cause a poor foundation condition.

Probable maximum flood means the flood that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the drainage basin.

Qualified person means a person or persons trained to recognize specific appearances of structural weakness and other conditions which are disrupting or have the potential to disrupt the operation or safety of the CCR unit by visual observation and, if applicable, to monitor instrumentation.

Qualified professional engineer means an individual who is licensed by a state as a Professional Engineer to practice one or more disciplines of engineering and who is qualified by education, technical knowledge and experience to make the specific technical certifications required under this subpart. Professional engineers making these certifications must be currently licensed in the state where the CCR unit(s) is located.

Recognized and generally accepted good engineering practices means engineering maintenance or operation activities based on established codes, widely accepted standards, published technical reports, or a practice widely recommended throughout the industry. Such practices generally detail approved ways to perform specific engineering, inspection, or mechanical integrity activities.

Retrofit means to remove all CCR and contaminated soils and sediments from the CCR surface impoundment, and to ensure the unit complies with the requirements in § 257.72

Representative sample means a sample of a universe or whole (*e.g.,* waste pile, lagoon, and groundwater) which can be expected to exhibit the average properties of the universe or whole. See EPA publication SW–846, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, Chapter 9 (available at *http://www.epa.gov/epawaste/hazard/testmethods/sw846/online/index.htm*) for a discussion and examples of representative samples.

Run-off means any rainwater, leachate, or other liquid that drains over land from any part of a CCR landfill or lateral expansion of a CCR landfill.

Run-on means any rainwater, leachate, or other liquid that drains over land onto any part of a CCR landfill or lateral expansion of a CCR landfill.

Sand and gravel pit or quarry means an excavation for the extraction of aggregate, minerals or metals. The term sand and gravel pit and/or quarry does not include subsurface or surface coal mines.

Seismic factor of safety means the factor of safety (safety factor) determined using analysis under earthquake conditions using the peak ground acceleration for a seismic event with a 2% probability of exceedance in 50 years, equivalent to a return period of approximately 2,500 years, based on the U.S. Geological Survey (USGS) seismic hazard maps for seismic events with this return period for the region where the CCR surface impoundment is located.

Seismic impact zone means an area having a 2% or greater probability that the maximum expected horizontal acceleration, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10 g in 50 years.

Slope protection means engineered or non-engineered measures installed on the upstream or downstream slope of the CCR surface impoundment to protect the slope against wave action or erosion, including but not limited to rock riprap, wooden pile, or concrete revetments, vegetated wave berms, concrete facing, gabions, geotextiles, or fascines.

Solid waste management or management means the systematic administration of the activities which provide for the collection, source separation, storage, transportation, processing, treatment, or disposal of solid waste.

State means any of the fifty States in addition to the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands.

State Director means the chief administrative officer of the lead state agency responsible for implementing the state program regulating disposal in CCR landfills, CCR surface impoundments, and all lateral expansions of a CCR unit.

Static factor of safety means the factor of safety (safety factor) determined using analysis under the long-term, maximum storage pool loading condition, the maximum surcharge pool loading condition, and under the end-of-construction loading condition.

Structural components mean liners, leachate collection and removal systems, final covers, run-on and run-off systems, inflow design flood control systems, and any other component used in the construction and operation of the CCR unit that is necessary to ensure the integrity of the unit and that the contents of the unit are not released into the environment.

Unstable area means a location that is susceptible to natural or human-induced events or forces capable of impairing the integrity, including structural components of some or all of the CCR unit that are responsible for preventing releases from such unit. Unstable areas can include poor foundation conditions, areas susceptible to mass movements, and karst terrains.

Uppermost aquifer means the geologic formation nearest the natural ground surface that is an aquifer, as well as lower aquifers that are hydraulically interconnected with this aquifer within the facility's property boundary. Upper limit is measured at a point nearest to the natural ground surface to which the aquifer rises during the wet season.

Waste boundary means a vertical surface located at the hydraulically downgradient limit of the CCR unit. The vertical surface extends down into the uppermost aquifer.

Location Restrictions

§ 257.60 Placement above the uppermost aquifer.

(a) New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must be constructed with a base that is located no less than 1.52 meters (five feet) above the upper limit of the uppermost aquifer, or must demonstrate that there will not be an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuations in groundwater elevations (including the seasonal high water table). The owner or operator must demonstrate by the dates specified in paragraph (c) of this section that the CCR unit meets the minimum requirements for placement above the uppermost aquifer.

(b) The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating that the demonstration meets the requirements of paragraph (a) of this section.

(c) The owner or operator of the CCR unit must complete the demonstration required by paragraph (a) of this section by the date specified in either paragraph (c)(1) or (2) of this section.

(1) For an existing CCR surface impoundment, the owner or operator must complete the demonstration no later than October 17, 2018.

(2) For a new CCR landfill, new CCR surface impoundment, or any lateral expansion of a CCR unit, the owner or operator must complete the demonstration no later than the date of initial receipt of CCR in the CCR unit.

(3) The owner or operator has completed the demonstration required by paragraph (a) of this section when the demonstration is placed in the facility's operating record as required by § 257.105(e).

(4) An owner or operator of an existing CCR surface impoundment who fails to demonstrate compliance with the requirements of paragraph (a) of this section by the date specified in paragraph (c)(1) of this section is subject to the requirements of § 257.101(b)(1).

(5) An owner or operator of a new CCR landfill, new CCR surface impoundment, or any lateral expansion of a CCR unit who fails to make the demonstration showing compliance with the requirements of paragraph (a) of this section is prohibited from placing CCR in the CCR unit.

(d) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(e), the notification requirements specified in § 257.106(e), and the internet requirements specified in § 257.107(e).

§ 257.61 Wetlands.

(a) New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in wetlands, as defined in § 232.2 of this chapter, unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that the CCR unit meets the requirements of paragraphs (a)(1) through (5) of this section.

(1) Where applicable under section 404 of the Clean Water Act or applicable state wetlands laws, a clear and objective rebuttal of the presumption that an alternative to the CCR unit is reasonably available that does not involve wetlands.

(2) The construction and operation of the CCR unit will not cause or contribute to any of the following:

(i) A violation of any applicable state or federal water quality standard;

(ii) A violation of any applicable toxic effluent standard or prohibition under section 307 of the Clean Water Act;

(iii) Jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of a critical habitat, protected under the Endangered Species Act of 1973; and

(iv) A violation of any requirement under the Marine Protection, Research, and Sanctuaries Act of 1972 for the protection of a marine sanctuary.

(3) The CCR unit will not cause or contribute to significant degradation of wetlands by addressing all of the following factors:

(i) Erosion, stability, and migration potential of native wetland soils, muds and deposits used to support the CCR unit;

(ii) Erosion, stability, and migration potential of dredged and fill materials used to support the CCR unit;

(iii) The volume and chemical nature of the CCR;

(iv) Impacts on fish, wildlife, and other aquatic resources and their habitat from release of CCR;

(v) The potential effects of catastrophic release of CCR to the wetland and the resulting impacts on the environment; and

(vi) Any additional factors, as necessary, to demonstrate that ecological resources in the wetland are sufficiently protected.

(4) To the extent required under section 404 of the Clean Water Act or applicable state wetlands laws, steps have been taken to attempt to achieve no net loss of wetlands (as defined by acreage and function) by first avoiding impacts to wetlands to the maximum extent reasonable as required by paragraphs (a)(1) through (3) of this section, then minimizing unavoidable impacts to the maximum extent reasonable, and finally offsetting remaining unavoidable wetland impacts through all appropriate and reasonable compensatory mitigation actions (*e.g.,* restoration of existing degraded wetlands or creation of man-made wetlands); and

(5) Sufficient information is available to make a reasoned determination with respect to the demonstrations in paragraphs (a)(1) through (4) of this section.

(b) The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating that the demonstration meets the requirements of paragraph (a) of this section.

(c) The owner or operator of the CCR unit must complete the demonstrations required by paragraph (a) of this section by the date specified in either paragraph (c)(1) or (2) of this section.

(1) For an existing CCR surface impoundment, the owner or operator must complete the demonstration no later than October 17, 2018.

(2) For a new CCR landfill, new CCR surface impoundment, or any lateral expansion of a CCR unit, the owner or operator must complete the demonstration no later than the date of initial receipt of CCR in the CCR unit.

(3) The owner or operator has completed the demonstration required by paragraph (a) of this section when the demonstration is placed in the facility's operating record as required by § 257.105(e).

(4) An owner or operator of an existing CCR surface impoundment who fails to demonstrate compliance with the requirements of paragraph (a) of this section by the date specified in paragraph (c)(1) of this section is subject to the requirements of § 257.101(b)(1).

(5) An owner or operator of a new CCR landfill, new CCR surface impoundment, or any lateral expansion of a CCR unit who fails to make the demonstrations showing compliance with the requirements of paragraph (a) of this section is prohibited from placing CCR in the CCR unit.

(d) The owner or operator must comply with the recordkeeping requirements specified in § 257.105(e), the notification requirements specified in § 257.106(e), and the Internet requirements specified in § 257.107(e).

§ 257.62 Fault areas.

(a) New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located within 60 meters (200 feet) of the outermost damage zone of a fault that has had displacement in Holocene time unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that an alternative setback distance of less than 60 meters (200 feet) will prevent damage to the structural integrity of the CCR unit.

(b) The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating that the demonstration meets the requirements of paragraph (a) of this section.

(c) The owner or operator of the CCR unit must complete the demonstration required by paragraph (a) of this section by the date specified in either paragraph (c)(1) or (2) of this section.

(1) For an existing CCR surface impoundment, the owner or operator must complete the demonstration no later than October 17, 2018.

(2) For a new CCR landfill, new CCR surface impoundment, or any lateral expansion of a CCR unit, the owner or operator must complete the demonstration no later than the date of initial receipt of CCR in the CCR unit.

(3) The owner or operator has completed the demonstration required by paragraph (a) of this section when the demonstration is placed in the facility's operating record as required by § 257.105(e).

(4) An owner or operator of an existing CCR surface impoundment who fails to demonstrate compliance with the requirements of paragraph (a) of this section by the date specified in paragraph (c)(1) of this section is subject to the requirements of § 257.101(b)(1).

(5) An owner or operator of a new CCR landfill, new CCR surface impoundment, or any lateral expansion of a CCR unit who fails to make the demonstration showing compliance with the requirements of paragraph (a) of this section is prohibited from placing CCR in the CCR unit.

(d) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(e), the notification requirements specified in § 257.106(e), and the Internet requirements specified in § 257.107(e).

§ 257.63 Seismic impact zones.

(a) New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in seismic impact zones unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that all structural components including liners, leachate collection and removal systems, and surface water control systems, are designed to resist the maximum horizontal acceleration in lithified earth material for the site.

(b) The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating that the demonstration meets the requirements of paragraph (a) of this section.

(c) The owner or operator of the CCR unit must complete the demonstration required by paragraph (a) of this section by the date specified in either paragraph (c)(1) or (2) of this section.

(1) For an existing CCR surface impoundment, the owner or operator must complete the demonstration no later than October 17, 2018.

(2) For a new CCR landfill, new CCR surface impoundment, or any lateral expansion of a CCR unit, the owner or operator must complete the demonstration no later than the date of initial receipt of CCR in the CCR unit.

(3) The owner or operator has completed the demonstration required by paragraph (a) of this section when the demonstration is placed in the facility's operating record as required by § 257.105(e).

(4) An owner or operator of an existing CCR surface impoundment who fails to demonstrate compliance with the requirements of paragraph (a) of this section by the date specified in paragraph (c)(1) of this section is subject to the requirements of § 257.101(b)(1).

(5) An owner or operator of a new CCR landfill, new CCR surface impoundment, or any lateral expansion of a CCR unit who fails to make the demonstration showing compliance with the requirements of paragraph (a) of this section is prohibited from placing CCR in the CCR unit.

(d) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(e), the notification requirements specified in § 257.106(e), and the Internet requirements specified in § 257.107(e).

§ 257.64 Unstable areas.

(a) An existing or new CCR landfill, existing or new CCR surface impoundment, or any lateral expansion of a CCR unit must not be located in an unstable area unless the owner or operator demonstrates by the dates specified in paragraph (d) of this section that recognized and generally accepted good engineering practices have been incorporated into the design of the CCR unit to ensure that the integrity of the structural components of the CCR unit will not be disrupted.

(b) The owner or operator must consider all of the following factors, at a minimum, when determining whether an area is unstable:

(1) On-site or local soil conditions that may result in significant differential settling;

(2) On-site or local geologic or geomorphologic features; and

(3) On-site or local human-made features or events (both surface and subsurface).

(c) The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating that the demonstration meets the requirements of paragraph (a) of this section.

(d) The owner or operator of the CCR unit must complete the demonstration required by paragraph (a) of this section by the date specified in either paragraph (d)(1) or (2) of this section.

(1) For an existing CCR landfill or existing CCR surface impoundment, the owner or operator must complete the demonstration no later than October 17, 2018.

(2) For a new CCR landfill, new CCR surface impoundment, or any lateral expansion of a CCR unit, the owner or operator must complete the demonstration no later than the date of initial receipt of CCR in the CCR unit.

(3) The owner or operator has completed the demonstration required by paragraph (a) of this section when the demonstration is placed in the facility's operating record as required by § 257.105(e).

(4) An owner or operator of an existing CCR surface impoundment or existing CCR landfill who fails to demonstrate compliance with the requirements of paragraph (a) of this section by the date specified in paragraph (d)(1) of this section is subject to the requirements of § 257.101(b)(1) or (d)(1), respectively.

(5) An owner or operator of a new CCR landfill, new CCR surface impoundment, or any lateral expansion of a CCR unit who fails to make the demonstration showing compliance with the requirements of paragraph (a) of this section is prohibited from placing CCR in the CCR unit.

(e) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(e), the notification requirements specified in § 257.106(e), and the Internet requirements specified in § 257.107(e).

Design Criteria

§ 257.70 Design criteria for new CCR landfills and any lateral expansion of a CCR landfill.

(a)(1) New CCR landfills and any lateral expansion of a CCR landfill must be designed, constructed, operated, and maintained with either a composite liner that meets the requirements of paragraph (b) of this section or an alternative composite liner that meets the requirements in paragraph (c) of this section, and a leachate collection and removal system that meets the requirements of paragraph (d) of this section.

(2) Prior to construction of an overfill the underlying surface impoundment must meet the requirements of § 257.102(d).

(b) A *composite liner* must consist of two components; the upper component consisting of, at a minimum, a 30-mil geomembrane liner (GM), and the lower component consisting of at least a two-foot layer of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} centimeters per second (cm/sec). GM components consisting of high density polyethylene (HDPE) must be at least 60-mil thick. The GM or upper liner component must be installed in direct and uniform contact with the compacted soil or lower liner component. The composite liner must be:

(1) Constructed of materials that have appropriate chemical properties and sufficient strength and thickness to prevent failure due to pressure gradients (including static head and external hydrogeologic forces), physical contact with the CCR or leachate to which they are exposed, climatic conditions, the stress of installation, and the stress of daily operation;

(2) Constructed of materials that provide appropriate shear resistance of the upper and lower component interface to prevent sliding of the upper component including on slopes;

(3) Placed upon a foundation or base capable of providing support to the liner and resistance to pressure gradients above and below the liner to prevent failure of the liner due to settlement, compression, or uplift; and

(4) Installed to cover all surrounding earth likely to be in contact with the CCR or leachate.

(c) If the owner or operator elects to install an alternative composite liner, all of the following requirements must be met:

(1) An *alternative composite liner* must consist of two components; the upper component consisting of, at a minimum, a 30-mil GM, and a lower component, that is not a geomembrane, with a liquid flow rate no greater than the liquid flow rate of two feet of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} cm/sec. GM components consisting of high density polyethylene (HDPE) must be at least 60-mil thick. If the lower component of the alternative liner is compacted soil, the GM must be installed in direct and uniform contact with the compacted soil.

(2) The owner or operator must obtain certification from a qualified professional engineer that the liquid flow rate through the lower component of the alternative composite liner is no greater than the liquid flow rate through two feet of compacted soil with a hydraulic conductivity of 1×10^{-7} cm/sec. The hydraulic conductivity for the two feet of compacted soil used in the comparison shall be no greater than 1×10^{-7} cm/sec. The hydraulic conductivity of any alternative to the two feet of compacted soil must be determined using recognized and generally accepted methods. The liquid flow rate comparison must be made using Equation 1 of this section, which is derived from Darcy's Law for gravity flow through porous media.

$$\text{(Eq. 1)} \qquad \frac{Q}{A} = q = k\left(\frac{h}{t} + 1\right)$$

Where,
Q = flow rate (cubic centimeters/second);
A = surface area of the liner (squared centimeters);
q = flow rate per unit area (cubic centimeters/second/squared centimeter);
k = hydraulic conductivity of the liner (centimeters/second);
h = hydraulic head above the liner (centimeters); and
t = thickness of the liner (centimeters).

(3) The alternative composite liner must meet the requirements specified in paragraphs (b)(1) through (4) of this section.

(d) The *leachate collection and removal system* must be designed, constructed, operated, and maintained to collect and remove leachate from the landfill during the active life and post-closure care period. The leachate collection and removal system must be:

(1) Designed and operated to maintain less than a 30-centimeter depth of leachate over the composite liner or alternative composite liner;

(2) Constructed of materials that are chemically resistant to the CCR and any non-CCR waste managed in the CCR unit and the leachate expected to be generated, and of sufficient strength and thickness to prevent collapse under the pressures exerted by overlying waste, waste cover materials, and equipment used at the CCR unit; and

(3) Designed and operated to minimize clogging during the active life and post-closure care period.

(e) Prior to construction of the CCR landfill or any lateral expansion of a CCR landfill, the owner or operator must obtain a certification from a qualified professional engineer that the design of the composite liner (or, if applicable, alternative composite liner) and the leachate collection and removal system meets the requirements of this section.

(f) Upon completion of construction of the CCR landfill or any lateral expansion of a CCR landfill, the owner or operator must obtain a certification from a qualified professional engineer that the composite liner (or, if applicable, alternative composite liner) and the leachate collection and removal system has been constructed in accordance with the requirements of this section.

(g) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(f), the notification requirements specified in § 257.106(f), and the Internet requirements specified in § 257.107(f).

§ 257.71 Liner design criteria for existing CCR surface impoundments.

(a)(1) No later than October 17, 2016, the owner or operator of an existing CCR surface impoundment must document whether or not such unit was constructed with any one of the following:

(i) A liner consisting of a minimum of two feet of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} cm/sec;

(ii) A composite liner that meets the requirements of § 257.70(b); or

(iii) An alternative composite liner that meets the requirements of § 257.70(c).

(2) The hydraulic conductivity of the compacted soil must be determined using recognized and generally accepted methods.

(3) An existing CCR surface impoundment is considered to be an existing unlined CCR surface impoundment if either:

(i) The owner or operator of the CCR unit determines that the CCR unit is not constructed with a liner that meets the requirements of paragraphs (a)(1)(i), (ii), or (iii) of this section; or

(ii) The owner or operator of the CCR unit fails to document whether the CCR unit was constructed with a liner that meets the requirements of paragraphs (a)(1)(i), (ii), or (iii) of this section.

(4) All existing unlined CCR surface impoundments are subject to the requirements of § 257.101(a).

(b) The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer attesting that the documentation as to whether a CCR unit meets the requirements of paragraph (a) of this section is accurate.

(c) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(f), the notification requirements specified in § 257.106(f), and the Internet requirements specified in § 257.107(f).

§ 257.72 Liner design criteria for new CCR surface impoundments and any lateral expansion of a CCR surface impoundment.

(a) New CCR surface impoundments and lateral expansions of existing and new CCR surface impoundments must be designed, constructed, operated, and maintained with either a composite liner or an alternative composite liner that meets the requirements of § 257.70(b) or (c).

(b) Any liner specified in this section must be installed to cover all surrounding earth likely to be in contact with CCR. Dikes shall not be constructed on top of the composite liner.

(c) Prior to construction of the CCR surface impoundment or any lateral expansion of a CCR surface impoundment, the owner or operator must obtain certification from a qualified professional engineer that the design of the composite liner or, if applicable, the design of an alternative composite liner complies with the requirements of this section.

(d) Upon completion, the owner or operator must obtain certification from a qualified professional engineer that the composite liner or if applicable, the alternative composite liner has been constructed in accordance with the requirements of this section.

(e) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(f), the notification requirements specified in § 257.106(f), and the Internet requirements specified in § 257.107(f).

§ 257.73 Structural integrity criteria for existing CCR surface impoundments.

(a) The requirements of paragraphs (a)(1) through (4) of this section apply to all existing CCR surface impoundments, except for those existing CCR surface impoundments that are incised CCR units. If an incised CCR surface impoundment is subsequently modified (*e.g.,* a dike is constructed) such that the CCR unit no longer meets the definition of an incised CCR unit, the CCR unit is subject to the requirements of paragraphs (a)(1) through (4) of this section.

(1) No later than, December 17, 2015, the owner or operator of the CCR unit must place on or immediately adjacent to the CCR unit a permanent identification marker, at least six feet high showing the identification number of the CCR unit, if one has been assigned by the state, the name associated with the CCR unit and the name of the owner or operator of the CCR unit.

(2) *Periodic hazard potential classification assessments.* (i) The owner or operator of the CCR unit must conduct initial and periodic hazard potential classification assessments of the CCR unit according to the timeframes specified in paragraph (f) of this section. The owner or operator must document the hazard potential classification of each CCR unit as either a high hazard potential CCR surface impoundment, a significant hazard potential CCR surface impoundment, or a low hazard potential CCR surface impoundment. The owner or operator must also document the basis for each hazard potential classification.

(ii) The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating that the initial hazard potential classification and each subsequent periodic classification specified in paragraph (a)(2)(i) of this section was conducted in accordance with the requirements of this section.

(3) *Emergency Action Plan (EAP)*—(i) *Development of the plan.* No later than April 17, 2017, the owner or operator of a CCR unit determined to be either a high hazard potential CCR surface impoundment or a significant hazard potential CCR surface impoundment under paragraph (a)(2) of this section must prepare and maintain a written EAP. At a minimum, the EAP must:

(A) Define the events or circumstances involving the CCR unit that represent a safety emergency, along with a description of the procedures that will be followed to detect a safety emergency in a timely manner;

(B) Define responsible persons, their respective responsibilities, and notification procedures in the event of a safety emergency involving the CCR unit;

(C) Provide contact information of emergency responders;

(D) Include a map which delineates the downstream area which would be affected in the event of a CCR unit failure and a physical description of the CCR unit; and

(E) Include provisions for an annual face-to-face meeting or exercise between representatives of the owner or operator of the CCR unit and the local emergency responders.

(ii) *Amendment of the plan.* (A) The owner or operator of a CCR unit subject to the requirements of paragraph (a)(3)(i) of this section may amend the written EAP at any time provided the revised plan is placed in the facility's operating record as required by § 257.105(f)(6). The owner or operator must amend the written EAP whenever there is a change in conditions that would substantially affect the EAP in effect.

(B) The written EAP must be evaluated, at a minimum, every five years to ensure the information required in paragraph (a)(3)(i) of this section is accurate. As necessary, the EAP must be updated and a revised EAP placed in the facility's operating record as required by § 257.105(f)(6).

(iii) *Changes in hazard potential classification.* (A) If the owner or operator of a CCR unit determines during a periodic hazard potential assessment that the CCR unit is no longer classified as either a high hazard potential CCR surface impoundment or a significant hazard potential CCR surface impoundment, then the owner or operator of the CCR unit is no longer subject to the requirement to prepare and maintain a written EAP beginning on the date the periodic hazard potential assessment documentation is placed in the facility's operating record as required by § 257.105(f)(5).

(B) If the owner or operator of a CCR unit classified as a low hazard potential CCR surface impoundment subsequently determines that the CCR unit is properly re-classified as either a high hazard potential CCR surface impoundment or a significant hazard potential CCR surface impoundment, then the owner or operator of the CCR unit must prepare a written EAP for the CCR unit as required by paragraph (a)(3)(i) of this section within six months of completing such periodic hazard potential assessment.

(iv) The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating that the written EAP, and any subsequent amendment of the EAP, meets the requirements of paragraph (a)(3) of this section.

(v) *Activation of the EAP.* The EAP must be implemented once events or circumstances involving the CCR unit that represent a safety emergency are detected, including conditions identified during periodic structural stability assessments, annual inspections, and inspections by a qualified person.

(4) The CCR unit and surrounding areas must be designed, constructed, operated, and maintained with vegetated slopes of dikes not to exceed a height of 6 inches above the slope of the dike, except for slopes which are protected with an alternate form(s) of slope protection.

(b) The requirements of paragraphs (c) through (e) of this section apply to an owner or operator of an existing CCR surface impoundment that either:

(1) Has a height of five feet or more and a storage volume of 20 acre-feet or more; or

(2) Has a height of 20 feet or more.

(c)(1) No later than October 17, 2016, the owner or operator of the CCR unit must compile a history of construction, which shall contain, to the extent feasible, the information specified in paragraphs (c)(1)(i) through (xi) of this section.

(i) The name and address of the person(s) owning or operating the CCR unit; the name associated with the CCR unit; and the identification number of the CCR unit if one has been assigned by the state.

(ii) The location of the CCR unit identified on the most recent U.S. Geological Survey (USGS) 7½ minute or 15 minute topographic quadrangle map, or a topographic map of equivalent scale if a USGS map is not available.

(iii) A statement of the purpose for which the CCR unit is being used.

(iv) The name and size in acres of the watershed within which the CCR unit is located.

(v) A description of the physical and engineering properties of the foundation and abutment materials on which the CCR unit is constructed.

(vi) A statement of the type, size, range, and physical and engineering properties of the materials used in constructing each zone or stage of the CCR unit; the method of site preparation and construction of each zone of the CCR unit; and the approximate dates of construction of each successive stage of construction of the CCR unit.

(vii) At a scale that details engineering structures and appurtenances relevant to the design, construction, operation, and maintenance of the CCR unit, detailed dimensional drawings of the CCR unit, including a plan view and cross sections of the length and width of the CCR unit, showing all zones, foundation improvements, drainage provisions, spillways, diversion ditches, outlets, instrument locations, and slope protection, in addition to the normal operating pool surface elevation and the maximum pool surface elevation following peak discharge from the inflow design flood, the expected maximum depth of CCR within the CCR surface impoundment, and any identifiable natural or manmade features that could adversely affect operation of the CCR unit due to malfunction or mis-operation.

(viii) A description of the type, purpose, and location of existing instrumentation.

(ix) Area-capacity curves for the CCR unit.

(x) A description of each spillway and diversion design features and capacities and calculations used in their determination.

(xi) The construction specifications and provisions for surveillance, maintenance, and repair of the CCR unit.

(xii) Any record or knowledge of structural instability of the CCR unit.

(2) *Changes to the history of construction.* If there is a significant change to any information compiled under paragraph (c)(1) of this section, the owner or operator of the CCR unit must update the relevant information and place it in the facility's operating record as required by § 257.105(f)(9).

(d) *Periodic structural stability assessments.* (1) The owner or operator of the CCR unit must conduct initial and periodic structural stability assessments and document whether the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and CCR wastewater which can be impounded therein. The assessment must, at a minimum, document whether the CCR unit has been designed, constructed, operated, and maintained with:

(i) Stable foundations and abutments;

(ii) Adequate slope protection to protect against surface erosion, wave action, and adverse effects of sudden drawdown;

(iii) Dikes mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit;

(iv) Vegetated slopes of dikes and surrounding areas not to exceed a height of six inches above the slope of the dike, except for slopes which have an alternate form or forms of slope protection;

(v) A single spillway or a combination of spillways configured as specified in paragraph (d)(1)(v)(A) of this section. The combined capacity of all spillways must be designed, constructed, operated, and maintained to adequately manage flow during and following the peak discharge from the event specified in paragraph (d)(1)(v)(B) of this section.

(A) All spillways must be either:

(*1*) Of non-erodible construction and designed to carry sustained flows; or

(*2*) Earth- or grass-lined and designed to carry short-term, infrequent flows at non-erosive velocities where sustained flows are not expected.

(B) The combined capacity of all spillways must adequately manage flow during and following the peak discharge from a:

(*1*) Probable maximum flood (PMF) for a high hazard potential CCR surface impoundment; or

(*2*) 1000-year flood for a significant hazard potential CCR surface impoundment; or

(*3*) 100-year flood for a low hazard potential CCR surface impoundment.

(vi) Hydraulic structures underlying the base of the CCR unit or passing through the dike of the CCR unit that maintain structural integrity and are free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris which may negatively affect the operation of the hydraulic structure; and

(vii) For CCR units with downstream slopes which can be inundated by the pool of an adjacent water body, such as a river, stream or lake, downstream slopes that maintain structural stability during low pool of the adjacent water body or sudden drawdown of the adjacent water body.

(2) The periodic assessment described in paragraph (d)(1) of this section must identify any structural stability deficiencies associated with the CCR unit in addition to recommending corrective measures. If a deficiency or a release is identified during the periodic assessment, the owner or operator unit must remedy the deficiency or release as soon as feasible and prepare documentation detailing the corrective measures taken.

(3) The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating that the initial assessment and each subsequent periodic assessment was conducted in accordance with the requirements of this section.

(e) *Periodic safety factor assessments.* (1) The owner or operator must conduct an initial and periodic safety factor assessments for each CCR unit and document whether the calculated factors of safety for each CCR unit achieve the minimum safety factors specified in paragraphs (e)(1)(i) through (iv) of this section for the critical cross section of the embankment. The critical cross section is the cross section anticipated to be the most susceptible of all cross sections to structural failure based on appropriate engineering considerations, including loading conditions. The safety factor assessments must be supported by appropriate engineering calculations.

(i) The calculated static factor of safety under the long-term, maximum storage pool loading condition must equal or exceed 1.50.

(ii) The calculated static factor of safety under the maximum surcharge pool loading condition must equal or exceed 1.40.

(iii) The calculated seismic factor of safety must equal or exceed 1.00.

(iv) For dikes constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety must equal or exceed 1.20.

(2) The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating

that the initial assessment and each subsequent periodic assessment specified in paragraph (e)(1) of this section meets the requirements of this section.

(f) *Timeframes for periodic assessments*—(1) *Initial assessments.* Except as provided by paragraph (f)(2) of this section, the owner or operator of the CCR unit must complete the initial assessments required by paragraphs (a)(2), (d), and (e) of this section no later than October 17, 2016. The owner or operator has completed an initial assessment when the owner or operator has placed the assessment required by paragraphs (a)(2), (d), and (e) of this section in the facility's operating record as required by § 257.105(f)(5), (10), and (12).

(2) *Use of a previously completed assessment(s) in lieu of the initial assessment(s).* The owner or operator of the CCR unit may elect to use a previously completed assessment to serve as the initial assessment required by paragraphs (a)(2), (d), and (e) of this section provided that the previously completed assessment(s):

(i) Was completed no earlier than 42 months prior to October 17, 2016; and

(ii) Meets the applicable requirements of paragraphs (a)(2), (d), and (e) of this section.

(3) *Frequency for conducting periodic assessments.* The owner or operator of the CCR unit must conduct and complete the assessments required by paragraphs (a)(2), (d), and (e) of this section every five years. The date of completing the initial assessment is the basis for establishing the deadline to complete the first subsequent assessment. If the owner or operator elects to use a previously completed assessment(s) in lieu of the initial assessment as provided by paragraph (f)(2) of this section, the date of the report for the previously completed assessment is the basis for establishing the deadline to complete the first subsequent assessment. The owner or operator may complete any required assessment prior to the required deadline provided the owner or operator places the completed assessment(s) into the facility's operating record within a reasonable amount of time. In all cases, the deadline for completing subsequent assessments is based on the date of completing the previous assessment. For purposes of this paragraph (f)(3), the owner or operator has completed an assessment when the relevant assessment(s) required by paragraphs (a)(2), (d), and (e) of this section has been placed in the facility's operating record as required by § 257.105(f)(5), (10), and (12).

(4) *Closure of the CCR unit.* An owner or operator of a CCR unit who either fails to complete a timely safety factor assessment or fails to demonstrate minimum safety factors as required by paragraph (e) of this section is subject to the requirements of § 257.101(b)(2).

(g) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(f), the notification requirements specified in § 257.106(f), and the internet requirements specified in § 257.107(f).

§ 257.74 Structural integrity criteria for new CCR surface impoundments and any lateral expansion of a CCR surface impoundment.

(a) The requirements of paragraphs (a)(1) through (4) of this section apply to all new CCR surface impoundments and any lateral expansion of a CCR surface impoundment, except for those new CCR surface impoundments that are incised CCR units. If an incised CCR surface impoundment is subsequently modified (*e.g.,* a dike is constructed) such that the CCR unit no longer meets the definition of an incised CCR unit, the CCR unit is subject to the requirements of paragraphs (a)(1) through (4) of this section.

(1) No later than the initial receipt of CCR, the owner or operator of the CCR unit must place on or immediately adjacent to the CCR unit a permanent identification marker, at least six feet high showing the identification number of the CCR unit, if one has been assigned by the state, the name associated with the CCR unit and the name of the owner or operator of the CCR unit.

(2) *Periodic hazard potential classification assessments.* (i) The owner or operator of the CCR unit must conduct initial and periodic hazard potential classification assessments of the CCR unit according to the timeframes specified in paragraph (f) of this section. The owner or operator must document the hazard potential classification of each CCR unit as either a high hazard potential CCR surface impoundment, a significant hazard potential CCR surface impoundment, or a low hazard potential CCR surface impoundment. The owner or operator must also document the basis for each hazard potential classification.

(ii) The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating that the initial hazard potential classification and each subsequent periodic classification specified in paragraph (a)(2)(i) of this section was conducted in accordance with the requirements of this section.

(3) *Emergency Action Plan (EAP)*—(i) *Development of the plan.* Prior to the initial receipt of CCR in the CCR unit, the owner or operator of a CCR unit determined to be either a high hazard potential CCR surface impoundment or a significant hazard potential CCR surface impoundment under paragraph (a)(2) of this section must prepare and maintain a written EAP. At a minimum, the EAP must:

(A) Define the events or circumstances involving the CCR unit that represent a safety emergency, along with a description of the procedures that will be followed to detect a safety emergency in a timely manner;

(B) Define responsible persons, their respective responsibilities, and notification procedures in the event of a safety emergency involving the CCR unit;

(C) Provide contact information of emergency responders;

(D) Include a map which delineates the downstream area which would be affected in the event of a CCR unit failure and a physical description of the CCR unit; and

(E) Include provisions for an annual face-to-face meeting or exercise between representatives of the owner or operator of the CCR unit and the local emergency responders.

(ii) *Amendment of the plan.* (A) The owner or operator of a CCR unit subject to the requirements of paragraph (a)(3)(i) of this section may amend the written EAP at any time provided the revised plan is placed in the facility's operating record as required by § 257.105(f)(6). The owner or operator must amend the written EAP whenever there is a change in conditions that would substantially affect the EAP in effect.

(B) The written EAP must be evaluated, at a minimum, every five years to ensure the information required in paragraph (a)(3)(i) of this section is accurate. As necessary, the EAP must be updated and a revised EAP placed in the facility's operating record as required by § 257.105(f)(6).

(iii) *Changes in hazard potential classification.* (A) If the owner or operator of a CCR unit determines during a periodic hazard potential assessment that the CCR unit is no longer classified as either a high hazard potential CCR surface impoundment or a significant hazard potential CCR surface impoundment, then the owner or operator of the CCR unit is no longer subject to the requirement to prepare and maintain a written EAP beginning on the date the periodic hazard potential assessment documentation is placed in the facility's operating record as required by § 257.105(f)(5).

(B) If the owner or operator of a CCR unit classified as a low hazard potential CCR surface impoundment subsequently determines that the CCR unit is properly re-classified as either a high hazard potential CCR surface impoundment or a significant hazard potential CCR surface impoundment, then the owner or operator of the CCR unit must prepare a written EAP for the CCR unit as required by paragraph (a)(3)(i) of this section within six months of completing such periodic hazard potential assessment.

(iv) The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating that the written EAP, and any subsequent amendment of the EAP, meets the requirements of paragraph (a)(3) of this section.

(v) *Activation of the EAP.* The EAP must be implemented once events or circumstances involving the CCR unit that represent a safety emergency are detected, including conditions identified during periodic structural stability assessments, annual inspections, and inspections by a qualified person.

(4) The CCR unit and surrounding areas must be designed, constructed, operated, and maintained with vegetated slopes of dikes not to exceed a height of six inches above the slope of the dike, except for slopes which are protected with an alternate form(s) of slope protection.

(b) The requirements of paragraphs (c) through (e) of this section apply to an owner or operator of a new CCR surface impoundment and any lateral expansion of a CCR surface impoundment that either:

(1) Has a height of five feet or more and a storage volume of 20 acre-feet or more; or

(2) Has a height of 20 feet or more.

(c)(1) No later than the initial receipt of CCR in the CCR unit, the owner or operator unit must compile the design and construction plans for the CCR unit, which must include, to the extent feasible, the information specified in paragraphs (c)(1)(i) through (xi) of this section.

(i) The name and address of the person(s) owning or operating the CCR unit; the name associated with the CCR unit; and the identification number of the CCR unit if one has been assigned by the state.

(ii) The location of the CCR unit identified on the most recent U.S. Geological Survey (USGS) 7½ minute or 15 minute topographic quadrangle map, or a topographic map of equivalent scale if a USGS map is not available.

(iii) A statement of the purpose for which the CCR unit is being used.

(iv) The name and size in acres of the watershed within which the CCR unit is located.

(v) A description of the physical and engineering properties of the foundation and abutment materials on which the CCR unit is constructed.

(vi) A statement of the type, size, range, and physical and engineering properties of the materials used in constructing each zone or stage of the CCR unit; the method of site preparation and construction of each zone of the CCR unit; and the dates of construction of each successive stage of construction of the CCR unit.

(vii) At a scale that details engineering structures and appurtenances relevant to the design, construction, operation, and maintenance of the CCR unit, detailed dimensional drawings of the CCR unit, including a plan view and cross sections of the length and width of the CCR unit, showing all zones, foundation improvements, drainage provisions, spillways, diversion ditches, outlets, instrument locations, and slope protection, in addition to the normal operating pool surface elevation and the maximum pool surface elevation following peak discharge from the inflow design flood, the expected maximum depth of CCR within the CCR surface impoundment, and any identifiable natural or manmade features that could adversely affect operation of the CCR unit due to malfunction or mis-operation.

(viii) A description of the type, purpose, and location of existing instrumentation.

(ix) Area-capacity curves for the CCR unit.

(x) A description of each spillway and diversion design features and capacities and calculations used in their determination.

(xi) The construction specifications and provisions for surveillance, maintenance, and repair of the CCR unit.

(xii) Any record or knowledge of structural instability of the CCR unit.

(2) *Changes in the design and construction.* If there is a significant change to any information compiled under paragraph (c)(1) of this section, the owner or operator of the CCR unit must update the relevant information and place it in the facility's operating record as required by § 257.105(f)(13).

(d) *Periodic structural stability assessments.* (1) The owner or operator of the CCR unit must conduct initial and periodic structural stability assessments and document whether the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and CCR wastewater which can be impounded therein. The assessment must, at a minimum, document whether the CCR unit has been designed, constructed, operated, and maintained with:

(i) Stable foundations and abutments;

(ii) Adequate slope protection to protect against surface erosion, wave action, and adverse effects of sudden drawdown;

(iii) Dikes mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit;

(iv) Vegetated slopes of dikes and surrounding areas not to exceed a height of six inches above the slope of the dike, except for slopes which have an alternate form or forms of slope protection;

(v) A single spillway or a combination of spillways configured as specified in paragraph (d)(1)(v)(A) of this section. The combined capacity of all spillways must be designed, constructed, operated, and maintained to adequately manage flow during and following the peak discharge from the event specified in paragraph (d)(1)(v)(B) of this section.

(A) All spillways must be either:

(*1*) Of non-erodible construction and designed to carry sustained flows; or

(*2*) Earth- or grass-lined and designed to carry short-term, infrequent flows at non-erosive velocities where sustained flows are not expected.

(B) The combined capacity of all spillways must adequately manage flow during and following the peak discharge from a:

(*1*) Probable maximum flood (PMF) for a high hazard potential CCR surface impoundment; or

(*2*) 1000-year flood for a significant hazard potential CCR surface impoundment; or

(*3*) 100-year flood for a low hazard potential CCR surface impoundment.

(vi) Hydraulic structures underlying the base of the CCR unit or passing through the dike of the CCR unit that maintain structural integrity and are free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris which may negatively affect the operation of the hydraulic structure; and

(vii) For CCR units with downstream slopes which can be inundated by the pool of an adjacent water body, such as a river, stream or lake, downstream slopes that maintain structural stability during low pool of the adjacent water body or sudden drawdown of the adjacent water body.

(2) The periodic assessment described in paragraph (d)(1) of this section must identify any structural stability deficiencies associated with the CCR unit in addition to recommending corrective measures. If a deficiency or a release is identified during the periodic assessment, the owner or operator unit must remedy the deficiency or release as soon as feasible and prepare documentation detailing the corrective measures taken.

(3) The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating that the initial assessment and each subsequent periodic assessment was conducted in accordance with the requirements of this section.

(e) *Periodic safety factor assessments.* (1) The owner or operator must conduct an initial and periodic safety factor assessments for each CCR unit and document whether the calculated factors of safety for each CCR unit achieve the minimum safety factors specified in paragraphs (e)(1)(i) through (v) of this section for the critical cross section of the embankment. The critical cross section is the cross section anticipated to be the most susceptible of all cross sections to structural failure based on appropriate engineering considerations, including loading conditions. The safety factor assessments must be supported by appropriate engineering calculations.

(i) The calculated static factor of safety under the end-of-construction loading condition must equal or exceed 1.30. The assessment of this loading condition is only required for the initial safety factor assessment and is not required for subsequent assessments.

(ii) The calculated static factor of safety under the long-term, maximum storage pool loading condition must equal or exceed 1.50.

(iii) The calculated static factor of safety under the maximum surcharge pool loading condition must equal or exceed 1.40.

(iv) The calculated seismic factor of safety must equal or exceed 1.00.

(v) For dikes constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety must equal or exceed 1.20.

(2) The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating that the initial assessment and each subsequent periodic assessment specified in paragraph (e)(1) of this section meets the requirements of this section.

(f) *Timeframes for periodic assessments*—(1) *Initial assessments.* Except as provided by paragraph (f)(2) of this section, the owner or operator of the CCR unit must complete the initial assessments required by paragraphs (a)(2), (d), and (e) of this section prior to the initial receipt of CCR in the unit. The owner or operator has completed an initial assessment when the owner or operator has placed the assessment required by paragraphs (a)(2), (d), and (e) of this section in the facility's operating record as required by § 257.105(f)(5), (10), and (12).

(2) *Frequency for conducting periodic assessments.* The owner or operator of the CCR unit must conduct and complete the assessments required by paragraphs (a)(2), (d), and (e) of this section every five years. The date of completing the initial assessment is the basis for establishing the deadline to complete the first subsequent assessment. The owner or operator may complete any required assessment prior to the required deadline provided the owner or operator places the completed assessment(s) into the facility's operating record within a reasonable amount of time. In all cases, the deadline for completing subsequent assessments is based on the date of completing the previous assessment. For purposes of this paragraph (f)(2), the owner or operator has completed an assessment when the relevant assessment(s) required by paragraphs (a)(2), (d), and (e) of this section has been placed in the facility's operating record as required by § 257.105(f)(5), (10), and (12).

(3) *Failure to document minimum safety factors during the initial assessment.* Until the date an owner or operator of a CCR unit documents that the calculated factors of safety achieve the minimum safety factors specified in paragraphs (e)(1)(i) through (v) of this section, the owner or operator is prohibited from placing CCR in such unit.

(4) *Closure of the CCR unit.* An owner or operator of a CCR unit who either fails to complete a timely periodic safety factor assessment or fails to demonstrate minimum safety factors as required by paragraph (e) of this section is subject to the requirements of § 257.101(c).

(g) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(f), the notification requirements specified in § 257.106(f), and the internet requirements specified in § 257.107(f).

Operating Criteria

§ 257.80 Air criteria.

(a) The owner or operator of a CCR landfill, CCR surface impoundment, or any lateral expansion of a CCR unit must adopt measures that will effectively minimize CCR from becoming airborne at the facility, including CCR fugitive dust originating from CCR units, roads, and other CCR management and material handling activities.

(b) *CCR fugitive dust control plan.* The owner or operator of the CCR unit must prepare and operate in accordance with a CCR fugitive dust control plan as specified in paragraphs (b)(1) through (7) of this section. This requirement applies in addition to, not in place of, any applicable standards under the Occupational Safety and Health Act.

(1) The CCR fugitive dust control plan must identify and describe the CCR fugitive dust control measures the owner or operator will use to minimize CCR from becoming airborne at the facility. The owner or operator must select, and include in the CCR fugitive dust control plan, the CCR fugitive dust control measures that are most appropriate for site conditions, along with an explanation of how the measures selected are applicable and appropriate for site conditions. Examples of control measures that may be appropriate include: Locating CCR inside an enclosure or partial enclosure; operating a water spray or fogging system; reducing fall distances at material drop points; using wind barriers, compaction, or vegetative covers; establishing and enforcing reduced vehicle speed limits; paving and sweeping roads; covering trucks transporting CCR; reducing or halting operations during high wind events; or applying a daily cover.

(2) If the owner or operator operates a CCR landfill or any lateral expansion of a CCR landfill, the CCR fugitive dust control plan must include procedures to emplace CCR as conditioned CCR. Conditioned CCR means wetting CCR with water to a moisture content that will prevent wind dispersal, but will not result in free liquids. In lieu of water, CCR conditioning may be accomplished with an appropriate chemical dust suppression agent.

(3) The CCR fugitive dust control plan must include procedures to log citizen complaints received by the owner or operator involving CCR fugitive dust events at the facility.

(4) The CCR fugitive dust control plan must include a description of the procedures the owner or operator will

follow to periodically assess the effectiveness of the control plan.

(5) The owner or operator of a CCR unit must prepare an initial CCR fugitive dust control plan for the facility no later than October 19, 2015, or by initial receipt of CCR in any CCR unit at the facility if the owner or operator becomes subject to this subpart after October 19, 2015. The owner or operator has completed the initial CCR fugitive dust control plan when the plan has been placed in the facility's operating record as required by § 257.105(g)(1).

(6) *Amendment of the plan.* The owner or operator of a CCR unit subject to the requirements of this section may amend the written CCR fugitive dust control plan at any time provided the revised plan is placed in the facility's operating record as required by § 257.105(g)(1). The owner or operator must amend the written plan whenever there is a change in conditions that would substantially affect the written plan in effect, such as the construction and operation of a new CCR unit.

(7) The owner or operator must obtain a certification from a qualified professional engineer that the initial CCR fugitive dust control plan, or any subsequent amendment of it, meets the requirements of this section.

(c) *Annual CCR fugitive dust control report.* The owner or operator of a CCR unit must prepare an annual CCR fugitive dust control report that includes a description of the actions taken by the owner or operator to control CCR fugitive dust, a record of all citizen complaints, and a summary of any corrective measures taken. The initial annual report must be completed no later than 14 months after placing the initial CCR fugitive dust control plan in the facility's operating record. The deadline for completing a subsequent report is one year after the date of completing the previous report. For purposes of this paragraph (c), the owner or operator has completed the annual CCR fugitive dust control report when the plan has been placed in the facility's operating record as required by § 257.105(g)(2).

(d) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(g), the notification requirements specified in § 257.106(g), and the internet requirements specified in § 257.107(g).

§ 257.81 Run-on and run-off controls for CCR landfills.

(a) The owner or operator of an existing or new CCR landfill or any lateral expansion of a CCR landfill must design, construct, operate, and maintain:

(1) A run-on control system to prevent flow onto the active portion of the CCR unit during the peak discharge from a 24-hour, 25-year storm; and

(2) A run-off control system from the active portion of the CCR unit to collect and control at least the water volume resulting from a 24-hour, 25-year storm.

(b) Run-off from the active portion of the CCR unit must be handled in accordance with the surface water requirements under § 257.3–3.

(c) *Run-on and run-off control system plan*—(1) *Content of the plan.* The owner or operator must prepare initial and periodic run-on and run-off control system plans for the CCR unit according to the timeframes specified in paragraphs (c)(3) and (4) of this section. These plans must document how the run-on and run-off control systems have been designed and constructed to meet the applicable requirements of this section. Each plan must be supported by appropriate engineering calculations. The owner or operator has completed the initial run-on and run-off control system plan when the plan has been placed in the facility's operating record as required by § 257.105(g)(3).

(2) *Amendment of the plan.* The owner or operator may amend the written run-on and run-off control system plan at any time provided the revised plan is placed in the facility's operating record as required by § 257.105(g)(3). The owner or operator must amend the written run-on and run-off control system plan whenever there is a change in conditions that would substantially affect the written plan in effect.

(3) *Timeframes for preparing the initial plan*—(i) *Existing CCR landfills.* The owner or operator of the CCR unit must prepare the initial run-on and run-off control system plan no later than October 17, 2016.

(ii) *New CCR landfills and any lateral expansion of a CCR landfill.* The owner or operator must prepare the initial run-on and run-off control system plan no later than the date of initial receipt of CCR in the CCR unit.

(4) *Frequency for revising the plan.* The owner or operator of the CCR unit must prepare periodic run-on and run-off control system plans required by paragraph (c)(1) of this section every five years. The date of completing the initial plan is the basis for establishing the deadline to complete the first subsequent plan. The owner or operator may complete any required plan prior to the required deadline provided the owner or operator places the completed plan into the facility's operating record within a reasonable amount of time. In all cases, the deadline for completing a subsequent plan is based on the date of completing the previous plan. For purposes of this paragraph (c)(4), the owner or operator has completed a periodic run-on and run-off control system plan when the plan has been placed in the facility's operating record as required by § 257.105(g)(3).

(5) The owner or operator must obtain a certification from a qualified professional engineer stating that the initial and periodic run-on and run-off control system plans meet the requirements of this section.

(d) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(g), the notification requirements specified in § 257.106(g), and the internet requirements specified in § 257.107(g).

§ 257.82 Hydrologic and hydraulic capacity requirements for CCR surface impoundments.

(a) The owner or operator of an existing or new CCR surface impoundment or any lateral expansion of a CCR surface impoundment must design, construct, operate, and maintain an inflow design flood control system as specified in paragraphs (a)(1) and (2) of this section.

(1) The inflow design flood control system must adequately manage flow into the CCR unit during and following the peak discharge of the inflow design flood specified in paragraph (a)(3) of this section.

(2) The inflow design flood control system must adequately manage flow from the CCR unit to collect and control the peak discharge resulting from the inflow design flood specified in paragraph (a)(3) of this section.

(3) The inflow design flood is:

(i) For a high hazard potential CCR surface impoundment, as determined under § 257.73(a)(2) or § 257.74(a)(2), the probable maximum flood;

(ii) For a significant hazard potential CCR surface impoundment, as determined under § 257.73(a)(2) or § 257.74(a)(2), the 1,000-year flood;

(iii) For a low hazard potential CCR surface impoundment, as determined under § 257.73(a)(2) or § 257.74(a)(2), the 100-year flood; or

(iv) For an incised CCR surface impoundment, the 25-year flood.

(b) Discharge from the CCR unit must be handled in accordance with the surface water requirements under § 257.3–3.

(c) *Inflow design flood control system plan*—(1) *Content of the plan.* The owner or operator must prepare initial and periodic inflow design flood control system plans for the CCR unit according to the timeframes specified in paragraphs (c)(3) and (4) of this section. These plans must document how the inflow design flood control system has been designed and constructed to meet the requirements of this section. Each plan must be supported by appropriate engineering calculations. The owner or operator of the CCR unit has completed the inflow design flood control system plan when the plan has been placed in the facility's operating record as required by § 257.105(g)(4).

(2) *Amendment of the plan.* The owner or operator of the CCR unit may amend the written inflow design flood control system plan at any time provided the revised plan is placed in the facility's operating record as required by § 257.105(g)(4). The owner or operator must amend the written inflow design flood control system plan whenever there is a change in conditions that would substantially affect the written plan in effect.

(3) *Timeframes for preparing the initial plan*—(i) *Existing CCR surface impoundments.* The owner or operator of the CCR unit must prepare the initial inflow design flood control system plan no later than October 17, 2016.

(ii) *New CCR surface impoundments and any lateral expansion of a CCR surface impoundment.* The owner or operator must prepare the initial inflow design flood control system plan no later than the date of initial receipt of CCR in the CCR unit.

(4) *Frequency for revising the plan.* The owner or operator must prepare periodic inflow design flood control system plans required by paragraph (c)(1) of this section every five years. The date of completing the initial plan is the basis for establishing the deadline to complete the first periodic plan. The owner or operator may complete any required plan prior to the required deadline provided the owner or operator places the completed plan into the facility's operating record within a reasonable amount of time. In all cases, the deadline for completing a subsequent plan is based on the date of completing the previous plan. For purposes of this paragraph (c)(4), the owner or operator has completed an inflow design flood control system plan when the plan has been placed in the facility's operating record as required by § 257.105(g)(4).

(5) The owner or operator must obtain a certification from a qualified professional engineer stating that the initial and periodic inflow design flood control system plans meet the requirements of this section.

(d) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(g), the notification requirements specified in § 257.106(g), and the internet requirements specified in § 257.107(g).

§ 257.83 Inspection requirements for CCR surface impoundments.

(a) *Inspections by a qualified person.* (1) All CCR surface impoundments and any lateral expansion of a CCR surface impoundment must be examined by a qualified person as follows:

(i) At intervals not exceeding seven days, inspect for any appearances of actual or potential structural weakness and other conditions which are disrupting or have the potential to disrupt the operation or safety of the CCR unit;

(ii) At intervals not exceeding seven days, inspect the discharge of all outlets of hydraulic structures which pass underneath the base of the surface impoundment or through the dike of the CCR unit for abnormal discoloration, flow or discharge of debris or sediment; and

(iii) At intervals not exceeding 30 days, monitor all CCR unit instrumentation.

(iv) The results of the inspection by a qualified person must be recorded in the facility's operating record as required by § 257.105(g)(5).

(2) *Timeframes for inspections by a qualified person*—(i) *Existing CCR surface impoundments.* The owner or operator of the CCR unit must initiate the inspections required under paragraph (a) of this section no later than October 19, 2015.

(ii) *New CCR surface impoundments and any lateral expansion of a CCR surface impoundment.* The owner or operator of the CCR unit must initiate the inspections required under paragraph (a) of this section upon initial receipt of CCR by the CCR unit.

(b) Annual i*nspections by a qualified professional engineer.* (1) If the existing or new CCR surface impoundment or any lateral expansion of the CCR surface impoundment is subject to the periodic structural stability assessment requirements under § 257.73(d) or § 257.74(d), the CCR unit must additionally be inspected on a periodic basis by a qualified professional engineer to ensure that the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering standards. The inspection must, at a minimum, include:

(i) A review of available information regarding the status and condition of the CCR unit, including, but not limited to, files available in the operating record (*e.g.,* CCR unit design and construction information required by §§ 257.73(c)(1) and 257.74(c)(1), previous periodic structural stability assessments required under §§ 257.73(d) and 257.74(d), the results of inspections by a qualified person, and results of previous annual inspections);

(ii) A visual inspection of the CCR unit to identify signs of distress or malfunction of the CCR unit and appurtenant structures; and

(iii) A visual inspection of any hydraulic structures underlying the base of the CCR unit or passing through the dike of the CCR unit for structural integrity and continued safe and reliable operation.

(2) *Inspection report.* The qualified professional engineer must prepare a report following each inspection that addresses the following:

(i) Any changes in geometry of the impounding structure since the previous annual inspection;

(ii) The location and type of existing instrumentation and the maximum recorded readings of each instrument since the previous annual inspection;

(iii) The approximate minimum, maximum, and present depth and elevation of the impounded water and CCR since the previous annual inspection;

(iv) The storage capacity of the impounding structure at the time of the inspection;

(v) The approximate volume of the impounded water and CCR at the time of the inspection;

(vi) Any appearances of an actual or potential structural weakness of the CCR unit, in addition to any existing conditions that are disrupting or have the potential to disrupt the operation and safety of the CCR unit and appurtenant structures; and

(vii) Any other change(s) which may have affected the stability or operation of the impounding structure since the previous annual inspection.

(3) *Timeframes for conducting the initial inspection*—(i) *Existing CCR surface impoundments.* The owner or operator of the CCR unit must complete the initial inspection required by paragraphs (b)(1) and (2) of this section no later than January 18, 2016.

(ii) *New CCR surface impoundments and any lateral expansion of a CCR surface impoundment.* The owner or operator of the CCR unit must complete the initial annual inspection required by paragraphs (b)(1) and (2) of this section is completed no later than 14 months

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following the date of initial receipt of CCR in the CCR unit.

(4) *Frequency of inspections.* (i) Except as provided for in paragraph (b)(4)(ii) of this section, the owner or operator of the CCR unit must conduct the inspection required by paragraphs (b)(1) and (2) of this section on an annual basis. The date of completing the initial inspection report is the basis for establishing the deadline to complete the first subsequent inspection. Any required inspection may be conducted prior to the required deadline provided the owner or operator places the completed inspection report into the facility's operating record within a reasonable amount of time. In all cases, the deadline for completing subsequent inspection reports is based on the date of completing the previous inspection report. For purposes of this section, the owner or operator has completed an inspection when the inspection report has been placed in the facility's operating record as required by § 257.105(g)(6).

(ii) In any calendar year in which both the periodic inspection by a qualified professional engineer and the quinquennial (occurring every five years) structural stability assessment by a qualified professional engineer required by §§ 257.73(d) and 257.74(d) are required to be completed, the annual inspection is not required, provided the structural stability assessment is completed during the calendar year. If the annual inspection is not conducted in a year as provided by this paragraph (b)(4)(ii), the deadline for completing the next annual inspection is one year from the date of completing the quinquennial structural stability assessment.

(5) If a deficiency or release is identified during an inspection, the owner or operator must remedy the deficiency or release as soon as feasible and prepare documentation detailing the corrective measures taken.

(c) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(g), the notification requirements specified in § 257.106(g), and the internet requirements specified in § 257.107(g).

§ 257.84 Inspection requirements for CCR landfills.

(a) *Inspections by a qualified person.* (1) All CCR landfills and any lateral expansion of a CCR landfill must be examined by a qualified person as follows:

(i) At intervals not exceeding seven days, inspect for any appearances of actual or potential structural weakness and other conditions which are disrupting or have the potential to disrupt the operation or safety of the CCR unit; and

(ii) The results of the inspection by a qualified person must be recorded in the facility's operating record as required by § 257.105(g)(8).

(2) *Timeframes for inspections by a qualified person*—(i) *Existing CCR landfills.* The owner or operator of the CCR unit must initiate the inspections required under paragraph (a) of this section no later than October 19, 2015.

(ii) *New CCR landfills and any lateral expansion of a CCR landfill.* The owner or operator of the CCR unit must initiate the inspections required under paragraph (a) of this section upon initial receipt of CCR by the CCR unit.

(b) *Annual inspections by a qualified professional engineer.* (1) Existing and new CCR landfills and any lateral expansion of a CCR landfill must be inspected on a periodic basis by a qualified professional engineer to ensure that the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering standards. The inspection must, at a minimum, include:

(i) A review of available information regarding the status and condition of the CCR unit, including, but not limited to, files available in the operating record (*e.g.,* the results of inspections by a qualified person, and results of previous annual inspections); and

(ii) A visual inspection of the CCR unit to identify signs of distress or malfunction of the CCR unit.

(2) *Inspection report.* The qualified professional engineer must prepare a report following each inspection that addresses the following:

(i) Any changes in geometry of the structure since the previous annual inspection;

(ii) The approximate volume of CCR contained in the unit at the time of the inspection;

(iii) Any appearances of an actual or potential structural weakness of the CCR unit, in addition to any existing conditions that are disrupting or have the potential to disrupt the operation and safety of the CCR unit; and

(iv) Any other change(s) which may have affected the stability or operation of the CCR unit since the previous annual inspection.

(3) *Timeframes for conducting the initial inspection*—(i) *Existing CCR landfills.* The owner or operator of the CCR unit must complete the initial inspection required by paragraphs (b)(1) and (2) of this section no later than January 18, 2016.

(ii) *New CCR landfills and any lateral expansion of a CCR landfill.* The owner or operator of the CCR unit must complete the initial annual inspection required by paragraphs (b)(1) and (2) of this section no later than 14 months following the date of initial receipt of CCR in the CCR unit.

(4) *Frequency of inspections.* The owner or operator of the CCR unit must conduct the inspection required by paragraphs (b)(1) and (2) of this section on an annual basis. The date of completing the initial inspection report is the basis for establishing the deadline to complete the first subsequent inspection. Any required inspection may be conducted prior to the required deadline provided the owner or operator places the completed inspection report into the facility's operating record within a reasonable amount of time. In all cases, the deadline for completing subsequent inspection reports is based on the date of completing the previous inspection report. For purposes of this section, the owner or operator has completed an inspection when the inspection report has been placed in the facility's operating record as required by § 257.105(g)(9).

(5) If a deficiency or release is identified during an inspection, the owner or operator must remedy the deficiency or release as soon as feasible and prepare documentation detailing the corrective measures taken.

(c) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(g), the notification requirements specified in § 257.106(g), and the internet requirements specified in § 257.107(g).

Groundwater Monitoring and Corrective Action

§ 257.90 Applicability.

(a) Except as provided for in § 257.100 for inactive CCR surface impoundments, all CCR landfills, CCR surface impoundments, and lateral expansions of CCR units are subject to the groundwater monitoring and corrective action requirements under §§ 257.90 through 257.98.

(b) *Initial timeframes*—(1) *Existing CCR landfills and existing CCR surface impoundments.* No later than October 17, 2017, the owner or operator of the CCR unit must be in compliance with the following groundwater monitoring requirements:

(i) Install the groundwater monitoring system as required by § 257.91;

(ii) Develop the groundwater sampling and analysis program to include selection of the statistical procedures to be used for evaluating groundwater monitoring data as required by § 257.93;

(iii) Initiate the detection monitoring program to include obtaining a minimum of eight independent samples for each background and downgradient well as required by § 257.94(b); and

(iv) Begin evaluating the groundwater monitoring data for statistically significant increases over background levels for the constituents listed in appendix III of this part as required by § 257.94.

(2) *New CCR landfills, new CCR surface impoundments, and all lateral expansions of CCR units.* Prior to initial receipt of CCR by the CCR unit, the owner or operator must be in compliance with the groundwater monitoring requirements specified in paragraph (b)(1)(i) and (ii) of this section. In addition, the owner or operator of the CCR unit must initiate the detection monitoring program to include obtaining a minimum of eight independent samples for each background well as required by § 257.94(b).

(c) Once a groundwater monitoring system and groundwater monitoring program has been established at the CCR unit as required by this subpart, the owner or operator must conduct groundwater monitoring and, if necessary, corrective action throughout the active life and post-closure care period of the CCR unit.

(d) In the event of a release from a CCR unit, the owner or operator must immediately take all necessary measures to control the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of contaminants into the environment. The owner or operator of the CCR unit must comply with all applicable requirements in §§ 257.96, 257.97, and 257.98.

(e) *Annual groundwater monitoring and corrective action report.* For existing CCR landfills and existing CCR surface impoundments, no later than January 31, 2018, and annually thereafter, the owner or operator must prepare an annual groundwater monitoring and corrective action report. For new CCR landfills, new CCR surface impoundments, and all lateral expansions of CCR units, the owner or operator must prepare the initial annual groundwater monitoring and corrective action report no later than January 31 of the year following the calendar year a groundwater monitoring system has been established for such CCR unit as required by this subpart, and annually thereafter. For the preceding calendar year, the annual report must document the status of the groundwater monitoring and corrective action program for the CCR unit, summarize key actions completed, describe any problems encountered, discuss actions to resolve the problems, and project key activities for the upcoming year. For purposes of this section, the owner or operator has prepared the annual report when the report is placed in the facility's operating record as required by § 257.105(h)(1). At a minimum, the annual groundwater monitoring and corrective action report must contain the following information, to the extent available:

(1) A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit;

(2) Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken;

(3) In addition to all the monitoring data obtained under §§ 257.90 through 257.98, a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs;

(4) A narrative discussion of any transition between monitoring programs (*e.g.,* the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase over background levels); and

(5) Other information required to be included in the annual report as specified in §§ 257.90 through 257.98.

(f) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(h), the notification requirements specified in § 257.106(h), and the internet requirements specified in § 257.107(h).

§ 257.91 Groundwater monitoring systems.

(a) *Performance standard.* The owner or operator of a CCR unit must install a groundwater monitoring system that consists of a sufficient number of wells, installed at appropriate locations and depths, to yield groundwater samples from the uppermost aquifer that:

(1) Accurately represent the quality of background groundwater that has not been affected by leakage from a CCR unit. A determination of background quality may include sampling of wells that are not hydraulically upgradient of the CCR management area where:

(i) Hydrogeologic conditions do not allow the owner or operator of the CCR unit to determine what wells are hydraulically upgradient; or

(ii) Sampling at other wells will provide an indication of background groundwater quality that is as representative or more representative than that provided by the upgradient wells; and

(2) Accurately represent the quality of groundwater passing the waste boundary of the CCR unit. The downgradient monitoring system must be installed at the waste boundary that ensures detection of groundwater contamination in the uppermost aquifer. All potential contaminant pathways must be monitored.

(b) The number, spacing, and depths of monitoring systems shall be determined based upon site-specific technical information that must include thorough characterization of:

(1) Aquifer thickness, groundwater flow rate, groundwater flow direction including seasonal and temporal fluctuations in groundwater flow; and

(2) Saturated and unsaturated geologic units and fill materials overlying the uppermost aquifer, materials comprising the uppermost aquifer, and materials comprising the confining unit defining the lower boundary of the uppermost aquifer, including, but not limited to, thicknesses, stratigraphy, lithology, hydraulic conductivities, porosities and effective porosities.

(c) The groundwater monitoring system must include the minimum number of monitoring wells necessary to meet the performance standards specified in paragraph (a) of this section, based on the site-specific information specified in paragraph (b) of this section. The groundwater monitoring system must contain:

(1) A minimum of one upgradient and three downgradient monitoring wells; and

(2) Additional monitoring wells as necessary to accurately represent the quality of background groundwater that has not been affected by leakage from the CCR unit and the quality of groundwater passing the waste boundary of the CCR unit.

(d) The owner or operator of multiple CCR units may install a multiunit groundwater monitoring system instead of separate groundwater monitoring systems for each CCR unit.

(1) The multiunit groundwater monitoring system must be equally as capable of detecting monitored constituents at the waste boundary of

the CCR unit as the individual groundwater monitoring system specified in paragraphs (a) through (c) of this section for each CCR unit based on the following factors:

(i) Number, spacing, and orientation of each CCR unit;

(ii) Hydrogeologic setting;

(iii) Site history; and

(iv) Engineering design of the CCR unit.

(2) If the owner or operator elects to install a multiunit groundwater monitoring system, and if the multiunit system includes at least one existing unlined CCR surface impoundment as determined by § 257.71(a), and if at any time after October 19, 2015 the owner or operator determines in any sampling event that the concentrations of one or more constituents listed in appendix IV to this part are detected at statistically significant levels above the groundwater protection standard established under § 257.95(h) for the multiunit system, then all unlined CCR surface impoundments comprising the multiunit groundwater monitoring system are subject to the closure requirements under § 257.101(a) to retrofit or close.

(e) Monitoring wells must be cased in a manner that maintains the integrity of the monitoring well borehole. This casing must be screened or perforated and packed with gravel or sand, where necessary, to enable collection of groundwater samples. The annular space (*i.e.,* the space between the borehole and well casing) above the sampling depth must be sealed to prevent contamination of samples and the groundwater.

(1) The owner or operator of the CCR unit must document and include in the operating record the design, installation, development, and decommissioning of any monitoring wells, piezometers and other measurement, sampling, and analytical devices. The qualified professional engineer must be given access to this documentation when completing the groundwater monitoring system certification required under paragraph (f) of this section.

(2) The monitoring wells, piezometers, and other measurement, sampling, and analytical devices must be operated and maintained so that they perform to the design specifications throughout the life of the monitoring program.

(f) The owner or operator must obtain a certification from a qualified professional engineer stating that the groundwater monitoring system has been designed and constructed to meet the requirements of this section. If the groundwater monitoring system includes the minimum number of monitoring wells specified in paragraph (c)(1) of this section, the certification must document the basis supporting this determination.

(g) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(h), the notification requirements specified in § 257.106(h), and the internet requirements specified in § 257.107(h).

§ 257.92 [Reserved]

§ 257.93 Groundwater sampling and analysis requirements.

(a) The groundwater monitoring program must include consistent sampling and analysis procedures that are designed to ensure monitoring results that provide an accurate representation of groundwater quality at the background and downgradient wells required by § 257.91. The owner or operator of the CCR unit must develop a sampling and analysis program that includes procedures and techniques for:

(1) Sample collection;

(2) Sample preservation and shipment;

(3) Analytical procedures;

(4) Chain of custody control; and

(5) Quality assurance and quality control.

(b) The groundwater monitoring program must include sampling and analytical methods that are appropriate for groundwater sampling and that accurately measure hazardous constituents and other monitoring parameters in groundwater samples. For purposes of §§ 257.90 through 257.98, the term *constituent* refers to both hazardous constituents and other monitoring parameters listed in either appendix III or IV of this part.

(c) Groundwater elevations must be measured in each well immediately prior to purging, each time groundwater is sampled. The owner or operator of the CCR unit must determine the rate and direction of groundwater flow each time groundwater is sampled. Groundwater elevations in wells which monitor the same CCR management area must be measured within a period of time short enough to avoid temporal variations in groundwater flow which could preclude accurate determination of groundwater flow rate and direction.

(d) The owner or operator of the CCR unit must establish background groundwater quality in a hydraulically upgradient or background well(s) for each of the constituents required in the particular groundwater monitoring program that applies to the CCR unit as determined under § 257.94(a) or § 257.95(a). Background groundwater quality may be established at wells that are not located hydraulically upgradient from the CCR unit if it meets the requirements of § 257.91(a)(1).

(e) The number of samples collected when conducting detection monitoring and assessment monitoring (for both downgradient and background wells) must be consistent with the statistical procedures chosen under paragraph (f) of this section and the performance standards under paragraph (g) of this section. The sampling procedures shall be those specified under § 257.94(b) through (d) for detection monitoring, § 257.95(b) through (d) for assessment monitoring, and § 257.96(b) for corrective action.

(f) The owner or operator of the CCR unit must select one of the statistical methods specified in paragraphs (f)(1) through (5) of this section to be used in evaluating groundwater monitoring data for each specified constituent. The statistical test chosen shall be conducted separately for each constituent in each monitoring well.

(1) A parametric analysis of variance followed by multiple comparison procedures to identify statistically significant evidence of contamination. The method must include estimation and testing of the contrasts between each compliance well's mean and the background mean levels for each constituent.

(2) An analysis of variance based on ranks followed by multiple comparison procedures to identify statistically significant evidence of contamination. The method must include estimation and testing of the contrasts between each compliance well's median and the background median levels for each constituent.

(3) A tolerance or prediction interval procedure, in which an interval for each constituent is established from the distribution of the background data and the level of each constituent in each compliance well is compared to the upper tolerance or prediction limit.

(4) A control chart approach that gives control limits for each constituent.

(5) Another statistical test method that meets the performance standards of paragraph (g) of this section.

(6) The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating that the selected statistical method is appropriate for evaluating the groundwater monitoring data for the CCR management area. The certification must include a narrative description of the statistical method selected to evaluate the groundwater monitoring data.

(g) Any statistical method chosen under paragraph (f) of this section shall comply with the following performance standards, as appropriate, based on the statistical test method used:

(1) The statistical method used to evaluate groundwater monitoring data shall be appropriate for the distribution of constituents. Normal distributions of data values shall use parametric methods. Non-normal distributions shall use non-parametric methods. If the distribution of the constituents is shown by the owner or operator of the CCR unit to be inappropriate for a normal theory test, then the data must be transformed or a distribution-free (non-parametric) theory test must be used. If the distributions for the constituents differ, more than one statistical method may be needed.

(2) If an individual well comparison procedure is used to compare an individual compliance well constituent concentration with background constituent concentrations or a groundwater protection standard, the test shall be done at a Type I error level no less than 0.01 for each testing period. If a multiple comparison procedure is used, the Type I experiment wise error rate for each testing period shall be no less than 0.05; however, the Type I error of no less than 0.01 for individual well comparisons must be maintained. This performance standard does not apply to tolerance intervals, prediction intervals, or control charts.

(3) If a control chart approach is used to evaluate groundwater monitoring data, the specific type of control chart and its associated parameter values shall be such that this approach is at least as effective as any other approach in this section for evaluating groundwater data. The parameter values shall be determined after considering the number of samples in the background data base, the data distribution, and the range of the concentration values for each constituent of concern.

(4) If a tolerance interval or a predictional interval is used to evaluate groundwater monitoring data, the levels of confidence and, for tolerance intervals, the percentage of the population that the interval must contain, shall be such that this approach is at least as effective as any other approach in this section for evaluating groundwater data. These parameters shall be determined after considering the number of samples in the background data base, the data distribution, and the range of the concentration values for each constituent of concern.

(5) The statistical method must account for data below the limit of detection with one or more statistical procedures that shall at least as effective as any other approach in this section for evaluating groundwater data. Any practical quantitation limit that is used in the statistical method shall be the lowest concentration level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions that are available to the facility.

(6) If necessary, the statistical method must include procedures to control or correct for seasonal and spatial variability as well as temporal correlation in the data.

(h) The owner or operator of the CCR unit must determine whether or not there is a statistically significant increase over background values for each constituent required in the particular groundwater monitoring program that applies to the CCR unit, as determined under § 257.94(a) or § 257.95(a).

(1) In determining whether a statistically significant increase has occurred, the owner or operator must compare the groundwater quality of each constituent at each monitoring well designated pursuant to § 257.91(a)(2) or (d)(1) to the background value of that constituent, according to the statistical procedures and performance standards specified under paragraphs (f) and (g) of this section.

(2) Within 90 days after completing sampling and analysis, the owner or operator must determine whether there has been a statistically significant increase over background for any constituent at each monitoring well.

(i) The owner or operator must measure ''total recoverable metals'' concentrations in measuring groundwater quality. Measurement of total recoverable metals captures both the particulate fraction and dissolved fraction of metals in natural waters. Groundwater samples shall not be field-filtered prior to analysis.

(j) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(h), the notification requirements specified in § 257.106(h), and the Internet requirements specified in § 257.107(h).

§ 257.94 Detection monitoring program.

(a) The owner or operator of a CCR unit must conduct detection monitoring at all groundwater monitoring wells consistent with this section. At a minimum, a detection monitoring program must include groundwater monitoring for all constituents listed in appendix III to this part.

(b) Except as provided in paragraph (d) of this section, the monitoring frequency for the constituents listed in appendix III to this part shall be at least semiannual during the active life of the CCR unit and the post-closure period. For existing CCR landfills and existing CCR surface impoundments, a minimum of eight independent samples from each background and downgradient well must be collected and analyzed for the constituents listed in appendix III and IV to this part no later than October 17, 2017. For new CCR landfills, new CCR surface impoundments, and all lateral expansions of CCR units, a minimum of eight independent samples for each background well must be collected and analyzed for the constituents listed in appendices III and IV to this part during the first six months of sampling.

(c) The number of samples collected and analyzed for each background well and downgradient well during subsequent semiannual sampling events must be consistent with § 257.93(e), and must account for any unique characteristics of the site, but must be at least one sample from each background and downgradient well.

(d) The owner or operator of a CCR unit may demonstrate the need for an alternative monitoring frequency for repeated sampling and analysis for constituents listed in appendix III to this part during the active life and the post-closure care period based on the availability of groundwater. If there is not adequate groundwater flow to sample wells semiannually, the alternative frequency shall be no less than annual. The need to vary monitoring frequency must be evaluated on a site-specific basis. The demonstration must be supported by, at a minimum, the information specified in paragraphs (d)(1) and (2) of this section.

(1) Information documenting that the need for less frequent sampling. The alternative frequency must be based on consideration of the following factors:

(i) Lithology of the aquifer and unsaturated zone;

(ii) Hydraulic conductivity of the aquifer and unsaturated zone; and

(iii) Groundwater flow rates.

(2) Information documenting that the alternative frequency will be no less effective in ensuring that any leakage from the CCR unit will be discovered within a timeframe that will not materially delay establishment of an assessment monitoring program.

(3) The owner or operator must obtain a certification from a qualified

professional engineer stating that the demonstration for an alternative groundwater sampling and analysis frequency meets the requirements of this section. The owner or operator must include the demonstration providing the basis for the alternative monitoring frequency and the certification by a qualified professional engineer in the annual groundwater monitoring and corrective action report required by § 257.90(e).

(e) If the owner or operator of the CCR unit determines, pursuant to § 257.93(h) that there is a statistically significant increase over background levels for one or more of the constituents listed in appendix III to this part at any monitoring well at the waste boundary specified under § 257.91(a)(2), the owner or operator must:

(1) Except as provided for in paragraph (e)(2) of this section, within 90 days of detecting a statistically significant increase over background levels for any constituent, establish an assessment monitoring program meeting the requirements of § 257.95.

(2) The owner or operator may demonstrate that a source other than the CCR unit caused the statistically significant increase over background levels for a constituent or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. The owner or operator must complete the written demonstration within 90 days of detecting a statistically significant increase over background levels to include obtaining a certification from a qualified professional engineer verifying the accuracy of the information in the report. If a successful demonstration is completed within the 90-day period, the owner or operator of the CCR unit may continue with a detection monitoring program under this section. If a successful demonstration is not completed within the 90-day period, the owner or operator of the CCR unit must initiate an assessment monitoring program as required under § 257.95. The owner or operator must also include the demonstration in the annual groundwater monitoring and corrective action report required by § 257.90(e), in addition to the certification by a qualified professional engineer.

(3) The owner or operator of a CCR unit must prepare a notification stating that an assessment monitoring program has been established. The owner or operator has completed the notification when the notification is placed in the facility's operating record as required by § 257.105(h)(5).

(f) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(h), the notification requirements specified in § 257.106(h), and the Internet requirements specified in § 257.107(h).

§ 257.95 Assessment monitoring program.

(a) Assessment monitoring is required whenever a statistically significant increase over background levels has been detected for one or more of the constituents listed in appendix III to this part.

(b) Within 90 days of triggering an assessment monitoring program, and annually thereafter, the owner or operator of the CCR unit must sample and analyze the groundwater for all constituents listed in appendix IV to this part. The number of samples collected and analyzed for each well during each sampling event must be consistent with § 257.93(e), and must account for any unique characteristics of the site, but must be at least one sample from each well.

(c) The owner or operator of a CCR unit may demonstrate the need for an alternative monitoring frequency for repeated sampling and analysis for constituents listed in appendix IV to this part during the active life and the post-closure care period based on the availability of groundwater. If there is not adequate groundwater flow to sample wells semiannually, the alternative frequency shall be no less than annual. The need to vary monitoring frequency must be evaluated on a site-specific basis. The demonstration must be supported by, at a minimum, the information specified in paragraphs (c)(1) and (2) of this section.

(1) Information documenting that the need for less frequent sampling. The alternative frequency must be based on consideration of the following factors:

(i) Lithology of the aquifer and unsaturated zone;

(ii) Hydraulic conductivity of the aquifer and unsaturated zone; and

(iii) Groundwater flow rates.

(2) Information documenting that the alternative frequency will be no less effective in ensuring that any leakage from the CCR unit will be discovered within a timeframe that will not materially delay the initiation of any necessary remediation measures.

(3) The owner or operator must obtain a certification from a qualified professional engineer stating that the demonstration for an alternative groundwater sampling and analysis frequency meets the requirements of this section. The owner or operator must include the demonstration providing the basis for the alternative monitoring frequency and the certification by a qualified professional engineer in the annual groundwater monitoring and corrective action report required by § 257.90(e).

(d) After obtaining the results from the initial and subsequent sampling events required in paragraph (b) of this section, the owner or operator must:

(1) Within 90 days of obtaining the results, and on at least a semiannual basis thereafter, resample all wells that were installed pursuant to the requirements of § 257.91, conduct analyses for all parameters in appendix III to this part and for those constituents in appendix IV to this part that are detected in response to paragraph (b) of this section, and record their concentrations in the facility operating record. The number of samples collected and analyzed for each background well and downgradient well during subsequent semiannual sampling events must be consistent with § 257.93(e), and must account for any unique characteristics of the site, but must be at least one sample from each background and downgradient well;

(2) Establish groundwater protection standards for all constituents detected pursuant to paragraph (b) or (d) of this section. The groundwater protection standards must be established in accordance with paragraph (h) of this section; and

(3) Include the recorded concentrations required by paragraph (d)(1) of this section, identify the background concentrations established under § 257.94(b), and identify the groundwater protection standards established under paragraph (d)(2) of this section in the annual groundwater monitoring and corrective action report required by § 257.90(e).

(e) If the concentrations of all constituents listed in appendices III and IV to this part are shown to be at or below background values, using the statistical procedures in § 257.93(g), for two consecutive sampling events, the owner or operator may return to detection monitoring of the CCR unit. The owner or operator must prepare a notification stating that detection monitoring is resuming for the CCR unit. The owner or operator has completed the notification when the notification is placed in the facility's operating record as required by § 257.105(h)(7).

(f) If the concentrations of any constituent in appendices III and IV to this part are above background values, but all concentrations are below the groundwater protection standard established under paragraph (h) of this section, using the statistical procedures in § 257.93(g), the owner or operator must continue assessment monitoring in accordance with this section.

(g) If one or more constituents in appendix IV to this part are detected at statistically significant levels above the groundwater protection standard established under paragraph (h) of this section in any sampling event, the owner or operator must prepare a notification identifying the constituents in appendix IV to this part that have exceeded the groundwater protection standard. The owner or operator has completed the notification when the notification is placed in the facility's operating record as required by § 257.105(h)(8). The owner or operator of the CCR unit also must:

(1) Characterize the nature and extent of the release and any relevant site conditions that may affect the remedy ultimately selected. The characterization must be sufficient to support a complete and accurate assessment of the corrective measures necessary to effectively clean up all releases from the CCR unit pursuant to § 257.96. Characterization of the release includes the following minimum measures:

(i) Install additional monitoring wells necessary to define the contaminant plume(s);

(ii) Collect data on the nature and estimated quantity of material released including specific information on the constituents listed in appendix IV of this part and the levels at which they are present in the material released;

(iii) Install at least one additional monitoring well at the facility boundary in the direction of contaminant migration and sample this well in accordance with paragraph (d)(1) of this section; and

(iv) Sample all wells in accordance with paragraph (d)(1) of this section to characterize the nature and extent of the release.

(2) Notify all persons who own the land or reside on the land that directly overlies any part of the plume of contamination if contaminants have migrated off-site if indicated by sampling of wells in accordance with paragraph (g)(1) of this section. The owner or operator has completed the notifications when they are placed in the facility's operating record as required by § 257.105(h)(8).

(3) Within 90 days of finding that any of the constituents listed in appendix IV to this part have been detected at a statistically significant level exceeding the groundwater protection standards the owner or operator must either:

(i) Initiate an assessment of corrective measures as required by § 257.96; or

(ii) Demonstrate that a source other than the CCR unit caused the contamination, or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. Any such demonstration must be supported by a report that includes the factual or evidentiary basis for any conclusions and must be certified to be accurate by a qualified professional engineer. If a successful demonstration is made, the owner or operator must continue monitoring in accordance with the assessment monitoring program pursuant to this section, and may return to detection monitoring if the constituents in appendices III and IV to this part are at or below background as specified in paragraph (e) of this section. The owner or operator must also include the demonstration in the annual groundwater monitoring and corrective action report required by § 257.90(e), in addition to the certification by a qualified professional engineer.

(4) If a successful demonstration has not been made at the end of the 90 day period provided by paragraph (g)(3)(ii) of this section, the owner or operator of the CCR unit must initiate the assessment of corrective measures requirements under § 257.96.

(5) If an assessment of corrective measures is required under § 257.96 by either paragraph (g)(3)(i) or (g)(4) of this section, and if the CCR unit is an existing unlined CCR surface impoundment as determined by § 257.71(a), then the CCR unit is subject to the closure requirements under § 257.101(a) to retrofit or close. In addition, the owner or operator must prepare a notification stating that an assessment of corrective measures has been initiated.

(h) The owner or operator of the CCR unit must establish a groundwater protection standard for each constituent in appendix IV to this part detected in the groundwater. The groundwater protection standard shall be:

(1) For constituents for which a maximum contaminant level (MCL) has been established under §§ 141.62 and 141.66 of this title, the MCL for that constituent;

(2) For constituents for which an MCL has not been established, the background concentration for the constituent established from wells in accordance with § 257.91; or

(3) For constituents for which the background level is higher than the MCL identified under paragraph (h)(1) of this section, the background concentration.

(i) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(h), the notification requirements specified in § 257.106(h), and the Internet requirements specified in § 257.107(h).

§ 257.96 Assessment of corrective measures.

(a) Within 90 days of finding that any constituent listed in appendix IV to this part has been detected at a statistically significant level exceeding the groundwater protection standard defined under § 257.95(h), or immediately upon detection of a release from a CCR unit, the owner or operator must initiate an assessment of corrective measures to prevent further releases, to remediate any releases and to restore affected area to original conditions. The assessment of corrective measures must be completed within 90 days, unless the owner or operator demonstrates the need for additional time to complete the assessment of corrective measures due to site-specific conditions or circumstances. The owner or operator must obtain a certification from a qualified professional engineer attesting that the demonstration is accurate. The 90-day deadline to complete the assessment of corrective measures may be extended for no longer than 60 days. The owner or operator must also include the demonstration in the annual groundwater monitoring and corrective action report required by § 257.90(e), in addition to the certification by a qualified professional engineer.

(b) The owner or operator of the CCR unit must continue to monitor groundwater in accordance with the assessment monitoring program as specified in § 257.95.

(c) The assessment under paragraph (a) of this section must include an analysis of the effectiveness of potential corrective measures in meeting all of the requirements and objectives of the remedy as described under § 257.97 addressing at least the following:

(1) The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination;

(2) The time required to begin and complete the remedy;

(3) The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s).

(d) The owner or operator must place the completed assessment of corrective measures in the facility's operating record. The assessment has been completed when it is placed in the facility's operating record as required by § 257.105(h)(10).

(e) The owner or operator must discuss the results of the corrective measures assessment at least 30 days prior to the selection of remedy, in a public meeting with interested and affected parties.

(f) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(h), the notification requirements specified in § 257.106(h), and the Internet requirements specified in § 257.107(h).

§ 257.97 Selection of remedy.

(a) Based on the results of the corrective measures assessment conducted under § 257.96, the owner or operator must, as soon as feasible, select a remedy that, at a minimum, meets the standards listed in paragraph (b) of this section. This requirement applies to, not in place of, any applicable standards under the Occupational Safety and Health Act. The owner or operator must prepare a semiannual report describing the progress in selecting and designing the remedy. Upon selection of a remedy, the owner or operator must prepare a final report describing the selected remedy and how it meets the standards specified in paragraph (b) of this section. The owner or operator must obtain a certification from a qualified professional engineer that the remedy selected meets the requirements of this section. The report has been completed when it is placed in the operating record as required by § 257.105(h)(12).

(b) Remedies must:

(1) Be protective of human health and the environment;

(2) Attain the groundwater protection standard as specified pursuant to § 257.95(h);

(3) Control the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of constituents in appendix IV to this part into the environment;

(4) Remove from the environment as much of the contaminated material that was released from the CCR unit as is feasible, taking into account factors such as avoiding inappropriate disturbance of sensitive ecosystems;

(5) Comply with standards for management of wastes as specified in § 257.98(d).

(c) In selecting a remedy that meets the standards of paragraph (b) of this section, the owner or operator of the CCR unit shall consider the following evaluation factors:

(1) The long- and short-term effectiveness and protectiveness of the potential remedy(s), along with the degree of certainty that the remedy will prove successful based on consideration of the following:

(i) Magnitude of reduction of existing risks;

(ii) Magnitude of residual risks in terms of likelihood of further releases due to CCR remaining following implementation of a remedy;

(iii) The type and degree of long-term management required, including monitoring, operation, and maintenance;

(iv) Short-term risks that might be posed to the community or the environment during implementation of such a remedy, including potential threats to human health and the environment associated with excavation, transportation, and re-disposal of contaminant;

(v) Time until full protection is achieved;

(vi) Potential for exposure of humans and environmental receptors to remaining wastes, considering the potential threat to human health and the environment associated with excavation, transportation, re-disposal, or containment;

(vii) Long-term reliability of the engineering and institutional controls; and

(viii) Potential need for replacement of the remedy.

(2) The effectiveness of the remedy in controlling the source to reduce further releases based on consideration of the following factors:

(i) The extent to which containment practices will reduce further releases; and

(ii) The extent to which treatment technologies may be used.

(3) The ease or difficulty of implementing a potential remedy(s) based on consideration of the following types of factors:

(i) Degree of difficulty associated with constructing the technology;

(ii) Expected operational reliability of the technologies;

(iii) Need to coordinate with and obtain necessary approvals and permits from other agencies;

(iv) Availability of necessary equipment and specialists; and

(v) Available capacity and location of needed treatment, storage, and disposal services.

(4) The degree to which community concerns are addressed by a potential remedy(s).

(d) The owner or operator must specify as part of the selected remedy a schedule(s) for implementing and completing remedial activities. Such a schedule must require the completion of remedial activities within a reasonable period of time taking into consideration the factors set forth in paragraphs (d)(1) through (6) of this section. The owner or operator of the CCR unit must consider the following factors in determining the schedule of remedial activities:

(1) Extent and nature of contamination, as determined by the characterization required under § 257.95(g);

(2) Reasonable probabilities of remedial technologies in achieving compliance with the groundwater protection standards established under § 257.95(h) and other objectives of the remedy;

(3) Availability of treatment or disposal capacity for CCR managed during implementation of the remedy;

(4) Potential risks to human health and the environment from exposure to contamination prior to completion of the remedy;

(5) Resource value of the aquifer including:

(i) Current and future uses;

(ii) Proximity and withdrawal rate of users;

(iii) Groundwater quantity and quality;

(iv) The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to CCR constituents;

(v) The hydrogeologic characteristic of the facility and surrounding land; and

(vi) The availability of alternative water supplies; and

(6) Other relevant factors.

(e) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(h), the notification requirements specified in § 257.106(h), and the Internet requirements specified in § 257.107(h).

§ 257.98 Implementation of the corrective action program.

(a) Within 90 days of selecting a remedy under § 257.97, the owner or operator must initiate remedial activities. Based on the schedule established under § 257.97(d) for implementation and completion of remedial activities the owner or operator must:

(1) Establish and implement a corrective action groundwater monitoring program that:

(i) At a minimum, meets the requirements of an assessment monitoring program under § 257.95;

(ii) Documents the effectiveness of the corrective action remedy; and

(iii) Demonstrates compliance with the groundwater protection standard pursuant to paragraph (c) of this section.

(2) Implement the corrective action remedy selected under § 257.97; and

(3) Take any interim measures necessary to reduce the contaminants leaching from the CCR unit, and/or potential exposures to human or ecological receptors. Interim measures must, to the greatest extent feasible, be consistent with the objectives of and contribute to the performance of any remedy that may be required pursuant to § 257.97. The following factors must be considered by an owner or operator in determining whether interim measures are necessary:

(i) Time required to develop and implement a final remedy;

(ii) Actual or potential exposure of nearby populations or environmental receptors to any of the constituents listed in appendix IV of this part;

(iii) Actual or potential contamination of drinking water supplies or sensitive ecosystems;

(iv) Further degradation of the groundwater that may occur if remedial action is not initiated expeditiously;

(v) Weather conditions that may cause any of the constituents listed in appendix IV to this part to migrate or be released;

(vi) Potential for exposure to any of the constituents listed in appendix IV to this part as a result of an accident or failure of a container or handling system; and

(vii) Other situations that may pose threats to human health and the environment.

(b) If an owner or operator of the CCR unit, determines, at any time, that compliance with the requirements of § 257.97(b) is not being achieved through the remedy selected, the owner or operator must implement other methods or techniques that could feasibly achieve compliance with the requirements.

(c) Remedies selected pursuant to § 257.97 shall be considered complete when:

(1) The owner or operator of the CCR unit demonstrates compliance with the groundwater protection standards established under § 257.95(h) has been achieved at all points within the plume of contamination that lie beyond the groundwater monitoring well system established under § 257.91.

(2) Compliance with the groundwater protection standards established under § 257.95(h) has been achieved by demonstrating that concentrations of constituents listed in appendix IV to this part have not exceeded the groundwater protection standard(s) for a period of three consecutive years using the statistical procedures and performance standards in § 257.93(f) and (g).

(3) All actions required to complete the remedy have been satisfied.

(d) All CCR that are managed pursuant to a remedy required under § 257.97, or an interim measure required under paragraph (a)(3) of this section, shall be managed in a manner that complies with all applicable RCRA requirements.

(e) Upon completion of the remedy, the owner or operator must prepare a notification stating that the remedy has been completed. The owner or operator must obtain a certification from a qualified professional engineer attesting that the remedy has been completed in compliance with the requirements of paragraph (c) of this section. The report has been completed when it is placed in the operating record as required by § 257.105(h)(13).

(f) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(h), the notification requirements specified in § 257.106(h), and the internet requirements specified in § 257.107(h).

Closure and Post-Closure Care

§ 257.100 Inactive CCR surface impoundments.

(a) Except as provided by paragraph (b) of this section, inactive CCR surface impoundments are subject to all of the requirements of this subpart applicable to existing CCR surface impoundments.

(b) An owner or operator of an inactive CCR surface impoundment that completes closure of such CCR unit, and meets all of the requirements of either paragraphs (b)(1) through (4) of this section or paragraph (b)(5) of this section no later than April 17, 2018, is exempt from all other requirements of this subpart.

(1) *Closure by leaving CCR in place.* If the owner or operator of the inactive CCR surface impoundment elects to close the CCR surface impoundment by leaving CCR in place, the owner or operator must ensure that, at a minimum, the CCR unit is closed in a manner that will:

(i) Control, minimize or eliminate, to the maximum extent feasible, post-closure infiltration of liquids into the waste and releases of CCR, leachate, or contaminated run-off to the ground or surface waters or to the atmosphere;

(ii) Preclude the probability of future impoundment of water, sediment, or slurry;

(iii) Include measures that provide for major slope stability to prevent the sloughing or movement of the final cover system; and

(iv) Minimize the need for further maintenance of the CCR unit.

(2) The owner or operator of the inactive CCR surface impoundment must meet the requirements of paragraphs (b)(2)(i) and (ii) of this section prior to installing the final cover system required under paragraph (b)(3) of this section.

(i) Free liquids must be eliminated by removing liquid wastes or solidifying the remaining wastes and waste residues.

(ii) Remaining wastes must be stabilized sufficient to support the final cover system.

(3) The owner or operator must install a final cover system that is designed to minimize infiltration and erosion, and at a minimum, meets the requirements of paragraph (b)(3)(i) of this section, or the requirements of an alternative final cover system specified in paragraph (b)(3)(ii) of this section.

(i) The final cover system must be designed and constructed to meet the criteria specified in paragraphs (b)(3)(i)(A) through (D) of this section.

(A) The permeability of the final cover system must be less than or equal to the permeability of any bottom liner system or natural subsoils present, or a permeability no greater than 1×10^{-5} centimeters/second, whichever is less.

(B) The infiltration of liquids through the CCR unit must be minimized by the use of an infiltration layer that contains a minimum of 18 inches of earthen material.

(C) The erosion of the final cover system must be minimized by the use of an erosion layer that contains a minimum of six inches of earthen material that is capable of sustaining native plant growth.

(D) The disruption of the integrity of the final cover system must be minimized through a design that accommodates settling and subsidence.

(ii) The owner or operator may select an alternative final cover system design, provided the alternative final cover system is designed and constructed to meet the criteria in paragraphs (b)(3)(ii)(A) through (C) of this section.

(A) The design of the final cover system must include an infiltration layer that achieves an equivalent reduction in infiltration as the infiltration layer specified in paragraphs (b)(3)(i)(A) and (B) of this section.

(B) The design of the final cover system must include an erosion layer that provides equivalent protection from wind or water erosion as the erosion layer specified in paragraph (b)(3)(i)(C) of this section.

(C) The disruption of the integrity of the final cover system must be minimized through a design that accommodates settling and subsidence.

(4) The owner or operator of the CCR surface impoundment must obtain a written certification from a qualified professional engineer stating that the design of the final cover system meets either the requirements of paragraphs (b)(3)(i) or (ii) of this section.

(5) *Closure through removal of CCR.* The owner or operator may alternatively elect to close an inactive CCR surface impoundment by removing and decontaminating all areas affected by releases from the CCR surface impoundment. CCR removal and decontamination of the CCR surface impoundment are complete when all CCR in the inactive CCR surface impoundment is removed, including the bottom liner of the CCR unit.

(6) The owner or operator of the CCR surface impoundment must obtain a written certification from a qualified professional engineer that closure of the CCR surface impoundment under either paragraphs (b)(1) through (4) or (b)(5) of this section is technically feasible within the timeframe in paragraph (b) of this section.

(7) If the owner or operator of the CCR surface impoundment fails to complete closure of the inactive CCR surface impoundment within the timeframe in paragraph (b) of this section, the CCR unit must comply with all of the requirements applicable to existing CCR surface impoundments under this subpart.

(c) *Required notices and progress reports.* An owner or operator of an inactive CCR surface impoundment that closes in accordance with paragraph (b) of this section must complete the notices and progress reports specified in paragraphs (c)(1) through (3) of this section.

(1) No later than December 17, 2015, the owner or operator must prepare and place in the facility's operating record a notification of intent to initiate closure of the CCR surface impoundment. The notification must state that the CCR surface impoundment is an inactive CCR surface impoundment closing under the requirements of paragraph (b) of this section. The notification must also include a narrative description of how the CCR surface impoundment will be closed, a schedule for completing closure activities, and the required certifications under paragraphs (b)(4) and (6) of this section, if applicable.

(2) The owner or operator must prepare periodic progress reports summarizing the progress of closure implementation, including a description of the actions completed to date, any problems encountered and a description of the actions taken to resolve the problems, and projected closure activities for the upcoming year. The annual progress reports must be completed according to the following schedule:

(i) The first annual progress report must be prepared no later than 13 months after completing the notification of intent to initiate closure required by paragraph (c)(1) of this section.

(ii) The second annual progress report must be prepared no later than 12 months after completing the first progress report required by paragraph (c)(2)(i) of this section.

(iii) The owner or operator has completed the progress reports specified in paragraph (c)(2) of this section when the reports are placed in the facility's operating record as required by § 257.105(i)(2).

(3) The owner or operator must prepare and place in the facility's operating record a notification of completion of closure of the CCR surface impoundment. The notification must be submitted within 60 days of completing closure of the CCR surface impoundment and must include a written certification from a qualified professional engineer stating that the CCR surface impoundment was closed in accordance with the requirements of either paragraph (b)(1) through (4) or (b)(5) of this section.

(d) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(i), the notification requirements specified in § 257.106(i), and the internet requirements specified in § 257.107(i).

§ 257.101 Closure or retrofit of CCR units.

(a) The owner or operator of an existing unlined CCR surface impoundment, as determined under § 257.71(a), is subject to the requirements of paragraph (a)(1) of this section.

(1) Except as provided by paragraph (a)(3) of this section, if at any time after October 19, 2015 an owner or operator of an existing unlined CCR surface impoundment determines in any sampling event that the concentrations of one or more constituents listed in appendix IV to this part are detected at statistically significant levels above the groundwater protection standard established under § 257.95(h) for such CCR unit, within six months of making such determination, the owner or operator of the existing unlined CCR surface impoundment must cease placing CCR and non-CCR wastestreams into such CCR surface impoundment and either retrofit or close the CCR unit in accordance with the requirements of § 257.102.

(2) An owner or operator of an existing unlined CCR surface impoundment that closes in accordance with paragraph (a)(1) of this section must include a statement in the notification required under § 257.102(g) or (k)(5) that the CCR surface impoundment is closing or retrofitting under the requirements of paragraph (a)(1) of this section.

(3) The timeframe specified in paragraph (a)(1) of this section does not apply if the owner or operator complies with the alternative closure procedures specified in § 257.103.

(4) At any time after the initiation of closure under paragraph (a)(1) of this section, the owner or operator may cease closure activities and initiate a retrofit of the CCR unit in accordance with the requirements of § 257.102(k).

(b) The owner or operator of an existing CCR surface impoundment is subject to the requirements of paragraph (b)(1) of this section.

(1) Except as provided by paragraph (b)(4) of this section, within six months of determining that an existing CCR surface impoundment has not demonstrated compliance with any location standard specified in §§ 257.60(a), 257.61(a), 257.62(a), 257.63(a), and 257.64(a), the owner or operator of the CCR surface impoundment must cease placing CCR and non-CCR wastestreams into such CCR unit and close the CCR unit in accordance with the requirements of § 257.102.

(2) Within six months of either failing to complete the initial or any subsequent periodic safety factor assessment required by § 257.73(e) by the deadlines specified in § 257.73(f)(1) through (3) or failing to document that the calculated factors of safety for the existing CCR surface impoundment achieve the minimum safety factors specified in § 257.73(e)(1)(i) through (iv), the owner or operator of the CCR surface impoundment must cease placing CCR and non-CCR wastestreams into such CCR unit and close the CCR unit in accordance with the requirements of § 257.102.

(3) An owner or operator of an existing CCR surface impoundment that closes in accordance with paragraphs (b)(1) or (2) of this section must include a statement in the notification required under § 257.102(g) that the CCR surface impoundment is closing under the requirements of paragraphs (b)(1) or (2) of this section.

(4) The timeframe specified in paragraph (b)(1) of this section does not apply if the owner or operator complies with the alternative closure procedures specified in § 257.103.

(c) The owner or operator of a new CCR surface impoundment is subject to the requirements of paragraph (c)(1) of this section.

(1) Within six months of either failing to complete the initial or any subsequent periodic safety factor assessment required by § 257.74(e) by the deadlines specified in § 257.74(f)(1) through (3) or failing to document that the calculated factors of safety for the new CCR surface impoundment achieve the minimum safety factors specified in § 257.74(e)(1)(i) through (v), the owner or operator of the CCR surface impoundment must cease placing CCR and non-CCR wastestreams into such CCR unit and close the CCR unit in accordance with the requirements of § 257.102.

(2) An owner or operator of an new CCR surface impoundment that closes in accordance with paragraph (c)(1) of this section must include a statement in the notification required under § 257.102(g) that the CCR surface impoundment is closing under the requirements of paragraph (c)(1) of this section.

(d) The owner or operator of an existing CCR landfill is subject to the requirements of paragraph (d)(1) of this section.

(1) Except as provided by paragraph (d)(3) of this section, within six months of determining that an existing CCR landfill has not demonstrated compliance with the location restriction for unstable areas specified in § 257.64(a), the owner or operator of the CCR unit must cease placing CCR and non-CCR waste streams into such CCR landfill and close the CCR unit in accordance with the requirements of § 257.102.

(2) An owner or operator of an existing CCR landfill that closes in accordance with paragraph (d)(1) of this section must include a statement in the notification required under § 257.102(g) that the CCR landfill is closing under the requirements of paragraph (d)(1) of this section.

(3) The timeframe specified in paragraph (d)(1) of this section does not apply if the owner or operator complies with the alternative closure procedures specified in § 257.103.

§ 257.102 Criteria for conducting the closure or retrofit of CCR units.

(a) Closure of a CCR landfill, CCR surface impoundment, or any lateral expansion of a CCR unit must be completed either by leaving the CCR in place and installing a final cover system or through removal of the CCR and decontamination of the CCR unit, as described in paragraphs (b) through (j) of this section. Retrofit of a CCR surface impoundment must be completed in accordance with the requirements in paragraph (k) of this section.

(b) *Written closure plan*—(1) *Content of the plan.* The owner or operator of a CCR unit must prepare a written closure plan that describes the steps necessary to close the CCR unit at any point during the active life of the CCR unit consistent with recognized and generally accepted good engineering practices. The written closure plan must include, at a minimum, the information specified in paragraphs (b)(1)(i) through (vi) of this section.

(i) A narrative description of how the CCR unit will be closed in accordance with this section.

(ii) If closure of the CCR unit will be accomplished through removal of CCR from the CCR unit, a description of the procedures to remove the CCR and decontaminate the CCR unit in accordance with paragraph (c) of this section.

(iii) If closure of the CCR unit will be accomplished by leaving CCR in place, a description of the final cover system, designed in accordance with paragraph (d) of this section, and the methods and procedures to be used to install the final cover. The closure plan must also discuss how the final cover system will achieve the performance standards specified in paragraph (d) of this section.

(iv) An estimate of the maximum inventory of CCR ever on-site over the active life of the CCR unit.

(v) An estimate of the largest area of the CCR unit ever requiring a final cover as required by paragraph (d) of this section at any time during the CCR unit's active life.

(vi) A schedule for completing all activities necessary to satisfy the closure criteria in this section, including an estimate of the year in which all closure activities for the CCR unit will be completed. The schedule should provide sufficient information to describe the sequential steps that will be taken to close the CCR unit, including identification of major milestones such as coordinating with and obtaining necessary approvals and permits from other agencies, the dewatering and stabilization phases of CCR surface impoundment closure, or installation of the final cover system, and the estimated timeframes to complete each step or phase of CCR unit closure. When preparing the written closure plan, if the owner or operator of a CCR unit estimates that the time required to complete closure will exceed the timeframes specified in paragraph (f)(1) of this section, the written closure plan must include the site-specific information, factors and considerations that would support any time extension sought under paragraph (f)(2) of this section.

(2) *Timeframes for preparing the initial written closure plan*—(i) *Existing CCR landfills and existing CCR surface impoundments.* No later than October 17, 2016, the owner or operator of the CCR unit must prepare an initial written closure plan consistent with the requirements specified in paragraph (b)(1) of this section.

(ii) *New CCR landfills and new CCR surface impoundments, and any lateral expansion of a CCR unit.* No later than the date of the initial receipt of CCR in the CCR unit, the owner or operator must prepare an initial written closure plan consistent with the requirements specified in paragraph (b)(1) of this section.

(iii) The owner or operator has completed the written closure plan when the plan, including the certification required by paragraph (b)(4) of this section, has been placed in the facility's operating record as required by § 257.105(i)(4).

(3) *Amendment of a written closure plan.* (i) The owner or operator may amend the initial or any subsequent written closure plan developed pursuant to paragraph (b)(1) of this section at any time.

(ii) The owner or operator must amend the written closure plan whenever:

(A) There is a change in the operation of the CCR unit that would substantially affect the written closure plan in effect; or

(B) Before or after closure activities have commenced, unanticipated events necessitate a revision of the written closure plan.

(iii) The owner or operator must amend the closure plan at least 60 days prior to a planned change in the operation of the facility or CCR unit, or no later than 60 days after an unanticipated event requires the need to revise an existing written closure plan. If a written closure plan is revised after closure activities have commenced for a CCR unit, the owner or operator must amend the current closure plan no later than 30 days following the triggering event.

(4) The owner or operator of the CCR unit must obtain a written certification from a qualified professional engineer that the initial and any amendment of

the written closure plan meets the requirements of this section.

(c) *Closure by removal of CCR.* An owner or operator may elect to close a CCR unit by removing and decontaminating all areas affected by releases from the CCR unit. CCR removal and decontamination of the CCR unit are complete when constituent concentrations throughout the CCR unit and any areas affected by releases from the CCR unit have been removed and groundwater monitoring concentrations do not exceed the groundwater protection standard established pursuant to § 257.95(h) for constituents listed in appendix IV to this part.

(d) *Closure performance standard when leaving CCR in place*—(1) The owner or operator of a CCR unit must ensure that, at a minimum, the CCR unit is closed in a manner that will:

(i) Control, minimize or eliminate, to the maximum extent feasible, post-closure infiltration of liquids into the waste and releases of CCR, leachate, or contaminated run-off to the ground or surface waters or to the atmosphere;

(ii) Preclude the probability of future impoundment of water, sediment, or slurry;

(iii) Include measures that provide for major slope stability to prevent the sloughing or movement of the final cover system during the closure and post-closure care period;

(iv) Minimize the need for further maintenance of the CCR unit; and

(v) Be completed in the shortest amount of time consistent with recognized and generally accepted good engineering practices.

(2) *Drainage and stabilization of CCR surface impoundments.* The owner or operator of a CCR surface impoundment or any lateral expansion of a CCR surface impoundment must meet the requirements of paragraphs (d)(2)(i) and (ii) of this section prior to installing the final cover system required under paragraph (d)(3) of this section.

(i) Free liquids must be eliminated by removing liquid wastes or solidifying the remaining wastes and waste residues.

(ii) Remaining wastes must be stabilized sufficient to support the final cover system.

(3) *Final cover system.* If a CCR unit is closed by leaving CCR in place, the owner or operator must install a final cover system that is designed to minimize infiltration and erosion, and at a minimum, meets the requirements of paragraph (d)(3)(i) of this section, or the requirements of the alternative final cover system specified in paragraph (d)(3)(ii) of this section.

(i) The final cover system must be designed and constructed to meet the criteria in paragraphs (d)(3)(i)(A) through (D) of this section. The design of the final cover system must be included in the written closure plan required by paragraph (b) of this section.

(A) The permeability of the final cover system must be less than or equal to the permeability of any bottom liner system or natural subsoils present, or a permeability no greater than 1×10^{-5} cm/sec, whichever is less.

(B) The infiltration of liquids through the closed CCR unit must be minimized by the use of an infiltration layer that contains a minimum of 18 inches of earthen material.

(C) The erosion of the final cover system must be minimized by the use of an erosion layer that contains a minimum of six inches of earthen material that is capable of sustaining native plant growth.

(D) The disruption of the integrity of the final cover system must be minimized through a design that accommodates settling and subsidence.

(ii) The owner or operator may select an alternative final cover system design, provided the alternative final cover system is designed and constructed to meet the criteria in paragraphs (f)(3)(ii)(A) through (D) of this section. The design of the final cover system must be included in the written closure plan required by paragraph (b) of this section.

(A) The design of the final cover system must include an infiltration layer that achieves an equivalent reduction in infiltration as the infiltration layer specified in paragraphs (d)(3)(i)(A) and (B) of this section.

(B) The design of the final cover system must include an erosion layer that provides equivalent protection from wind or water erosion as the erosion layer specified in paragraph (d)(3)(i)(C) of this section.

(C) The disruption of the integrity of the final cover system must be minimized through a design that accommodates settling and subsidence.

(iii) The owner or operator of the CCR unit must obtain a written certification from a qualified professional engineer that the design of the final cover system meets the requirements of this section.

(e) *Initiation of closure activities.* Except as provided for in paragraph (e)(4) of this section and § 257.103, the owner or operator of a CCR unit must commence closure of the CCR unit no later than the applicable timeframes specified in either paragraph (e)(1) or (2) of this section.

(1) The owner or operator must commence closure of the CCR unit no later than 30 days after the date on which the CCR unit either:

(i) Receives the known final receipt of waste, either CCR or any non-CCR waste stream; or

(ii) Removes the known final volume of CCR from the CCR unit for the purpose of beneficial use of CCR.

(2)(i) Except as provided by paragraph (e)(2)(ii) of this section, the owner or operator must commence closure of a CCR unit that has not received CCR or any non-CCR waste stream or is no longer removing CCR for the purpose of beneficial use within two years of the last receipt of waste or within two years of the last removal of CCR material for the purpose of beneficial use.

(ii) Notwithstanding paragraph (e)(2)(i) of this section, the owner or operator of the CCR unit may secure an additional two years to initiate closure of the idle unit provided the owner or operator provides written documentation that the CCR unit will continue to accept wastes or will start removing CCR for the purpose of beneficial use. The documentation must be supported by, at a minimum, the information specified in paragraphs (e)(2)(ii)(A) and (B) of this section. The owner or operator may obtain two-year extensions provided the owner or operator continues to be able to demonstrate that there is reasonable likelihood that the CCR unit will accept wastes in the foreseeable future or will remove CCR from the unit for the purpose of beneficial use. The owner or operator must place each completed demonstration, if more than one time extension is sought, in the facility's operating record as required by § 257.105(i)(5) prior to the end of any two-year period.

(A) Information documenting that the CCR unit has remaining storage or disposal capacity or that the CCR unit can have CCR removed for the purpose of beneficial use; and

(B) Information demonstrating that that there is a reasonable likelihood that the CCR unit will resume receiving CCR or non-CCR waste streams in the foreseeable future or that CCR can be removed for the purpose of beneficial use. The narrative must include a best estimate as to when the CCR unit will resume receiving CCR or non-CCR waste streams. The situations listed in paragraphs (e)(2)(ii)(B)(*1*) through (*4*) of this section are examples of situations that would support a determination that the CCR unit will resume receiving CCR or non-CCR waste streams in the foreseeable future.

(*1*) Normal plant operations include periods during which the CCR unit does not receive CCR or non-CCR waste streams, such as the alternating use of two or more CCR units whereby at any point in time one CCR unit is receiving CCR while CCR is being removed from a second CCR unit after its dewatering.

(*2*) The CCR unit is dedicated to a coal-fired boiler unit that is temporarily idled (*e.g.,* CCR is not being generated) and there is a reasonable likelihood that the coal-fired boiler will resume operations in the future.

(*3*) The CCR unit is dedicated to an operating coal-fired boiler (*i.e.,* CCR is being generated); however, no CCR are being placed in the CCR unit because the CCR are being entirely diverted to beneficial uses, but there is a reasonable likelihood that the CCR unit will again be used in the foreseeable future.

(*4*) The CCR unit currently receives only non-CCR waste streams and those non-CCR waste streams are not generated for an extended period of time, but there is a reasonable likelihood that the CCR unit will again receive non-CCR waste streams in the future.

(iii) In order to obtain additional time extension(s) to initiate closure of a CCR unit beyond the two years provided by paragraph (e)(2)(i) of this section, the owner or operator of the CCR unit must include with the demonstration required by paragraph (e)(2)(ii) of this section the following statement signed by the owner or operator or an authorized representative:

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this demonstration and all attached documents, and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

(3) For purposes of this subpart, closure of the CCR unit has commenced if the owner or operator has ceased placing waste and completes any of the following actions or activities:

(i) Taken any steps necessary to implement the written closure plan required by paragraph (b) of this section;

(ii) Submitted a completed application for any required state or agency permit or permit modification; or

(iii) Taken any steps necessary to comply with any state or other agency standards that are a prerequisite, or are otherwise applicable, to initiating or completing the closure of a CCR unit.

(4) The timeframes specified in paragraphs (e)(1) and (2) of this section do not apply to any of the following owners or operators:

(i) An owner or operator of an inactive CCR surface impoundment closing the CCR unit as required by § 257.100(b);

(ii) An owner or operator of an existing unlined CCR surface impoundment closing the CCR unit as required by § 257.101(a);

(iii) An owner or operator of an existing CCR surface impoundment closing the CCR unit as required by § 257.101(b);

(iv) An owner or operator of a new CCR surface impoundment closing the CCR unit as required by § 257.101(c); or

(v) An owner or operator of an existing CCR landfill closing the CCR unit as required by § 257.101(d).

(f) *Completion of closure activities.* (1) Except as provided for in paragraph (f)(2) of this section, the owner or operator must complete closure of the CCR unit:

(i) For existing and new CCR landfills and any lateral expansion of a CCR landfill, within six months of commencing closure activities.

(ii) For existing and new CCR surface impoundments and any lateral expansion of a CCR surface impoundment, within five years of commencing closure activities.

(2)(i) *Extensions of closure timeframes.* The timeframes for completing closure of a CCR unit specified under paragraphs (f)(1) of this section may be extended if the owner or operator can demonstrate that it was not feasible to complete closure of the CCR unit within the required timeframes due to factors beyond the facility's control. If the owner or operator is seeking a time extension beyond the time specified in the written closure plan as required by paragraph (b)(1) of this section, the demonstration must include a narrative discussion providing the basis for additional time beyond that specified in the closure plan. The owner or operator must place each completed demonstration, if more than one time extension is sought, in the facility's operating record as required by § 257.105(i)(6) prior to the end of any two-year period. Factors that may support such a demonstration include:

(A) Complications stemming from the climate and weather, such as unusual amounts of precipitation or a significantly shortened construction season;

(B) Time required to dewater a surface impoundment due to the volume of CCR contained in the CCR unit or the characteristics of the CCR in the unit;

(C) The geology and terrain surrounding the CCR unit will affect the amount of material needed to close the CCR unit; or

(D) Time required or delays caused by the need to coordinate with and obtain necessary approvals and permits from a state or other agency.

(ii) *Maximum time extensions.* (A) CCR surface impoundments of 40 acres or smaller may extend the time to complete closure by no longer than two years.

(B) CCR surface impoundments larger than 40 acres may extend the timeframe to complete closure of the CCR unit multiple times, in two-year increments. For each two-year extension sought, the owner or operator must substantiate the factual circumstances demonstrating the need for the extension. No more than a total of five two-year extensions may be obtained for any CCR surface impoundment.

(C) CCR landfills may extend the timeframe to complete closure of the CCR unit multiple times, in one-year increments. For each one-year extension sought, the owner or operator must substantiate the factual circumstances demonstrating the need for the extension. No more than a total of two one-year extensions may be obtained for any CCR landfill.

(iii) In order to obtain additional time extension(s) to complete closure of a CCR unit beyond the times provided by paragraph (f)(1) of this section, the owner or operator of the CCR unit must include with the demonstration required by paragraph (f)(2)(i) of this section the following statement signed by the owner or operator or an authorized representative:

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this demonstration and all attached documents, and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

(3) Upon completion, the owner or operator of the CCR unit must obtain a certification from a qualified professional engineer verifying that closure has been completed in accordance with the closure plan specified in paragraph (b) of this section and the requirements of this section.

(g) No later than the date the owner or operator initiates closure of a CCR unit, the owner or operator must prepare a notification of intent to close a CCR unit. The notification must include the certification by a qualified professional engineer for the design of the final cover system as required by § 257.102(d)(3)(iii), if applicable. The owner or operator has completed the notification when it has been placed in the facility's operating record as required by § 257.105(i)(7).

(h) Within 30 days of completion of closure of the CCR unit, the owner or operator must prepare a notification of closure of a CCR unit. The notification must include the certification by a qualified professional engineer as required by § 257.102(f)(3). The owner or operator has completed the notification when it has been placed in the facility's operating record as required by § 257.105(i)(8).

(i) *Deed notations.* (1) Except as provided by paragraph (i)(4) of this section, following closure of a CCR unit, the owner or operator must record a notation on the deed to the property, or some other instrument that is normally examined during title search.

(2) The notation on the deed must in perpetuity notify any potential purchaser of the property that:

(i) The land has been used as a CCR unit; and

(ii) Its use is restricted under the post-closure care requirements as provided by § 257.104(d)(1)(iii).

(3) Within 30 days of recording a notation on the deed to the property, the owner or operator must prepare a notification stating that the notation has been recorded. The owner or operator has completed the notification when it has been placed in the facility's operating record as required by § 257.105(i)(9).

(4) An owner or operator that closes a CCR unit in accordance with paragraph (c) of this section is not subject to the requirements of paragraphs (i)(1) through (3) of this section.

(j) The owner or operator of the CCR unit must comply with the closure recordkeeping requirements specified in § 257.105(i), the closure notification requirements specified in § 257.106(i), and the closure Internet requirements specified in § 257.107(i).

(k) *Criteria to retrofit an existing CCR surface impoundment.* (1) To retrofit an existing CCR surface impoundment, the owner or operator must:

(i) First remove all CCR, including any contaminated soils and sediments from the CCR unit; and

(ii) Comply with the requirements in § 257.72.

(iii) A CCR surface impoundment undergoing a retrofit remains subject to all other requirements of this subpart, including the requirement to conduct any necessary corrective action.

(2) *Written retrofit plan*—(i) *Content of the plan.* The owner or operator must prepare a written retrofit plan that describes the steps necessary to retrofit the CCR unit consistent with recognized and generally accepted good engineering practices. The written retrofit plan must include, at a minimum, all of the following information:

(A) A narrative description of the specific measures that will be taken to retrofit the CCR unit in accordance with this section.

(B) A description of the procedures to remove all CCR and contaminated soils and sediments from the CCR unit.

(C) An estimate of the maximum amount of CCR that will be removed as part of the retrofit operation.

(D) An estimate of the largest area of the CCR unit that will be affected by the retrofit operation.

(E) A schedule for completing all activities necessary to satisfy the retrofit criteria in this section, including an estimate of the year in which retrofit activities of the CCR unit will be completed.

(ii) *Timeframes for preparing the initial written retrofit plan.* (A) No later than 60 days prior to date of initiating retrofit activities, the owner or operator must prepare an initial written retrofit plan consistent with the requirements specified in paragraph (k)(2) of this section. For purposes of this subpart, initiation of retrofit activities has commenced if the owner or operator has ceased placing waste in the unit and completes any of the following actions or activities:

(*1*) Taken any steps necessary to implement the written retrofit plan;

(*2*) Submitted a completed application for any required state or agency permit or permit modification; or

(*3*) Taken any steps necessary to comply with any state or other agency standards that are a prerequisite, or are otherwise applicable, to initiating or completing the retrofit of a CCR unit.

(B) The owner or operator has completed the written retrofit plan when the plan, including the certification required by paragraph (k)(2)(iv) of this section, has been placed in the facility's operating record as required by § 257.105(j)(1).

(iii) *Amendment of a written retrofit plan.* (A) The owner or operator may amend the initial or any subsequent written retrofit plan at any time.

(B) The owner or operator must amend the written retrofit plan whenever:

(*1*) There is a change in the operation of the CCR unit that would substantially affect the written retrofit plan in effect; or

(*2*) Before or after retrofit activities have commenced, unanticipated events necessitate a revision of the written retrofit plan.

(C) The owner or operator must amend the retrofit plan at least 60 days prior to a planned change in the operation of the facility or CCR unit, or no later than 60 days after an unanticipated event requires the revision of an existing written retrofit plan. If a written retrofit plan is revised after retrofit activities have commenced for a CCR unit, the owner or operator must amend the current retrofit plan no later than 30 days following the triggering event.

(iv) The owner or operator of the CCR unit must obtain a written certification from a qualified professional engineer that the activities outlined in the written retrofit plan, including any amendment of the plan, meet the requirements of this section.

(3) *Deadline for completion of activities related to the retrofit of a CCR unit.* Any CCR surface impoundment that is being retrofitted must complete all retrofit activities within the same time frames and procedures specified for the closure of a CCR surface impoundment in § 257.102(f) or, where applicable, § 257.103.

(4) Upon completion, the owner or operator must obtain a certification from a qualified professional engineer verifying that the retrofit activities have been completed in accordance with the retrofit plan specified in paragraph (k)(2) of this section and the requirements of this section.

(5) No later than the date the owner or operator initiates the retrofit of a CCR unit, the owner or operator must prepare a notification of intent to retrofit a CCR unit. The owner or operator has completed the notification when it has been placed in the facility's operating record as required by § 257.105(j)(5).

(6) Within 30 days of completing the retrofit activities specified in paragraph (k)(1) of this section, the owner or operator must prepare a notification of completion of retrofit activities. The notification must include the certification by a qualified professional engineer as required by paragraph (k)(4) of this section. The owner or operator has completed the notification when it has been placed in the facility's operating record as required by § 257.105(j)(6).

(7) At any time after the initiation of a CCR unit retrofit, the owner or operator may cease the retrofit and initiate closure of the CCR unit in accordance with the requirements of § 257.102.

(8) The owner or operator of the CCR unit must comply with the retrofit recordkeeping requirements specified in

§ 257.105(j), the retrofit notification requirements specified in § 257.106(j), and the retrofit Internet requirements specified in § 257.107(j).

§ 257.103 Alternative closure requirements.

The owner or operator of a CCR landfill, CCR surface impoundment, or any lateral expansion of a CCR unit that is subject to closure pursuant to § 257.101(a), (b)(1), or (d) may continue to receive CCR in the unit provided the owner or operator meets the requirements of either paragraph (a) or (b) of this section.

(a)(1) *No alternative CCR disposal capacity.* Notwithstanding the provisions of § 257.101(a), (b)(1), or (d), a CCR unit may continue to receive CCR if the owner or operator of the CCR unit certifies that the CCR must continue to be managed in that CCR unit due to the absence of alternative disposal capacity both on-site and off-site of the facility. To qualify under this paragraph (a)(1), the owner or operator of the CCR unit must document that all of the following conditions have been met:

(i) No alternative disposal capacity is available on-site or off-site. An increase in costs or the inconvenience of existing capacity is not sufficient to support qualification under this section;

(ii) The owner or operator has made, and continues to make, efforts to obtain additional capacity. Qualification under this subsection lasts only as long as no alternative capacity is available. Once alternative capacity is identified, the owner or operator must arrange to use such capacity as soon as feasible;

(iii) The owner or operator must remain in compliance with all other requirements of this subpart, including the requirement to conduct any necessary corrective action; and

(iv) The owner or operator must prepare an annual progress report documenting the continued lack of alternative capacity and the progress towards the development of alternative CCR disposal capacity.

(2) Once alternative capacity is available, the CCR unit must cease receiving CCR and initiate closure following the timeframes in § 257.102(e) and (f).

(3) If no alternative capacity is identified within five years after the initial certification, the CCR unit must cease receiving CCR and close in accordance with the timeframes in § 257.102(e) and (f).

(b)(1) *Permanent cessation of a coal-fired boiler(s) by a date certain.* Notwithstanding the provisions of § 257.101(a), (b)(1), and (d), a CCR unit may continue to receive CCR if the owner or operator certifies that the facility will cease operation of the coal-fired boilers within the timeframes specified in paragraphs (b)(2) through (4) of this section, but in the interim period (prior to closure of the coal-fired boiler), the facility must continue to use the CCR unit due to the absence of alternative disposal capacity both on-site and off-site of the facility. To qualify under this paragraph (b)(1), the owner or operator of the CCR unit must document that all of the following conditions have been met:

(i) No alternative disposal capacity is available on-site or off-site. An increase in costs or the inconvenience of existing capacity is not sufficient to support qualification under this section.

(ii) The owner or operator must remain in compliance with all other requirements of this subpart, including the requirement to conduct any necessary corrective action; and

(iii) The owner or operator must prepare an annual progress report documenting the continued lack of alternative capacity and the progress towards the closure of the coal-fired boiler.

(2) For a CCR surface impoundment that is 40 acres or smaller, the coal-fired boiler must cease operation and the CCR surface impoundment must have completed closure no later than October 17, 2023.

(3) For a CCR surface impoundment that is larger than 40 acres, the coal-fired boiler must cease operation, and the CCR surface impoundment must complete closure no later than October 17, 2028.

(4) For a CCR landfill, the coal-fired boiler must cease operation, and the CCR landfill must complete closure no later than April 19, 2021.

(c) Required notices and progress reports. An owner or operator of a CCR unit that closes in accordance with paragraphs (a) or (b) of this section must complete the notices and progress reports specified in paragraphs (c)(1) through (3) of this section.

(1) Within six months of becoming subject to closure pursuant to § 257.101(a), (b)(1), or (d), the owner or operator must prepare and place in the facility's operating record a notification of intent to comply with the alternative closure requirements of this section. The notification must describe why the CCR unit qualifies for the alternative closure provisions under either paragraph (a) or (b) of this section, in addition to providing the documentation and certifications required by paragraph (a) or (b) of this section.

(2) The owner or operator must prepare the periodic progress reports required by paragraphs (a)(1)(iv) or (b)(1)(iii), in addition to describing any problems encountered and a description of the actions taken to resolve the problems. The annual progress reports must be completed according to the following schedule:

(i) The first annual progress report must be prepared no later than 13 months after completing the notification of intent to comply with the alternative closure requirements required by paragraph (c)(1) of this section.

(ii) The second annual progress report must be prepared no later than 12 months after completing the first annual progress report. Additional annual progress reports must be prepared within 12 months of completing the previous annual progress report.

(iii) The owner or operator has completed the progress reports specified in paragraph (c)(2) of this section when the reports are placed in the facility's operating record as required by § 257.105(i)(10).

(3) An owner or operator of a CCR unit must also prepare the notification of intent to close a CCR unit as required by § 257.102(g).

(d) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(i), the notification requirements specified in § 257.106(i), and the Internet requirements specified in § 257.107(i).

§ 257.104 Post-closure care requirements.

(a) *Applicability.* (1) Except as provided by either paragraph (a)(2) or (3) of this section, § 257.104 applies to the owners or operators of CCR landfills, CCR surface impoundments, and all lateral expansions of CCR units that are subject to the closure criteria under § 257.102.

(2) An owner or operator of a CCR unit that elects to close a CCR unit by removing CCR as provided by § 257.102(c) is not subject to the post-closure care criteria under this section.

(3) An owner or operator of an inactive CCR surface impoundment that elects to close a CCR unit pursuant to the requirements under § 257.100(b) is not subject to the post-closure care criteria under this section.

(b) *Post-closure care maintenance requirements.* Following closure of the CCR unit, the owner or operator must conduct post-closure care for the CCR unit, which must consist of at least the following:

(1) Maintaining the integrity and effectiveness of the final cover system, including making repairs to the final

cover as necessary to correct the effects of settlement, subsidence, erosion, or other events, and preventing run-on and run-off from eroding or otherwise damaging the final cover;

(2) If the CCR unit is subject to the design criteria under § 257.70, maintaining the integrity and effectiveness of the leachate collection and removal system and operating the leachate collection and removal system in accordance with the requirements of § 257.70; and

(3) Maintaining the groundwater monitoring system and monitoring the groundwater in accordance with the requirements of §§ 257.90 through 257.98.

(c) *Post-closure care period.* (1) Except as provided by paragraph (c)(2) of this section, the owner or operator of the CCR unit must conduct post-closure care for 30 years.

(2) If at the end of the post-closure care period the owner or operator of the CCR unit is operating under assessment monitoring in accordance with § 257.95, the owner or operator must continue to conduct post-closure care until the owner or operator returns to detection monitoring in accordance with § 257.95.

(d) *Written post-closure plan*—(1) *Content of the plan.* The owner or operator of a CCR unit must prepare a written post-closure plan that includes, at a minimum, the information specified in paragraphs (d)(1)(i) through (iii) of this section.

(i) A description of the monitoring and maintenance activities required in paragraph (b) of this section for the CCR unit, and the frequency at which these activities will be performed;

(ii) The name, address, telephone number, and email address of the person or office to contact about the facility during the post-closure care period; and

(iii) A description of the planned uses of the property during the post-closure period. Post-closure use of the property shall not disturb the integrity of the final cover, liner(s), or any other component of the containment system, or the function of the monitoring systems unless necessary to comply with the requirements in this subpart. Any other disturbance is allowed if the owner or operator of the CCR unit demonstrates that disturbance of the final cover, liner, or other component of the containment system, including any removal of CCR, will not increase the potential threat to human health or the environment. The demonstration must be certified by a qualified professional engineer, and notification shall be provided to the State Director that the demonstration has been placed in the operating record and on the owners or operator's publicly accessible Internet site.

(2) *Deadline to prepare the initial written post-closure plan*—(i) *Existing CCR landfills and existing CCR surface impoundments.* No later than October 17, 2016, the owner or operator of the CCR unit must prepare an initial written post-closure plan consistent with the requirements specified in paragraph (d)(1) of this section.

(ii) *New CCR landfills, new CCR surface impoundments, and any lateral expansion of a CCR unit.* No later than the date of the initial receipt of CCR in the CCR unit, the owner or operator must prepare an initial written post-closure plan consistent with the requirements specified in paragraph (d)(1) of this section.

(iii) The owner or operator has completed the written post-closure plan when the plan, including the certification required by paragraph (d)(4) of this section, has been placed in the facility's operating record as required by § 257.105(i)(4).

(3) *Amendment of a written post-closure plan.* (i) The owner or operator may amend the initial or any subsequent written post-closure plan developed pursuant to paragraph (d)(1) of this section at any time.

(ii) The owner or operator must amend the written closure plan whenever:

(A) There is a change in the operation of the CCR unit that would substantially affect the written post-closure plan in effect; or

(B) After post-closure activities have commenced, unanticipated events necessitate a revision of the written post-closure plan.

(iii) The owner or operator must amend the written post-closure plan at least 60 days prior to a planned change in the operation of the facility or CCR unit, or no later than 60 days after an unanticipated event requires the need to revise an existing written post-closure plan. If a written post-closure plan is revised after post-closure activities have commenced for a CCR unit, the owner or operator must amend the written post-closure plan no later than 30 days following the triggering event.

(4) The owner or operator of the CCR unit must obtain a written certification from a qualified professional engineer that the initial and any amendment of the written post-closure plan meets the requirements of this section.

(e) *Notification of completion of post-closure care period.* No later than 60 days following the completion of the post-closure care period, the owner or operator of the CCR unit must prepare a notification verifying that post-closure care has been completed. The notification must include the certification by a qualified professional engineer verifying that post-closure care has been completed in accordance with the closure plan specified in paragraph (d) of this section and the requirements of this section. The owner or operator has completed the notification when it has been placed in the facility's operating record as required by § 257.105(i)(13).

(f) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(i), the notification requirements specified in § 257.106(i), and the Internet requirements specified in § 257.107(i).

Recordkeeping, Notification, and Posting of Information to the Internet

§ 257.105 Recordkeeping requirements.

(a) Each owner or operator of a CCR unit subject to the requirements of this subpart must maintain files of all information required by this section in a written operating record at their facility.

(b) Unless specified otherwise, each file must be retained for at least five years following the date of each occurrence, measurement, maintenance, corrective action, report, record, or study.

(c) An owner or operator of more than one CCR unit subject to the provisions of this subpart may comply with the requirements of this section in one recordkeeping system provided the system identifies each file by the name of each CCR unit. The files may be maintained on microfilm, on a computer, on computer disks, on a storage system accessible by a computer, on magnetic tape disks, or on microfiche.

(d) The owner or operator of a CCR unit must submit to the State Director and/or appropriate Tribal authority any demonstration or documentation required by this subpart, if requested, when such information is not otherwise available on the owner or operator's publicly accessible Internet site.

(e) *Location restrictions.* The owner or operator of a CCR unit subject to this subpart must place the demonstrations documenting whether or not the CCR unit is in compliance with the requirements under §§ 257.60(a), 257.61(a), 257.62(a), 257.63(a), and 257.64(a), as it becomes available, in the facility's operating record.

(f) *Design criteria.* The owner or operator of a CCR unit subject to this subpart must place the following information, as it becomes available, in the facility's operating record:

(1) The design and construction certifications as required by § 257.70(e) and (f).

(2) The documentation of liner type as required by § 257.71(a).

(3) The design and construction certifications as required by § 257.72(c) and (d).

(4) Documentation prepared by the owner or operator stating that the permanent identification marker was installed as required by §§ 257.73(a)(1) and 257.74(a)(1).

(5) The initial and periodic hazard potential classification assessments as required by §§ 257.73(a)(2) and 257.74(a)(2).

(6) The emergency action plan (EAP), and any amendment of the EAP, as required by §§ 257.73(a)(3) and 257.74(a)(3), except that only the most recent EAP must be maintained in the facility's operating record irrespective of the time requirement specified in paragraph (b) of this section.

(7) Documentation prepared by the owner or operator recording the annual face-to-face meeting or exercise between representatives of the owner or operator of the CCR unit and the local emergency responders as required by §§ 257.73(a)(3)(i)(E) and 257.74(a)(3)(i)(E).

(8) Documentation prepared by the owner or operator recording all activations of the emergency action plan as required by §§ 257.73(a)(3)(v) and 257.74(a)(3)(v).

(9) The history of construction, and any revisions of it, as required by § 257.73(c), except that these files must be maintained until the CCR unit completes closure of the unit in accordance with § 257.102.

(10) The initial and periodic structural stability assessments as required by §§ 257.73(d) and 257.74(d).

(11) Documentation detailing the corrective measures taken to remedy the deficiency or release as required by §§ 257.73(d)(2) and 257.74(d)(2).

(12) The initial and periodic safety factor assessments as required by §§ 257.73(e) and 257.74(e).

(13) The design and construction plans, and any revisions of it, as required by § 257.74(c), except that these files must be maintained until the CCR unit completes closure of the unit in accordance with § 257.102.

(g) *Operating criteria.* The owner or operator of a CCR unit subject to this subpart must place the following information, as it becomes available, in the facility's operating record:

(1) The CCR fugitive dust control plan, and any subsequent amendment of the plan, required by § 257.80(b), except that only the most recent control plan must be maintained in the facility's operating record irrespective of the time requirement specified in paragraph (b) of this section.

(2) The annual CCR fugitive dust control report required by § 257.80(c).

(3) The initial and periodic run-on and run-off control system plans as required by § 257.81(c).

(4) The initial and periodic inflow design flood control system plan as required by § 257.82(c).

(5) Documentation recording the results of each inspection and instrumentation monitoring by a qualified person as required by § 257.83(a).

(6) The periodic inspection report as required by § 257.83(b)(2).

(7) Documentation detailing the corrective measures taken to remedy the deficiency or release as required by §§ 257.83(b)(5) and 257.84(b)(5).

(8) Documentation recording the results of the weekly inspection by a qualified person as required by § 257.84(a).

(9) The periodic inspection report as required by § 257.84(b)(2).

(h) *Groundwater monitoring and corrective action.* The owner or operator of a CCR unit subject to this subpart must place the following information, as it becomes available, in the facility's operating record:

(1) The annual groundwater monitoring and corrective action report as required by § 257.90(e).

(2) Documentation of the design, installation, development, and decommissioning of any monitoring wells, piezometers and other measurement, sampling, and analytical devices as required by § 257.91(e)(1).

(3) The groundwater monitoring system certification as required by § 257.91(f).

(4) The selection of a statistical method certification as required by § 257.93(f)(6).

(5) Within 30 days of establishing an assessment monitoring program, the notification as required by § 257.94(e)(3).

(6) The results of appendices III and IV to this part constituent concentrations as required by § 257.95(d)(1).

(7) Within 30 days of returning to a detection monitoring program, the notification as required by § 257.95(e).

(8) Within 30 days of detecting one or more constituents in appendix IV to this part at statistically significant levels above the groundwater protection standard, the notifications as required by § 257.95(g).

(9) Within 30 days of initiating the assessment of corrective measures requirements, the notification as required by § 257.95(g)(5).

(10) The completed assessment of corrective measures as required by § 257.96(d).

(11) Documentation prepared by the owner or operator recording the public meeting for the corrective measures assessment as required by § 257.96(e).

(12) The semiannual report describing the progress in selecting and designing the remedy and the selection of remedy report as required by § 257.97(a), except that the selection of remedy report must be maintained until the remedy has been completed.

(13) Within 30 days of completing the remedy, the notification as required by § 257.98(e).

(i) *Closure and post-closure care.* The owner or operator of a CCR unit subject to this subpart must place the following information, as it becomes available, in the facility's operating record:

(1) The notification of intent to initiate closure of the CCR unit as required by § 257.100(c)(1).

(2) The annual progress reports of closure implementation as required by § 257.100(c)(2)(i) and (ii).

(3) The notification of closure completion as required by § 257.100(c)(3).

(4) The written closure plan, and any amendment of the plan, as required by § 257.102(b), except that only the most recent closure plan must be maintained in the facility's operating record irrespective of the time requirement specified in paragraph (b) of this section.

(5) The written demonstration(s), including the certification required by § 257.102(e)(2)(iii), for a time extension for initiating closure as required by § 257.102(e)(2)(ii).

(6) The written demonstration(s), including the certification required by § 257.102(f)(2)(iii), for a time extension for completing closure as required by § 257.102(f)(2)(i).

(7) The notification of intent to close a CCR unit as required by § 257.102(g).

(8) The notification of completion of closure of a CCR unit as required by § 257.102(h).

(9) The notification recording a notation on the deed as required by § 257.102(i).

(10) The notification of intent to comply with the alternative closure requirements as required by § 257.103(c)(1).

(11) The annual progress reports under the alternative closure requirements as required by § 257.103(c)(2).

(12) The written post-closure plan, and any amendment of the plan, as required by § 257.104(d), except that only the most recent closure plan must be maintained in the facility's operating record irrespective of the time requirement specified in paragraph (b) of this section.

(13) The notification of completion of post-closure care period as required by § 257.104(e).

(j) *Retrofit criteria.* The owner or operator of a CCR unit subject to this subpart must place the following information, as it becomes available, in the facility's operating record:

(1) The written retrofit plan, and any amendment of the plan, as required by § 257.102(k)(2), except that only the most recent retrofit plan must be maintained in the facility's operating record irrespective of the time requirement specified in paragraph (b) of this section.

(2) The notification of intent that the retrofit activities will proceed in accordance with the alternative procedures in § 257.103.

(3) The annual progress reports required under the alternative requirements as required by § 257.103.

(4) The written demonstration(s), including the certification in § 257.102(f)(2)(iii), for a time extension for completing retrofit activities as required by § 257.102(k)(3).

(5) The notification of intent to initiate retrofit of a CCR unit as required by § 257.102(k)(5).

(6) The notification of completion of retrofit activities as required by § 257.102(k)(6).

§ 257.106 Notification requirements.

(a) The notifications required under paragraphs (e) through (i) of this section must be sent to the relevant State Director and/or appropriate Tribal authority before the close of business on the day the notification is required to be completed. For purposes of this section, *before the close of business* means the notification must be postmarked or sent by electronic mail (email). If a notification deadline falls on a weekend or federal holiday, the notification deadline is automatically extended to the next business day.

(b) If any CCR unit is located in its entirety within Indian Country, the notifications of this section must be sent to the appropriate Tribal authority. If any CCR unit is located in part within Indian Country, the notifications of this section must be sent both to the appropriate State Director and Tribal authority.

(c) Notifications may be combined as long as the deadline requirement for each notification is met.

(d) Unless otherwise required in this section, the notifications specified in this section must be sent to the State Director and/or appropriate Tribal authority within 30 days of placing in the operating record the information required by § 257.105.

(e) *Location restrictions.* The owner or operator of a CCR unit subject to the requirements of this subpart must notify the State Director and/or appropriate Tribal authority that each demonstration specified under § 257.105(e) has been placed in the operating record and on the owner or operator's publicly accessible internet site.

(f) *Design criteria.* The owner or operator of a CCR unit subject to this subpart must notify the State Director and/or appropriate Tribal authority when information has been placed in the operating record and on the owner or operator's publicly accessible internet site. The owner or operator must:

(1) Within 60 days of commencing construction of a new CCR unit, provide notification of the availability of the design certification specified under § 257.105(f)(1) or (3). If the owner or operator of the CCR unit elects to install an alternative composite liner, the owner or operator must also submit to the State Director and/or appropriate Tribal authority a copy of the alternative composite liner design.

(2) No later than the date of initial receipt of CCR by a new CCR unit, provide notification of the availability of the construction certification specified under § 257.105(f)(1) or (3).

(3) Provide notification of the availability of the documentation of liner type specified under § 257.105(f)(2).

(4) Provide notification of the availability of the initial and periodic hazard potential classification assessments specified under § 257.105(f)(5).

(5) Provide notification of the availability of emergency action plan (EAP), and any revisions of the EAP, specified under § 257.105(f)(6).

(6) Provide notification of the availability of documentation prepared by the owner or operator recording the annual face-to-face meeting or exercise between representatives of the owner or operator of the CCR unit and the local emergency responders specified under § 257.105(f)(7).

(7) Provide notification of documentation prepared by the owner or operator recording all activations of the emergency action plan specified under § 257.105(f)(8).

(8) Provide notification of the availability of the history of construction, and any revision of it, specified under § 257.105(f)(9).

(9) Provide notification of the availability of the initial and periodic structural stability assessments specified under § 257.105(f)(10).

(10) Provide notification of the availability of the documentation detailing the corrective measures taken to remedy the deficiency or release specified under § 257.105(f)(11).

(11) Provide notification of the availability of the initial and periodic safety factor assessments specified under § 257.105(f)(12).

(12) Provide notification of the availability of the design and construction plans, and any revision of them, specified under § 257.105(f)(13).

(g) *Operating criteria.* The owner or operator of a CCR unit subject to this subpart must notify the State Director and/or appropriate Tribal authority when information has been placed in the operating record and on the owner or operator's publicly accessible internet site. The owner or operator must:

(1) Provide notification of the availability of the CCR fugitive dust control plan, or any subsequent amendment of the plan, specified under § 257.105(g)(1).

(2) Provide notification of the availability of the annual CCR fugitive dust control report specified under § 257.105(g)(2).

(3) Provide notification of the availability of the initial and periodic run-on and run-off control system plans specified under § 257.105(g)(3).

(4) Provide notification of the availability of the initial and periodic inflow design flood control system plans specified under § 257.105(g)(4).

(5) Provide notification of the availability of the periodic inspection reports specified under § 257.105(g)(6).

(6) Provide notification of the availability of the documentation detailing the corrective measures taken to remedy the deficiency or release specified under § 257.105(g)(7).

(7) Provide notification of the availability of the periodic inspection reports specified under § 257.105(g)(9).

(h) *Groundwater monitoring and corrective action.* The owner or operator of a CCR unit subject to this subpart must notify the State Director and/or appropriate Tribal authority when information has been placed in the operating record and on the owner or operator's publicly accessible internet site. The owner or operator must:

(1) Provide notification of the availability of the annual groundwater

monitoring and corrective action report specified under § 257.105(h)(1).

(2) Provide notification of the availability of the groundwater monitoring system certification specified under § 257.105(h)(3).

(3) Provide notification of the availability of the selection of a statistical method certification specified under § 257.105(h)(4).

(4) Provide notification that an assessment monitoring programs has been established specified under § 257.105(h)(5).

(5) Provide notification that the CCR unit is returning to a detection monitoring program specified under § 257.105(h)(7).

(6) Provide notification that one or more constituents in appendix IV to this part have been detected at statistically significant levels above the groundwater protection standard and the notifications to land owners specified under § 257.105(h)(8).

(7) Provide notification that an assessment of corrective measures has been initiated specified under § 257.105(h)(9).

(8) Provide notification of the availability of assessment of corrective measures specified under § 257.105(h)(10).

(9) Provide notification of the availability of the semiannual report describing the progress in selecting and designing the remedy and the selection of remedy report specified under § 257.105(h)(12).

(10) Provide notification of the completion of the remedy specified under § 257.105(h)(13).

(i) *Closure and post-closure care.* The owner or operator of a CCR unit subject to this subpart must notify the State Director and/or appropriate Tribal authority when information has been placed in the operating record and on the owner or operator's publicly accessible Internet site. The owner or operator must:

(1) Provide notification of the intent to initiate closure of the CCR unit specified under § 257.105(i)(1).

(2) Provide notification of the availability of the annual progress reports of closure implementation specified under § 257.105(i)(2).

(3) Provide notification of closure completion specified under § 257.105(i)(3).

(4) Provide notification of the availability of the written closure plan, and any amendment of the plan, specified under § 257.105(i)(4).

(5) Provide notification of the availability of the demonstration(s) for a time extension for initiating closure specified under § 257.105(i)(5).

(6) Provide notification of the availability of the demonstration(s) for a time extension for completing closure specified under § 257.105(i)(6).

(7) Provide notification of intent to close a CCR unit specified under § 257.105(i)(7).

(8) Provide notification of completion of closure of a CCR unit specified under § 257.105(i)(8).

(9) Provide notification of the deed notation as required by § 257.105(i)(9).

(10) Provide notification of intent to comply with the alternative closure requirements specified under § 257.105(i)(10).

(11) The annual progress reports under the alternative closure requirements as required by § 257.105(i)(11).

(12) Provide notification of the availability of the written post-closure plan, and any amendment of the plan, specified under § 257.105(i)(12).

(13) Provide notification of completion of post-closure care specified under § 257.105(i)(13).

(j) *Retrofit criteria.* The owner or operator of a CCR unit subject to this subpart must notify the State Director and/or appropriate Tribal authority when information has been placed in the operating record and on the owner or operator's publicly accessible Internet site. The owner or operator must:

(1) Provide notification of the availability of the written retrofit plan, and any amendment of the plan, specified under § 257.105(j)(1).

(2) Provide notification of intent to comply with the alternative retrofit requirements specified under § 257.105(j)(2).

(3) The annual progress reports under the alternative retrofit requirements as required by § 257.105(j)(3).

(4) Provide notification of the availability of the demonstration(s) for a time extension for completing retrofit activities specified under § 257.105(j)(4).

(5) Provide notification of intent to initiate retrofit of a CCR unit specified under § 257.105(j)(5).

(6) Provide notification of completion of retrofit activities specified under § 257.105(j)(6).

§ 257.107 Publicly accessible Internet site requirements.

(a) Each owner or operator of a CCR unit subject to the requirements of this subpart must maintain a publicly accessible Internet site (CCR Web site) containing the information specified in this section. The owner or operator's Web site must be titled ''CCR Rule Compliance Data and Information.''

(b) An owner or operator of more than one CCR unit subject to the provisions of this subpart may comply with the requirements of this section by using the same Internet site for multiple CCR units provided the CCR Web site clearly delineates information by the name or identification number of each unit.

(c) Unless otherwise required in this section, the information required to be posted to the CCR Web site must be made available to the public for at least five years following the date on which the information was first posted to the CCR Web site.

(d) Unless otherwise required in this section, the information must be posted to the CCR Web site within 30 days of placing the pertinent information required by § 257.105 in the operating record.

(e) *Location restrictions.* The owner or operator of a CCR unit subject to this subpart must place each demonstration specified under § 257.105(e) on the owner or operator's CCR Web site.

(f) *Design criteria.* The owner or operator of a CCR unit subject to this subpart must place the following information on the owner or operator's CCR Web site:

(1) Within 60 days of commencing construction of a new unit, the design certification specified under § 257.105(f)(1) or (3).

(2) No later than the date of initial receipt of CCR by a new CCR unit, the construction certification specified under § 257.105(f)(1) or (3).

(3) The documentation of liner type specified under § 257.105(f)(2).

(4) The initial and periodic hazard potential classification assessments specified under § 257.105(f)(5).

(5) The emergency action plan (EAP) specified under § 257.105(f)(6), except that only the most recent EAP must be maintained on the CCR Web site irrespective of the time requirement specified in paragraph (c) of this section.

(6) Documentation prepared by the owner or operator recording the annual face-to-face meeting or exercise between representatives of the owner or operator of the CCR unit and the local emergency responders specified under § 257.105(f)(7).

(7) Documentation prepared by the owner or operator recording any activation of the emergency action plan specified under § 257.105(f)(8).

(8) The history of construction, and any revisions of it, specified under § 257.105(f)(9).

(9) The initial and periodic structural stability assessments specified under § 257.105(f)(10).

(10) The documentation detailing the corrective measures taken to remedy the

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deficiency or release specified under § 257.105(f)(11).

(11) The initial and periodic safety factor assessments specified under § 257.105(f)(12).

(12) The design and construction plans, and any revisions of them, specified under § 257.105(f)(13).

(g) *Operating criteria.* The owner or operator of a CCR unit subject to this subpart must place the following information on the owner or operator's CCR Web site:

(1) The CCR fugitive dust control plan, or any subsequent amendment of the plan, specified under § 257.105(g)(1) except that only the most recent plan must be maintained on the CCR Web site irrespective of the time requirement specified in paragraph (c) of this section.

(2) The annual CCR fugitive dust control report specified under § 257.105(g)(2).

(3) The initial and periodic run-on and run-off control system plans specified under § 257.105(g)(3).

(4) The initial and periodic inflow design flood control system plans specified under § 257.105(g)(4).

(5) The periodic inspection reports specified under § 257.105(g)(6).

(6) The documentation detailing the corrective measures taken to remedy the deficiency or release specified under § 257.105(g)(7).

(7) The periodic inspection reports specified under § 257.105(g)(9).

(h) *Groundwater monitoring and corrective action.* The owner or operator of a CCR unit subject to this subpart must place the following information on the owner or operator's CCR Web site:

(1) The annual groundwater monitoring and corrective action report specified under § 257.105(h)(1).

(2) The groundwater monitoring system certification specified under § 257.105(h)(3).

(3) The selection of a statistical method certification specified under § 257.105(h)(4).

(4) The notification that an assessment monitoring programs has been established specified under § 257.105(h)(5).

(5) The notification that the CCR unit is returning to a detection monitoring program specified under § 257.105(h)(7).

(6) The notification that one or more constituents in appendix IV to this part have been detected at statistically significant levels above the groundwater protection standard and the notifications to land owners specified under § 257.105(h)(8).

(7) The notification that an assessment of corrective measures has been initiated specified under § 257.105(h)(9).

(8) The assessment of corrective measures specified under § 257.105(h)(10).

(9) The semiannual reports describing the progress in selecting and designing remedy and the selection of remedy report specified under § 257.105(h)(12), except that the selection of the remedy report must be maintained until the remedy has been completed.

(10) The notification that the remedy has been completed specified under § 257.105(h)(13).

(i) *Closure and post-closure care.* The owner or operator of a CCR unit subject to this subpart must place the following information on the owner or operator's CCR Web site:

(1) The notification of intent to initiate closure of the CCR unit specified under § 257.105(i)(1).

(2) The annual progress reports of closure implementation specified under § 257.105(i)(2).

(3) The notification of closure completion specified under § 257.105(i)(3).

(4) The written closure plan, and any amendment of the plan, specified under § 257.105(i)(4).

(5) The demonstration(s) for a time extension for initiating closure specified under § 257.105(i)(5).

(6) The demonstration(s) for a time extension for completing closure specified under § 257.105(i)(6).

(7) The notification of intent to close a CCR unit specified under § 257.105(i)(7).

(8) The notification of completion of closure of a CCR unit specified under § 257.105(i)(8).

(9) The notification recording a notation on the deed as required by § 257.105(i)(9).

(10) The notification of intent to comply with the alternative closure requirements as required by § 257.105(i)(10).

(11) The annual progress reports under the alternative closure requirements as required by § 257.105(i)(11).

(12) The written post-closure plan, and any amendment of the plan, specified under § 257.105(i)(12).

(13) The notification of completion of post-closure care specified under § 257.105(i)(13).

(j) *Retrofit criteria.* The owner or operator of a CCR unit subject to this subpart must place the following information on the owner or operator's CCR Web site:

(1) The written retrofit plan, and any amendment of the plan, specified under § 257.105(j)(1).

(2) The notification of intent to comply with the alternative retrofit requirements as required by § 257.105(j)(2).

(3) The annual progress reports under the alternative retrofit requirements as required by § 257.105(j)(3).

(4) The demonstration(s) for a time extension for completing retrofit activities specified under § 257.105(j)(4).

(5) The notification of intent to retrofit a CCR unit specified under § 257.105(j)(5).

(6) The notification of completion of retrofit activities specified under § 257.105(j)(6).

■ 5. Amend part 257 by adding "Appendix III to Part 257" and "Appendix IV to Part 257" to read as follows:

Appendix III to Part 257—Constituents for Detection Monitoring

Common name [1]
Boron
Calcium
Chloride
Fluoride
pH
Sulfate
Total Dissolved Solids (TDS)

[1] Common names are those widely used in government regulations, scientific publications, and commerce; synonyms exist for many chemicals.

Appendix IV to Part 257—Constituents for Assessment Monitoring

Common name [1]
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Cobalt
Fluoride
Lead
Lithium
Mercury
Molybdenum
Selenium
Thallium
Radium 226 and 228 combined

[1] Common names are those widely used in government regulations, scientific publications, and commerce; synonyms exist for many chemicals.

PART 261—IDENTIFICATION AND LISTING OF HAZARDOUS WASTE

■ 6. The authority citation for part 261 continues to read as follows:

Authority: 42 U.S.C. 6905, 6912(a), 6921, 6922, 6924(y) and 6938.

■ 7. Section 261.4 is amended by revising paragraph (b)(4) to read as follows:

§ 261.4 Exclusions.

* * * * *

(b) * * *

(4)(i) 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, except as provided by § 266.112 of this chapter for facilities that burn or process hazardous waste.

(ii) The following wastes generated primarily from processes that support the combustion of coal or other fossil fuels that are co-disposed with the wastes in paragraph (b)(4)(i) of this section, except as provided by § 266.112 of this chapter for facilities that burn or process hazardous waste:

(A) *Coal pile run-off.* For purposes of paragraph (b)(4) of this section, coal pile run-off means any precipitation that drains off coal piles.

(B) *Boiler cleaning solutions.* For purposes of paragraph (b)(4) of this section, boiler cleaning solutions means water solutions and chemical solutions used to clean the fire-side and water-side of the boiler.

(C) *Boiler blowdown.* For purposes of paragraph (b)(4) of this section, boiler blowdown means water purged from boilers used to generate steam.

(D) *Process water treatment and demineralizer regeneration wastes.* For purposes of paragraph (b)(4) of this section, process water treatment and demineralizer regeneration wastes means sludges, rinses, and spent resins generated from processes to remove dissolved gases, suspended solids, and dissolved chemical salts from combustion system process water.

(E) *Cooling tower blowdown.* For purposes of paragraph (b)(4) of this section, cooling tower blowdown means water purged from a closed cycle cooling system. Closed cycle cooling systems include cooling towers, cooling ponds, or spray canals.

(F) *Air heater and precipitator washes.* For purposes of paragraph (b)(4) of this section, air heater and precipitator washes means wastes from cleaning air preheaters and electrostatic precipitators.

(G) *Effluents from floor and yard drains and sumps.* For purposes of paragraph (b)(4) of this section, effluents from floor and yard drains and sumps means wastewaters, such as wash water, collected by or from floor drains, equipment drains, and sumps located inside the power plant building; and wastewaters, such as rain runoff, collected by yard drains and sumps located outside the power plant building.

(H) *Wastewater treatment sludges.* For purposes of paragraph (b)(4) of this section, wastewater treatment sludges refers to sludges generated from the treatment of wastewaters specified in paragraphs (b)(4)(ii)(A) through (F) of this section.

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