ENVIRONMENTAL PROTECTION AGENCY

[EPA/OSW-FR-91-018; FRL-3956-1]

40 CFR Part 261

RIN 2050-AC41

Final Regulatory Determination for Special Wastes From Mineral Processing (Mining Waste Exclusion)

AGENCY: Environmental Protection Agency.

ACTION: Final regulatory determination and final rule.

SUMMARY: Today's action presents the Agency's final regulatory determination required by section 3001(b)(3)(C) of the Resource Conservation and Recovery Act (RCRA) for 20 special wastes from the processing of ores and minerals. EPA has concluded that regulation under Subtitle C of RCRA is inappropriate for all 20 of the special wastes that were studied. EPA plans to address 18 of the wastes under subtitle D, possibly in the program being developed for mining wastes. For the remaining two wastes (phosphogypsum and process waste water from phosphoric acid production), EPA plans to proceed with the development and promulgation of a program under the Toxic Substances Control Act (TSCA) that will address their management, including possible regulations concerning waste minimization/pollution prevention for these wastes. In addition, EPA plans to use existing authorities under either RCRA Section 7003 or CERCLA section 106 to address any site-specific ground-water contamination problems that are believed to pose substantial and imminent endangerment to human health or the environment. EPA has also decided to postpone consideration of a possible ban on the utilization of one of the special wastes, slag from elemental phosphorus production in construction and/or land reclamation.

The rationale and salient facts used by the Agency to arrive at these decisions are provided below.

EFFECTIVE DATE: July 15, 1991.

FOR FURTHER INFORMATION CONTACT: For further information on the regulatory determination, contact the RCRA/Superfund hotline at (800) 424-9346 (toll free) or (703) 928-9810, or Bob Hall at (703) 308-8412.

SUPPLEMENTARY INFORMATION:

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I. Background

A. Statutory Authority

Today's notice is issued under the authority of section 3001(b)(3)(C) of RCRA, which requires that after completion of the Report to Congress mandated by section 8002(p) of RCRA, the Administrator must determine whether or not subtitle C regulation of the special study wastes is warranted. Wastes for which the exclusion is retained will continue to be subject to regulation under RCRA Subtitle D as solid wastes.

B. History of the Mining Waste Exclusion

In October, 1980, RCRA was amended by adding section 3001(b)(3)(A)(ii) to exclude "solid waste from the extraction, beneficiation, and processing of ores and minerals" from regulation as hazardous waste under subtitle C of RCRA, pending completion of a study and a Report to Congress required by section 8002 (f) and (p) and a determination by the EPA Administrator either to promulgate regulations under subtitle C or that such regulations are unwarranted and that the exclusion should continue (as required by section 3001(b)(3)(C)). EPA modified its hazardous waste regulations in November 1980 to reflect this "Mining Waste Exclusion," and issued a preliminary, and quite broad, interpretation of the scope of its coverage. In particular, EPA interpreted the exclusion to include "solid waste from the exploration, mining, milling, smelting and refining of ores and minerals" (45 FR 76618, November 19, 1980).

In 1984, EPA was sued for failing to submit the Report to Congress and make the required regulatory determination by the statutory deadline (*Concerned Citizens of Adamstown* v. *EPA* No. 84-3041, D.D.C., August 21, 1985). In responding to this lawsuit, the Agency explained that it planned to propose a narrower interpretation of the scope of the Mining Waste Exclusion, so that it would encompass fewer wastes, and proposed to the Court two schedules: One for completing the section 8002 studies of extraction and beneficiation wastes and submitting the Report to Congress addressing these wastes, and one for proposing and promulgating a reinterpretation for mineral processing wastes. In so doing, the Agency, in effect, split the wastes that might be eligible for exclusion from regulation into two groups: Mining (mineral extraction and beneficiation) wastes, and mineral processing wastes. The Court agreed to this approach and established a schedule for the two tasks.

On December 31, 1985, EPA published the required Report to Congress on solid wastes from mineral extraction and beneficiation, and on July 3, 1986 (51 FR 24496) published a determination that regulation of such wastes under subtitle C of RCRA was not warranted. Since the determination was made, the Agency has been developing a tailored regulatory approach for these wastes under RCRA subtitle D.

In keeping with its Court-ordered directive to reinterpret the Mining Waste Exclusion for mineral processing wastes, in October, 1985, EPA proposed to narrow the scope of the Exclusion for mineral processing wastes to include only a few specific waste streams (see 50 FR 40292, October 2, 1985). However, the Agency did not specify the criteria that it used to identify these wastes, or to distinguish them from other wastes that were not identified as being eligible for the exclusion. In response to this proposal, many companies and industry organizations "nominated" wastes that they believed were eligible for the regulatory exemption. Faced with an inability at that time to articulate criteria that could be used to distinguish exempt from non-exempt wastes and the approaching Court-ordered deadline for final action, EPA withdrew its proposal on October 9, 1986 (51 FR 36233).

In July, 1988, the court in *Environmental Defense Fund* v. *EPA*, 852 F.2d 1316 (D. C. Cir. 1988), *cert. denied*, 109 S. Ct. 1120 (1989) held that EPA's withdrawal of its 1985 proposal was arbitrary and capricious, and ordered EPA to reinterpret the scope of the Exclusion for mineral processing wastes. In particular, EPA was directed by the court to restrict the scope of the Exclusion as it applied to mineral processing wastes to include only "large volume, low hazard" wastes. In a series of rulemaking notices, EPA has, during the past three years, established the

boundaries of the Mining Waste Exclusion for mineral processing wastes, has articulated the criteria that were used to define "mineral processing," and has evaluated whether individual wastes are large volume and low hazard and, thus, eligible for the temporary exclusion provided by RCRA section 3001(b)(3)(A)(ii). This rulemaking process was completed with the publication of final rules on September 1, 1989 (54 FR 36592) and January 23, 1990 (55 FR 2322). With the completion of these notices, the Agency established that the temporary exemption from subtitle C requirements established by the Exclusion for mineral processing wastes and, therefore, the scope of the Report to Congress, was limited to 20 specific mineral processing wastes. EPA then prepared and submitted a detailed and comprehensive Report to Congress addressing the 20 special mineral processing wastes, in compliance with the Court-ordered deadline. In addition to the explicit consideration of the eight study factors listed at section 8002(p) of RCRA, the Agency included in the Report a proposed regulatory status for each of the 20 special wastes. Thus, the Report serves both as an information source and as a tentative indication of the Agency's final determination. Accordingly, and in compliance with statutory directive, the Report, the data and analyses that underlie it, and the comments received on it have served as the primary basis for the regulatory decisions that are articulated in today's notice.

EPA did not complete the regulatory determination within the six month statutory deadline. As a result, the Environmental Defense Fund filed a new RCRA citizen's suit, which was settled by consent decree. *EDF* v. *EPA*, No. 91-29 (D.D.C. Mar. 4, 1991). Under the terms of the consent decree, EPA must issue the regulatory determination no later than May 20, 1991. Today's decision is issued in compliance with that decree.

Overview of the Report to Congress

Scope of the Report

The scope of the Report to Congress was limited to 20 mineral processing wastes, representing 12 mineral commodity sectors. These wastes are generated by 91 facilities located in 29 states. The 20 wastes covered by the Report to Congress, organized by sector, follow:

Sector	Waste(s)
Alumina	Red and brown muds from bauxite refining.
Chromium (Sodium Chromate/ dichromate).	Treated residue from roasting/ leaching of chrome ore.
Coal gasification	Gasifier ash from coal gasification.
	Process wastewater from coal gasification.
Copper	Slag from primary processing.
	Calcium sulfate wastewater treatment plant sludge from primary processing.
	Slag tailings from primary processing.
Elemental Phosphorus.	Slag from primary production.
Ferrous Metals	Iron blast furnace APC dust/ sludge.
	Iron blast furnace slag.
	Basic oxygen furnace and open hearth furnace APC dust/sludge.
	Basic oxygen furnace and open hearth furnace slag.
Hydrofluoric acid	Fluorogypsum.
	Process wastewater.
Lead	Slag from primary processing.
Magnesium	Process wastewater from primary magnesium processing by the anhydrous process.
Phosphoric acid	Phosphogypsum.
	Process wastewater.
Titanium tetrachloride.	Chloride process waste solids.
Zinc	Slag from primary processing.

2. Study Factors

The RTC addressed the following eight study factors required by section 8002(p) of RCRA:

1. The sources and volumes of such materials generated per year;
2. Present disposal and utilization practices;
3. Potential danger to human health and the environment from the disposal and reuse of such materials;
4. Documented cases in which danger to human health or the environment has been proved;
5. Alternatives to current disposal methods;
6. The costs of such alternatives;
7. The impacts of these alternatives on the use of phosphate rock, uranium ore, and other natural resources; and
8. The current and potential utilization of such materials.

In addition, the statute suggests that the Administrator may review studies and other actions of other federal and state agencies, and invite participation by other concerned parties, including industry and other federal and state agencies, with a view toward avoiding duplication of effort.

The Agency's approach in preparing this Report was to combine certain study factors, for purposes of analysis and exposition, into seven sections. The first section provides a brief overview of the industry, including the types of production processes used and the number and location of operating facilities that generate one or more of the mineral processing special wastes. The second section summarizes information on waste characteristics, generation, and current management practices (study factors 1 and 2), while the third section provides a discussion of potential for and documented cases of danger to human health or the environment (study factors 3 and 4). The fourth section (as suggested generally by section 8002(p) of RCRA), summarizes applicable federal and state regulatory controls. The fifth section discusses alternative waste management practices and potential utilization of the wastes (study factors 5 and 8), while the sixth section discusses costs and impacts of alternative practices (study factors 6 and 7). The seventh and final section summarizes and analyzes the findings of EPA's evaluation of the above study factors.

3. Preliminary Findings in the Report to Congress

The Report to Congress presented EPA's preliminary findings regarding the 20 special wastes from mineral processing, based on two separate approaches: (1) The application of the RCRA section 8002(p) study factors and (2) the application of the RCRA section 8002(p) study factors and additional considerations. A summary of the Agency's findings, prior to receipt and analysis of public comments, regarding the appropriate regulatory status of the 20 mineral processing special wastes covered in the RTC is provided below.

REPORT TO CONGRESS TENTATIVE RECOMMENDATIONS [1]

Waste stream	Approach 1 (using 8002(p) study factors)		Approach 2 (using 8002(p) study factors and additional considerations)
	Full subtitle C	Subtitle C-minus	
Red and Brown Muds from Bauxite Refining	D	D	D
Treated Residue from Roasting/Leaching of Chrome Ore	D	D	D
Gasifier Ash from Coal Gasification	D	D	D
Process Wastewater from Coal Gasification	D	D	D
Slag from Primary Copper Processing	D	D	D
Slag Tailings from Primary Copper Processing	D	D	D
Slag from Elemental Phosphorus Production	D	D	D
Iron Blast Furnace Slag	D	D	D
Basic Oxygen Furnace and Open Hearth Furnace Slag from Carbon Steel Prod.	D	D	D
Fluorogypsum from Hydrofluoric (HF) Acid Production	D	D	D
Process Wastewater from Magnesium Processing	D	D	D
Slag from Primary Zinc Processing	D	D	D
Phosphogypsum from Phosphoric Acid Production	D	D	D
Process Wastewater from Phosphoric Acid Production	D	D	D
Air Pollution Control Dust/Sludge from Iron Blast Furnaces	D	D	D
Air Pollution Control Dust/Sludge from Basic Oxygen Furnaces and Open Hearth Furnaces from Carbon Steel Production	D	D	D
Slag from Primary Lead Processing	D	C	D
Calcium Sulfate Wastewater Treatment Plant Sludge from Primary Copper Processing	D	C	D
Process Wastewater from HF Acid Production	C	C	D
Chloride Process Waste Solids from Titanium Tetrachloride Production	D	C	D

[1] Source: USEPA. 1990. Report to Congress on Special Wastes from Mineral Processing, Vol. I, pp. 11-17.

a. Approach 1: Application of the RCRA Section 8002(p) Study Factors

1. Wastes EPA Tentatively Recommended to Remain Under RCRA Subtitle D

Using the study factors listed in RCRA section 8002(p), EPA examined: (1) The potential for and documented danger to human health and the environment; (2) the need for additional regulations; and (3) the costs and impacts of subtitle C regulation for the 20 special wastes. EPA's analysis did not merely evaluate whether the wastes should be treated as hazardous in light of the criteria under subtitle C for other wastes, but took into account Congress' desire to examine "special wastes" in a different light. EPA's analysis suggested that regulation under subtitle C of RCRA would be inappropriate for the following 16 mineral processing wastes:

- Red and brown muds from bauxite refining;
- Treated residue from roasting/leaching of chrome ore;
- Gasifier ash from coal gasification;
- Process wastewater from coal gasification;
- Slag from primary copper processing;
- Slag tailings from primary copper processing;
- Slag from elemental phosphorus production;
- Iron blast furnace slag;
- Basic oxygen furnace and open hearth furnace slag from carbon steel production;
- Air pollution control dust/sludge from iron blast furnaces;
- Air pollution control dust/sludge from basic oxygen furnaces and open hearth furnaces from carbon steel production;
- Fluorogypsum from hydrofluoric acid production;
- Process wastewater from primary magnesium processing by the anhydrous process;
- Process wastewater from phosphoric acid production;
- Phosphogypsum from phosphoric acid production; and
- Slag from primary zinc processing.

Three of these sixteen wastes (treated residue from roasting/leaching of chrome ore; process wastewater from coal gasification; and slag tailings from primary copper processing) were found not to pose an actual or potential danger to human health and the environment. The thirteen remaining wastes were identified as having some actual or potential hazard associated with current management practices or plausible mismanagement scenarios, and so were further evaluated.

EPA found that the potential risk associated with slag from primary zinc processing, process wastewater from primary magnesium processing by the anhydrous process, air pollution control (APC) dust/sludge from iron blast furnaces and from basic oxygen and open hearth furnaces used to make carbon steel, red and brown muds from bauxite refining, elemental phosphorus slag, and gasifier ash from coal gasification, was comparatively low; that is, the Agency found that management of these materials did not present a substantial hazard to human health or the environment. In particular, no documented damages attributable to these wastes were identified. In addition, State regulations are in effect for the one primary magnesium facility and revised/strengthened regulations have been proposed for the primary zinc processing facility. EPA also found that several facilities recycle rather than dispose of ferrous metal production APC dust. Therefore, the Agency found that subtitle C regulation was not appropriate. In the case of elemental phosphorus slag, the Agency found that while there appeared to be some significant hazards associated with use of the material in construction applications (that is, off-site utilization), the best means of dealing with this problem was through the use of authorities provided by RCRA section 3001(b)(3)(B)(iii) (which allows for special controls from phosphate rock mining and mineral processing wastes) rather than through imposition of the subtitle C hazardous waste management standards.

EPA identified four wastes that did not exhibit a hazardous characteristic (with the exception of one sample of copper slag at one facility) but for which documented cases of adverse environmental impacts that affected surface water were identified at at least one facility:

- Iron blast furnace slag;
- Slag from primary copper processing;
- Basic oxygen furnace and open hearth furnace slag from carbon steel production; and
- Fluorogypsum from hydrofluoric acid production.

For all four wastes, however, these surface water releases (one of which occurred via ground water) have been and/or are being addressed under existing regulatory authorities at the state and/or federal level. Therefore, the Agency concluded that regulation of these four wastes as hazardous would provide additional protection to man health or the environment tifying the elimination of the special tus of these wastes; thus, subtitle C ulation was not considered propriate.

Phosphogypsum and phosphoric acid cess wastewater were also of ncern because damage case rmation indicated that both closed l currently active phosphogypsum cks (in which both the sphogypsum and the wastewater are naged) and wastewater cooling ds have caused ground-water tamination at 15 of the 16 facilities which monitoring data are available. e available waste composition data icated that phosphogypsum tested EP ic at one of the ten facilities with ilable data, and process wastewater ibited the characteristic of rosivity at most facilities and the EP-icity characteristic at some facilities. wever, EPA also estimated that the l industry-wide, incremental nualized cost of either full subtitle C ulation or the Subtitle C-Minus nario [1,2] for phosphogypsum and cess wastewater, as compared to the otitle D-Plus scenario [3] developed for t estimating purposes, could exceed 0 million and $50 million pectively, and could significantly ect several facilities. The Report imated that economic impacts ociated with subtitle C or C-Minus ulation at these facilities were pected to be significant, and it was ikely that these facilities could pass ng their higher costs. As a result, EPA tatively concluded that regulation for se wastes was most appropriate der RCRA subtitle D.

[2] A subtitle C scenario that utilizes the flexibility vided by RCRA section 3004(x).

[3] A subtitle D program similar to those being eloped for extraction and beneficiation wastes.

2. Wastes EPA Tentatively Considered for Regulation Under RCRA Subtitle C or D

EPA found, based on the information available at that time, that the remaining four wastes (calcium sulfate wastewater treatment plant sludge from primary copper processing, slag from primary lead processing, process wastewater from hydrofluoric acid production, and chloride process waste solids from titanium tetrachloride production) have posed or may pose a danger to human health or the environment. Available data indicated that all four of the wastes exhibit one or more of the characteristics of hazardous wastes. In particular, EPA found that all of the wastes except process wastewater from hydrofluoric acid production exhibit the characteristic of EP toxicity at least one facility; process wastewater from hydrofluoric acid production was found to be corrosive at all facilities where it is generated. In addition, damages associated with these wastes were documented as follows: (1) Current lead slag management practices have resulted in surface water contamination; (2) ground-water contamination that may in part be attributable to calcium sulfate sludge from primary copper processing was found at one of the two facilities that generate the waste; and (3) ground-water contamination that may in part be attributable to chloride process waste solids from titanium tetrachloride production was identified at at least one facility that generates this waste. Furthermore, the Report stated that the Agency was not confident that current practices and regulations are adequate to prevent further danger to health or the environment from these four wastes.

Nevertheless, EPA tentatively concluded that regulation of three of the four wastes as hazardous (calcium sulfate wastewater treatment plant sludge from primary copper processing, slag from primary lead processing, and chloride process waste solids from titanium tetrachloride production), under full subtitle C was not appropriate due to cost considerations. The Agency's basis for this finding was a cost comparison between full subtitle C and the D-Plus scenario (with Subtitle D-Plus including subtitle D requirements similar to those being developed for extraction and beneficiation wastes) that showed that the costs for full subtitle C regulation would be significantly higher and the associated impacts would be more significant at nearly all facilities than the estimated costs of regulation under the Subtitle D-Plus scenario.

For process wastewater from hydrofluoric acid production, EPA found that the estimated compliance costs for regulation under full subtitle C and regulation under the Subtitle D-Plus scenario were comparable and that the likely economic impacts were not expected to be significant. Based on these factors, EPA tentatively concluded that process wastewater from hydrofluoric acid production may warrant regulation under subtitle C.

On the other hand, EPA also estimated the cost of managing these four wastes under a subtitle C scenario that utilizes the flexibility provided by RCRA section 3004(x) (Subtitle C-Minus).[4] The Agency then compared the costs for Subtitle C-Minus regulation (rather than full subtitle C regulation) to the estimated costs that might result from regulation under a subtitle D program similar to those being developed for extraction and beneficiation wastes (Subtitle D-Plus). EPA found that the estimated costs for the Subtitle C-Minus and Subtitle D-Plus scenarios are comparable for nearly all facilities. Assuming a Subtitle C-Minus scenario, EPA tentatively concluded that all four wastes might warrant regulation under subtitle C.

b. Approach 2: Application of the RCRA Section 8002(p) Study Factors and Additional Considerations

Sections 3001(b)(3) and 8002(p) of RCRA and the decision in *Environmental Defense Fund* v. *EPA*, 852 F.2d 1309 (D.C. Cir. 1988) make it clear that the Agency may and should consider the specific factors of section 8002(p) (1)–(8) in making its decision regarding the appropriate regulatory status of special wastes. In addition, the Agency stated in the Report that in making its regulatory determination, it might be appropriate to consider other factors relating to the broader goals and objectives of the Agency and RCRA, such as developing and maintaining strong state mining and mineral processing waste regulatory programs and facilitating implementation of federal programs.

Accordingly, EPA stated in the Report to Congress that in order to facilitate both development and maintenance of strong state programs and implementation of any federal regulations that may be necessary for mineral processing wastes, it might be

[4] The Subtitle C-Minus scenario that was considered in the RTC is hypothetical and was assumed only for the purpose of cost estimation; it does not necessarily represent what EPA would consider an appropriate regulatory program.

appropriate to regulate all 20 of the special wastes under subtitle D of RCRA. In addition, the Report stated that some mining and mineral processing wastes might be excluded from any further federal regulation under RCRA.

In light of these considerations, the results of Approach 2 indicated that it might be appropriate for the waste streams identified under Approach 1 for potential subtitle C (full C or C-Minus) regulation not be subject to the hazardous waste management standards, but instead to be retained within the Mining Waste Exclusion. If such a finding was appropriate, EPA stated that it would need to be conditioned on the premise that major steps be taken to control releases from the facilities generating these waste streams. Some corrective measures are already being taken under a variety of Agency authorities (e.g., RCRA, Superfund, CWA) and more can and would be undertaken. EPA also asserted that the states must act to address the most immediate problems posed by these wastes, as well as any of the other mineral processing special wastes that have been found in the Report to pose significant actual or potential hazard to human health or the environment. To assist in this effort, EPA pledged to provide technical and other resource support to the involved states to improve their programs. If near term actions did not result in adequate control of such wastes, EPA would then take action to reconsider its regulatory determination and could designate certain waste streams as subtitle C hazardous wastes.

4. Public Comment Process

With publication of the Report to Congress, EPA initially established a 60-day public comment period that ended on September 28, 1990. In response to requests from several commenters, however, EPA extended the comment period to October 19, 1990. In addition, a public hearing on the Report was held in Washington, DC on October 17, 1990. EPA received 91 sets of written comments prior to the close of the comment period and eight late comments. All individual comments and a transcript from the public hearing are available for public inspection in the docket (Docket No. F-90-RMPA-FFFFF). The docket also contains a summary of all the comments presented at the hearings or submitted in writing. EPA's responses to those comments are provided in the docket, as well as in appendix A to this regulatory determination.

D. Supplemental Analysis and Notice of Data Availability

Supplemental analyses were conducted on five wastes that were addressed in the Report to Congress, including gasifier ash and process wastewater from coal gasification, basic oxygen furnace and open hearth furnace air pollution control dust/sludge, and phosphogypsum and process wastewater from phosphoric acid production. A Notice of Data Availability (NODA), which announced the availability of this information, was published in the **Federal Register** on January 7, 1991.

A 30-day public comment period was provided, which closed on February 6, 1991. As in the case of the Report to Congress, EPA received requests that it extend the comment period. However, EPA did not extend this comment period because of the need to proceed with the regulatory determination process as expeditiously as possible and because the Agency believed that the comment period provided was adequate. In addition, EPA took steps to ensure that commenters could make the maximum use of the time available. For example, EPA made the supplemental data publicly available as soon as possible, immediately following Agency signature, rather than waiting until the NODA was published in the **Federal Register**. Also, at the request of industry, EPA delayed the start of the public comment period until after the holidays.

Included in the new data was information on phosphoric acid process wastewater and phosphogypsum concerning generation and management of these wastes, the engineering feasibility and cost of alternative waste management practices, waste characteristics, ground water monitoring data, and state regulations. The Agency specifically solicited comments on the engineering feasibility and accuracy of cost estimates for the alternative waste management practices presented as part of the new data.

The Agency received 22 written comments addressing the NODA. All of the comments are available for public inspection in Docket No. F-91-RM2A-FFFFF. Agency responses to the comments are provided in the docket and appendix B to this regulatory determination.

II. Factors Considered in Making the Regulatory Determination

The RCRA statute, as amended, directs EPA to make a regulatory determination for the special study wastes based upon its Report to Congress and comments received from interested parties. The statute contains the following eight study factors:

1. The sources and volumes of such materials generated per year;
2. Present disposal and utilization practices;
3. Potential danger, if any, to human health and the environment from disposal and reuse of such materials;
4. Documented cases in which danger to human health or the environment has been proved;
5. Alternatives to current disposal methods;
6. The costs of such alternatives;
7. The impact of those alternatives on the use of phosphate rock and uranium ore, and other natural resources; and
8. The current and potential utilization of such materials.

In addition, RCRA section 8002(p) suggests that EPA review studies and actions of other federal and state agencies, and invite participation from concerned parties, including industry and other federal and state agencies in an attempt to avoid duplication of effort.

EPA has complied with the Congressional mandate in developing the required Report to Congress and soliciting and incorporating comments received from affected parties. In making today's regulatory determination, the Agency has relied upon the analysis of the eight study factors described as "Approach 1" in the RTC, modified slightly in response to public comments. EPA believes that this approach is most consistent with Congressional intent. To the extent that the Agency were otherwise to conclude that subtitle C regulation was warranted based upon consideration of all of these factors and information, EPA believes, upon further reflection, that it is unnecessary and probably inappropriate to look outside the Report to Congress, public comments, and supplemental technical information, as outlined for Approach 2 in the RTC, to justify a different determination.

In addition, as discussed in more detail in appendix A to this preamble, EPA believes that the so-called "additional factors" upon which Approach 2 was based are, in large part, already embodied within the contours of the inquiry that Congress intended for EPA to make in the Report and regulatory determination. The Report identifies (1) the development and maintenance of strong state mining and mineral processing regulatory programs, and (2) the facilitation of an integrated federal mining regulatory program as the key considerations under Approach 2. Section 8002(p)(5) instructs EPA to consider "alternatives to current

disposal methods" as a factor in developing the Report and regulatory determination. Certainly, consideration of alternative state regulatory schemes, in addition to federal schemes, is contemplated by this section. Also, facilitation of a potential integrated federal mining program was actually considered by EPA in its cost estimates (reflected in the "Subtitle D-Plus scenario").

Nonetheless, EPA does not believe that it should rely on "possible" improved state programs to determine that subtitle C is not warranted unless EPA is confident that such programs are being developed and can address the problems associated with mineral processing wastes that may pose a significant risk. Thus, EPA believes that section 8002(p) requires that EPA not consider these factors in a way that would supplant any decision the Agency makes under the decision making methodology outlined in Approach 1. In any event, EPA notes that the issue is effectively moot. As discussed below, EPA has determined, on the basis of Approach 1, that subtitle C is not appropriate for any of the 20 wastes analyzed. Thus, even if EPA were to employ Approach 2 as outlined in the Report, it would not change any of the decisions made today.

In "Approach 1," the Agency evaluated the RCRA section 8002(p) study factors by first assessing the need for additional regulatory controls (or absence thereof), then evaluating the options for appropriate requirements that could be applied to each individual waste stream for which additional controls might be in order, and, finally, estimating the associated costs and impacts. In applying the decision criteria, EPA believes that the factors that are most important in establishing the regulatory status of the special wastes should be given major emphasis. Therefore, potential risks posed and documented damages caused by the wastes, the need for additional regulations, and the costs and impacts that would be associated with more stringent regulatory controls are the focus of the three steps in the analytical process. The reason for this is that in the absence of a realistic showing of a potential risk and/or documented damages from current management (or for appropriate cases, plausible mismanagement), EPA believes that Congress would not intend to eliminate the special status of these wastes by imposing hazardous waste regulation under RCRA Subtitle C; if greater regulatory controls may be appropriate because of significant potential or documented danger, the costs and impacts of regulatory controls are the critical factors in determining whether a given alternative would conform to Congress' expressed goals for these wastes (adequate protection of human health and the environment and continued operation of the affected industries).

The overall decision making process as described in the RTC was left basically intact for the purpose of this regulatory determination. However, a number of specific changes have been made to the individual decision criteria in response to public comments; these changes are detailed below, and address the specific questions considered in this step-wise process, as well as how the answers to these questions interact when deciding whether to go from one step to the next.

The modified step-wise process that the Agency applied to the available information is outlined below.

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

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

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

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

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

In the RTC, EPA concluded that further evaluation was necessary if the answer to any of these three questions was yes. However, numerous commenters argued that several of the damage cases included in the RTC do not represent today's conditions, for a variety of reasons, that the risk assessment conducted for the RTC tends to overstate risk, and that the leachate concentrations measured using the EP leach test overestimate actual leachate concentrations. Although EPA disagrees with many of the specific points made by commenters in support of these arguments, as discussed in appendix A to this preamble, the Agency believes that a more flexible decision making approach is warranted in response to the general concerns expressed. Concluding that further evaluation is necessary if the answer to just one of the above questions is yes, without taking into account the overall certainty and conservativeness of that answer relative to the answers to the other questions, could unnecessarily lead the Agency into Step 2 of the decision making process.

Therefore, for this regulatory determination, EPA answered each of these questions and then considered the combined answers as a whole in deciding whether further evaluation was necessary. A fundamental concept in this approach was that no one question is more significant in reaching a decision regarding potential hazard than the others, as the answer to one question could offset, somewhat, the answer to another. That is, rather than following a very rigid approach of proceeding to Step 2 if the answer to just one question was yes, the Agency considered how the answers traded off, taking into account each answer's supporting weight of evidence and certainty.

For example, the scenario for a given waste could be that (1) there was not a documented damage case that could be attributed to the waste with reasonable certainty (i.e., the answer to question 1 was no); (2) the reasonably conservative risk analysis provided a sound basis for concluding that the potential for human health and environmental problems was low under current management practices or plausible mismanagement scenarios (i.e., the answer to question 2 was no); and (3) the waste exhibited the toxicity characteristic using the EP leach test (i.e., the answer to question 3 was yes), but only rarely and never for samples analyzed using the Synthetic Precipitation Leaching Procedure (SPLP). Under this scenario, EPA would have reached an overall low hazard conclusion because the balance of the information supporting the answers to questions 1 and 2 effectively outweighs, in the Agency's judgment, the answer to question 3.

By following this approach, the Agency considered all of the relevant information in making its decision on the potential for each waste to pose human health and environmental problems. If this analysis led the Agency to conclude that there is a reasonable potential for problems, then EPA concluded that further evaluation was necessary. If the conclusion was that the potential for problems is low, then the Agency determined that regulation of the waste under RCRA subtitle C is not appropriate. EPA believes that this "balancing" approach to the analysis in

Step 1 allows EPA to determine with more precision the actual hazards posed by those wastes, consistent with the intent of the Bevill Amendment. 852 F.2d at 1314. EPA also notes that this analysis does not precisely match the approach EPA uses to list or identify non-special wastes as hazardous, but is more conservative in the direction of not imposing regulation unless the potential risk justifies elimination of special status.

Step 2. Is more stringent regulation necessary and desirable?

If the waste has caused or may potentially cause human health or environmental impacts as determined in Step 1, then EPA concluded that an examination of alternative regulatory controls was appropriate. Given the context and purpose of the study, the Agency focused on an evaluation of the likelihood that such impacts might continue or arise in the absence of more stringent regulation, and whether subtitle C would be an efficient mechanism for controlling these impacts. Specifically, the Agency posed three questions:

1. Are current practices adequate to limit contaminant release and associated risk?
2. Are current federal and state regulatory controls adequate to address the management of the waste?
3. Will Subtitle C effectively address problems associated with the waste without imposing significant unnecessary controls that are inconsistent with the special status of the waste?

Due to changes made in response to public comments, these questions differ from the questions presented for Step 2 in the RTC, in two ways. First, the Agency eliminated a question concerning the likelihood of new facilities opening in the future and generating and managing a special waste in a different environmental setting than those examined in the RTC. The Agency acknowledges that this is a relevant issue and considered it in the Report to Congress for each industry and waste that was studied. However, EPA agrees with public commenters that an analysis of this issue relies largely on conjecture about the potential conditions that might exist at a new facility, if one were to open. Therefore, the Agency believes that the potential for problems at hypothetical new facilities is less important than the other factors considered in the decision making process, and did not consider the question explicitly in developing the regulatory determination.

Second, several commenters argued that subtitle C regulation, even with Section 3004(x) flexibility, would impose numerous prescriptive standards that would not necessarily be needed to control the problems at a given facility or across a commodity sector. While EPA disagrees with many of the specific points made by these commenters in support of their arguments, as presented in the appendices to this preamble, the Agency agrees that the suitability of subtitle C controls relative to the magnitude and extent of the problem(s) defined in Step 1 is an important issue in the decision making process and the approach is also consistent with EPA's previous approach to making regulatory determinations under the Bevill Amendment, which focused on whether subtitle C, even with the use of Section 3004(x), might be too "cumbersome and uncertain" to accomplish the goals of effective regulation of the risks from special wastes, or put another way, whether subtitle C is the right "template" for regulating the special wastes at issue. 852 F.2d at 1313, 1315. Therefore, the Agency added the third question listed above for the purpose of developing today's regulatory determination.

EPA considered the answers developed for these questions together with the answers to the questions addressed in Step 1 to reach an overall conclusion on the need for further evaluation. If current practices or existing regulatory controls were found to be adequate, or Subtitle C would not be an effective regulatory alternative, and if the potential for actual future impacts was considered low (e.g., existing facilities in remote locations, low likelihood of actual risk, adequate federal or state regulatory controls already exist), then the Agency concluded that the waste should not be regulated under Subtitle C. Otherwise, further examination of regulatory alternatives was considered necessary.

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

If, based upon the previous two steps, EPA believed that a waste might be a candidate for regulation under subtitle C, then the Agency estimated and evaluated the costs and impacts of two regulatory alternatives that are based upon subtitle C, and one regulatory alternative that reflects one possible approach that might be taken under RCRA subtitle D ("Subtitle D-Plus"). Two evaluations were performed. The first focused on the magnitude, distribution, and significance of the incremental costs of regulation under full Subtitle C as compared to the Subtitle D-Plus scenario for each potentially affected facility. The second focused on incremental costs and impacts associated with regulation under a modified subtitle C ("Subtitle C-Minus") scenario, that incorporates waste management standards based upon site-specific risk potential, as compared to Subtitle D-Plus. The key questions in the Agency's decision making process for both comparisons were as follows:

1. Are predicted economic impacts associated with the full subtitle C (or Subtitle C-Minus in the case of the second comparison) scenario significant for any of the affected facilities?
2. Are these impacts substantially greater than those that would be experienced under the Subtitle D-Plus scenario?
3. What is the likely extent to which compliance costs could be passed through to product markets or input costs could be reduced, i.e., to what extent could regulatory cost burdens be shared?
4. In the event that costs are significant, could a large proportion of domestic capacity or product consumption be affected?
5. What effects would hazardous waste regulation have upon the viability of the beneficial use or recycling of the special waste?

In EPA's judgment, an ability to pass through costs or an absence of significant impacts suggested that subtitle C regulation (or Subtitle C-Minus in the case of the second comparison) might be appropriate for wastes that pose significant risk. In cases in which the subtitle C (or Subtitle C-Minus) scenario would impose widespread and significant impacts on facilities, result in reductions in domestic capacity or supply, and/or deter the safe and beneficial use of the waste, EPA concluded that regulation under some other regulatory authority, including Subtitle D or TSCA, might be more appropriate.

III. Regulatory Determination for the 20 Special Wastes From Mineral Processing

The following discussion presents EPA's conclusions regarding the appropriate regulatory status of each of the special wastes from mineral processing, based on information obtained by analyzing the statutory study factors in the manner outlined above. The information summarized here incorporates information received during the public comment period and additional refinement of the data

presented in EPA's July 1990 Report to Congress and January 1991 NODA.

EPA has decided that regulation under subtitle C is inappropriate for all 20 of the mineral processing wastes. For nine of the wastes, no comments were received that objected to EPA's tentative determination in the Report to Congress that regulation under subtitle C for these wastes is unwarranted. These nine wastes include:

(1) Red and brown muds from bauxite refining;

(2) Treated residue from roasting/leaching of chrome ore;

(3) Gasifier ash from coal gasification;

(4) Process wastewater from coal sification;

5) Fluorogypsum from hydrofluoric d production;

6) Iron blast furnace slag;

7) Basic oxygen furnace and open arth furnace slag from carbon steel oduction;

8) Slag tailings from primary copper ocessing; and

9) Process wastewater from primary gnesium processing by the anhydrous ocess.

For the remaining eleven wastes, EPA eived at least one comment arguing t subtitle C regulations should be mulgated. EPA's determination ionale for each of these wastes ows.

Slag From Primary Copper ocessing. An examination of available ormation regarding copper slag leads he following findings regarding the ee key questions outlined above for p I in the Agency's decision making ocess.

First, copper slag rarely, if ever, nibits a hazardous waste aracteristic. Only one sample out of exceeded EP-toxicity regulatory els, for cadmium and lead. The ency agrees with commenters that the curacy of the one sample is estionable, because the cadmium ncentrations in the EP leachate ract are inconsistently high compared concentrations in the total sample alysis.

Second, although one commenter nted out that the slag contains a mber of constituents in ncentrations that exceed the nservative risk screening criteria used he Report to Congress, these ncentrations by themselves do not monstrate that the slag poses a nificant hazard. An examination of slag management practices and vironmental conditions at the 10 ive primary copper facilities icates that copper slag currently nerated at these facilities poses an erall low risk to human health and the environment. This is largely due to the fact that most of the active facilities are located in areas with low-risk environmental and exposure characteristics (e.g., very low precipitation and net recharge, large depths to ground water, large distances to surface water, and great distances to potentially exposed populations). As pointed out by several commenters, with whom EPA agrees, the Agency's risk modeling for copper slag was very conservative (tending to overestimate risks) and supports a conclusion that the slag poses low risks as currently managed.

Finally, following careful review of the information and public comments on the copper slag damage cases, EPA believes that the damages documented in the RTC for copper slag resulted from unusual circumstances that generally do not represent current management practices. For example, the damages at Commencement Bay (Puget Sound) were caused by the use of copper slag, as well as other wastes, as fill in a wetland or tideflats area. The nearby copper facility that generated the slag is now inactive, and the ten active primary copper processing facilities are generally concentrated in arid areas where it is very unlikely that slag could be disposed of in a wetland. Similarly, at the inactive copper facilities in Midvale, UT and El Paso, TX, environmental contamination has been caused by the co-management of slag from copper, lead, and/or zinc processing since the late 1800's. Based on the available damage case information, survey responses, and public comments, EPA believes that these cases do not reflect the industry norm today. In addition, EPA presently does not have damage case information that suggests that current copper slag management practices are causing problems.

Based on these findings, EPA concludes that current management of copper slag does not appear to pose significant human health or environmental hazards, and current slag management practices appear unlikely to cause problems in the future. As a result, Federal regulation under subtitle C is not appropriate. Given this finding, EPA did not evaluate the questions addressed in Steps 2 and 3 of the decision making methodology.

Slag From Elemental Phosphorus Production. Addressing the questions in Step 1 of the decision making process, the information included in the RTC and provided in public comments leads to the following major findings for elemental phosphorus slag.

First, elemental phosphorus slag does not exhibit any of the four characteristics of hazardous waste. One commenter contends that the slag is intrinsically dangerous because it is radioactive and contains toxic constituents. EPA agrees that the radionuclide content may pose a direct radiation threat when the slag is used off-site. (See further discussion on this issue later in this section and in section IV.) However, the slag contains few chemical constituents that exceed the RTC's conservative risk screening criteria by a significant margin, and none exceed regulatory levels that would qualify the slag for subtitle C controls.

Second, current on-site slag management practices and environmental conditions at the five active elemental phosphorus facilities generally pose a low risk via the ground-water and surface water exposure pathways. Significant risks via these pathways are limited by the low concentrations of potentially harmful constituents in slag leachate and the generally large size of slag particles that limit stormwater erosion potential. In addition, the potential for the slag piles to cause significant impacts to surface water is precluded by the relatively great distance (more than 500 meters) to the nearest water body at two facilities, the use of stormwater run-off controls at the slag piles at two facilities, and the large flow and assimilative capacity (30 cubic meters per second or 1,058 cubic feet per second) of the creek closest to the fifth facility. As the RTC and one commenter point out, one of the sites is located within a mile of a wetland, one site overlies an area of karst terrain, and one facility is located in a National Forest. While these facts are pertinent, the Agency believes, based on all the evidence, that existing management practices for elemental phosphorus slag should not significantly threaten these environments through the ground-water and surface water pathways, given the small potential for releases to these media.

Moreover, although one commenter points out that ground-water contamination has been observed at three of the five active facilities, available information on the documented damages at elemental phosphorus facilities indicates that the ground-water contamination is due to other wastes and waste management practices (e.g., historic unlined ponds used to store process wastewater). This supports the above finding that on-site management of the slag does not pose a significant ground-water risk.

On-site management at three facilities, however, may pose a

moderate risk via the air exposure pathway due to the chromium, cadmium, and uranium-238 concentrations in the slag. Although the vitrified nature and generally large size of particles tends to limit wind erosion, there is some evidence that dust from slag piles may be blown into the air and potentially lead to exposures. As noted in the RTC and reiterated by one commenter, three of the facilities are located in fairly densely populated areas and three are located in agricultural areas where airborne deposition and subsequent food chain exposures are possible.

Based on these findings, EPA concludes that current on-site management practices for elemental phosphorus slag do not appear to pose a significant ground-water or surface water risk and are not likely to cause significant problems through these pathways in the future. However, there is some potential for airborne releases and resulting impacts; because of the Agency's desire to fully evaluate all potential risks, the Agency proceeded to Step 2 of its decision making process to evaluate whether more stringent regulation is necessary and desirable.

In this step, EPA made three basic findings:

- The relatively low to moderate risk from the on-site management of elemental phosphorus slag is expected to continue in the future in the absence of subtitle C regulation given current waste management practices and environmental conditions at the five active facilities. The slag characteristics and existing management practices at the five active facilities are unlikely to change significantly.
- None of the states where elemental phosphorus slag is generated specifically apply fugitive dust control requirements to slag piles. However, adequate authority and mechanisms already exist under the Clean Air Act to control this dust. For example, the National Ambient Air Quality Standards include a standard for the airborne concentration of particulate matter, and the dust could be controlled under the National Emission Standards for Hazardous Air Pollutants, if necessary.
- Regulation under subtitle C would impose significant and specific requirements (e.g., liners, caps, ground-water monitoring) that are directed at controlling releases/risks that do not appear to exist or are otherwise controlled and, thus, are not appropriate given the special status of the waste.[5]

Based on these combined findings from Steps 1 and 2, EPA concludes that regulation of elemental phosphorus slag under subtitle C is not appropriate under the circumstances. (Accordingly, EPA did not proceed to Step 3 of its decision making process.) EPA plans to further examine the potential impacts of fugitive dust emissions from elemental phosphorus slag piles and will determine whether controls for these releases are needed, and if so, whether they can be developed under the Clean Air Act.

The Agency is uncertain about the potential gamma radiation exposures and risks associated with off-site use of elemental phosphorus slag in construction and land reclamation. As discussed in more detail in section IV of this preamble, the Agency has postponed any decisions about the significance of this risk and the need for additional control of off-site uses pending more extensive review. In response to comments, EPA acknowledges that the RTC is in error in its statement that radon emissions from elemental phosphorus slag pose significant risks, as other EPA studies clearly show that the slag is not a significant source of radon emissions. However, the fact that radon gas emissions from elemental phosphorus slag are inconsequential does not eliminate concern about the potential for direct exposure to gamma radiation emitted from the slag.

Slag From Primary Zinc Processing. Regarding the questions raised in Step 1 of the Agency's decision making process, a careful review of the RTC information and public comments on zinc slag leads to the following three conclusions.

Based on available data, zinc slag frequently exhibits EP-toxicity, as 25 of 37 samples contained lead in concentrations that exceed the EP-toxicity regulatory level by a factor of between 5 and 13. Using the SPLP test, however, lead concentrations never exceeded the EP toxicity regulatory level, although the SPLP test has been shown on occasion to underestimate the amount of leachable lead in a sample.

At the same time, based on a review of existing waste management practices and predictive modeling results, EPA believes that zinc slag, as currently managed at the sole active facility in Monaca, PA, poses an overall low risk to human health and the environment. For example, the Agency predicts that metals leached from zinc slag at the Monaca facility would be largely bound to subsurface soil and would not reach the deep useable aquifer within 200 years. Even if a shallower aquifer exists at the site as the RTC and one commenter suggest, any shallow ground water that may become contaminated with slag leachate is likely to discharge, without being withdrawn for human use, into the adjacent Ohio River via the steep bluff adjoining the site. The Ohio River is very large at this point, and EPA modeling predicts that it can readily assimilate any chronic loading of contaminants that may occur, and any such release would be controlled through permitting under the Clean Water Act.

A portion of the zinc slag is also sold for use at off-site locations as road gravel or construction aggregate, and another portion is stockpiled until it can be sold for off-site use as a source of iron. Given the high concentrations of lead measured in EP leach tests of zinc slag, EPA recognizes that possible off-site use locations may be more conducive to releases and risks than the existing processing facility in Monaca, PA, although the Agency has no evidence that such risks are occurring or would occur. In fact, the Agency did not discover any damages attributable to such slags used off-site.

Third, EPA did not discover any damage cases attributed to zinc slag at the Monaca facility. Damage case studies at inactive sites did demonstrate the potential for surface water contamination via stormwater run-off from zinc slag piles, however. While these cases demonstrate the potential for problems if zinc slag is not properly controlled, they do not by themselves indicate that more stringent controls are needed for slag at the one active facility. In fact, the lack of documented damage associated with the active facility supports the conclusion that zinc slag as currently managed at that facility poses a low risk. One commenter argued that the lack of damage case data from the active facility may be a reflection of the inadequacy of the facility's environmental monitoring system, and not the absence of actual damage. However, the Agency believes that slag at the Monaca facility does not pose a threat, principally because the slag composition at the Monaca facility is not considered comparable to that of the inactive facilities, i.e., it arises from feedstocks having a different chemical composition. It should also be noted that with respect to the commenter's specific point, the facility has been in operation for over 50 years and there are no available monitoring data that show any

[5] To be regulated under subtitle C the waste would have to be listed as a hazardous waste because it does not exhibit any of the four characteristics that would otherwise classify it as a hazardous waste.

evidence of damages resulting from the management of zinc slag.

The Agency considered these findings, by themselves, to be insufficient to support a final regulatory determination. Although on-site risks and damages at the sole active facility are low, the elevated EP leachate concentrations (as well as difficulties in interpreting the low SPLP leachate concentrations) and the prospect of zinc slag being managed at off-site locations that may present a problem prompted the Agency to proceed to Step 2 of its decision making process to determine whether more stringent regulation is necessary and desirable. In answer to the questions ldressed in Step 2, the Agency found at:

• The waste management practices ıd environmental conditions that ırrently limit the potential for gnificant threats to human health and e environment at the Monaca facility e expected to continue in the future in e absence of subtitle C regulation. milarly, management practices at off-te locations would not be expected to ıange significantly. The characteristics the slag are also unlikely to change in e future.

• EPA's recently promulgated ormwater regulations (55 FR 47990, ovember 16, 1990) under the Clean /ater Act will minimize the potential r adverse impacts of stormwater run-f from zinc slag piles in the future.

• The only potential problem ssociated with these slags that EPA as identified is with their off-site use or sposal. However, the Agency has no vidence that such use or disposal is ssulting in environmental damage. ontrol under subtitle C would impose gnificant and specific requirements .g., liners, closure and post-closure are) that are directed at controlling eleases/risks that do not appear to xist or are otherwise controlled and, ıus, are not appropriate given the pecial status of the waste.

inally, the Agency notes that the State f Pennsylvania has proposed egulations that would impose more ringent environmental controls on the n-site management and off-site use of nc slag, although the exact nature and xtent of these controls cannot be redicted with certainty. The proposed ıle would require generators to certify ıat they have attempted to reuse and/ r recycle the slag before disposal and ould require permits to contain rovisions for liners, leachate collection ystems, monitoring wells, and disposal f leachate.

Based on these combined findings om Steps 1 and 2, EPA concluded that regulation of zinc slag under subtitle C is inappropriate under the circumstances. (As a result, the Agency did not proceed to evaluate the questions addressed in Step 3 of its decision making process.)

Air Pollution Control (APC) Dust/ Sludge From Iron Blast Furnaces. Addressing the questions in Step 1 of the decision making process, the information provided in the RTC and in public comments on the RTC leads to the following findings for this waste.

First, EPA found that lead concentrations measured in iron blast furnace APC dust/sludge leachate using the EP leach test only occasionally exceeded the EP-toxicity regulatory level (4 out of 70 samples from 3 out of 16 facilities with data). In addition, the waste is recycled (completely at one facility and partially at another) at two of the three facilities where the waste was found to be EP-toxic. Although lead concentrations determined by SPLP analyses never exceeded the EP toxicity regulatory level, the Agency has difficulty interpreting these measurements because the SPLP test has been shown on occasion to underestimate the amount of leachable lead in a sample.

At the same time, based on an examination of the site specific conditions at 15 of the 26 facilities that generate this waste, current management practices and environmental conditions are highly variable, with the potential for contaminant releases existing at some sites. For example, there is potential for ground-water contamination at five facilities that manage at least some of the dust/sludge in surface impoundments, although the low EP leachate concentrations at these facilities (none exceeded the EP-toxicity regulatory levels) would appear to suggest that any such contamination would not likely be significant. The dust/sludge also consists of small particles that are amenable to release and transport via stormwater and wind erosion when the waste is managed in exposed piles. Due to site-specific management practices and environmental conditions, there appears to be some potential for migration into surface water at four facilities and a potential for airborne releases and exposures at seven facilities.

One commenter argued that risks posed by this waste could be substantially higher than reported, because, as the commenter pointed out, the RTC did not consider the site-specific conditions at all active facilities, inactive facilities that could be reactivated in the future, and potential new facilities. While the commenter raises a good point, the Agency notes that the sample of facilities examined in the RTC represents more than half (15) of the 26 active facilities and seven of the ten states where active facilities are located. Furthermore, the conditions examined in the RTC represent a wide diversity of management practices and environmental conditions. Specifically, all known management practices for the dust/sludge were represented by the 15 sample facilities, including disposal methods (landfills and ponds) and temporary storage methods (storage pads and transfer areas), such as might be present at facilities that recycle the waste or send it off-site for disposal. Some of these units are equipped with engineered controls to prevent releases (e.g., liners and run-off controls), while others are not. In terms of environmental conditions, the facilities examined represent a variety of depths to ground water, net recharge rates, distances to surface water, and proximities to potential receptors. As a consequence, the Agency believes that the facilities examined reasonably represent the conditions that might exist at the other facilities. EPA thus believes that the hazards that were evaluated reflect the diversity and nature of hazards posed by iron blast furnace APC dust/sludge at the other facilities.

Finally, despite the Agency's theoretical conclusions about the potential for iron blast furnace APC dust/sludge to be released into the environment at some facilities, EPA did not find any damage cases attributable to this waste, which EPA believes to be significant when evaluating the actual hazards posed by special wastes. One commenter alleged that there are such documented damage cases, but that EPA did not discover them because it did not review files for inactive sites and other key information sources. However, as stated in the Agency's responses to comments on the RTC's analytical methodology (see appendix A of this preamble), the Agency maintains the view that its damage case investigation effort for these and other wastes was comprehensive and thorough. The Agency closely evaluated the specific information sources referenced by the commenter and, though the information clearly shows environmental problems at ferrous metal production facilities, EPA does not believe that the damages can be attributed to the special wastes studied in the Report to Congress. For example, surface water and ground-water impacts were found related to "slag landfills" at two facilities, but the landfills contained a number of co-disposed wastes, including sludges, fly

ash, waste acid, and coke plant tars, all of which may have contributed to the observed impacts.

In summary, this waste exhibits hazardous waste characteristics only rarely—only three facilities out of 16 with data generate dust/sludge that exhibits the toxicity characteristic, and even then the data suggest that the waste exhibits the characteristic only occasionally. Moreover, the waste is recycled (completely at one facility and partially at another) at two of the three facilities where it occasionally exhibits the toxicity characteristic. The Agency recognizes that existing waste characteristics, management practices, and environmental conditions could lead to releases at selected facilities. However, the low EP leachate concentrations at most facilities and the lack of documented cases of damage attributable to the dust/sludge indicate that the potential effects of such releases are not of sufficient magnitude to warrant removal of the special status of these wastes. In addition, EPA's recently promulgated stormwater regulations (55 FR 47990, November 16, 1990) under the Clean Water Act will minimize the potential for adverse impacts of stormwater runoff from the dust/sludge. Based on these findings, EPA concludes that regulation of this waste under subtitle C is inappropriate under the circumstances. (Accordingly, the Agency did not evaluate the questions addressed in Steps 2 and 3 of its decision making process.)

Basic Oxygen Furnace and Open Hearth Furnace Air Pollution Control (APC) Dust/Sludge From Carbon Steel Production. Based on a review of information in the RTC, supplemental analysis, and public comments on steel APC dust/sludge, EPA's responses to the questions in Step 1 of the decision making process are basically the same as those outlined above for iron blast furnace APC dust/sludge. Specifically:

- Steel APC dust/sludge appears to be EP-toxic only rarely. Of seven samples analyzed from five facilities, the concentration of selenium exceeded the EP-toxicity regulatory level in only one sample, and in this one case, only by a factor of 1.5. Selenium concentrations as determined by SPLP analyses did not exceed the EP-toxicity level.
- Based on an examination of the site-specific conditions at 11 facilities that generate the dust/sludge, current management practices and environmental conditions are highly variable, with the potential for contaminant releases existing at certain facilities. Like the iron blast furnace APC dust/sludge, however, there appears to be only a minor potential for ground-water contamination at a few facilities that manage the steel APC dust/sludge in impoundments. The steel APC dust/sludge consists of small particles that would be amenable to release and transport via stormwater and wind erosion if the waste is not properly controlled.
- EPA did not identify a single case of documented damage that can be attributed to steel APC dust/sludge.

Based on these findings, EPA concludes that subtitle C regulation for steel APC dust sludge is inappropriate under the circumstances that exist. (Therefore, the Agency did not employ Steps 2 and 3 of its decision making methodology.) The basic rationale for this conclusion is the same as that for iron blast furnace APC dust/sludge. That is, the dust/sludge rarely if ever exhibits a characteristic of hazardous waste. Although existing management practices and environmental conditions have the potential for environmental releases at certain facilities (although no evidence exists that such contamination has occurred or would occur), the waste's low contaminant concentrations and lack of damage cases indicate that the potential for adverse effects is not of sufficient magnitude to warrant removal of the special status of the waste. Thus, to the extent that additional controls may be justified, and state management controls are deemed to be inadequate, EPA may pursue appropriate controls for steel APC dust/sludge management under the Subtitle D program being developed for mineral extraction and beneficiation wastes.

Calcium Sulfate Wastewater Treatment Plant Sludge From Primary Copper Processing. In the Report to Congress, EPA tentatively recommended subtitle C regulation for this waste under Approach 1B. However, EPA received data in comments indicating that only one facility now generates and disposes of this sludge. In addition, as outlined in section II of this preamble, the Agency modified Step 2 of its decision making methodology in response to public comments to deemphasize consideration of potential threats that could exist at any new facilities that open in the future in favor of the other Step 2 factors, in light of the speculative nature of EPA's predictions regarding industry expansion. The possibility of expansion was an important factor contributing to the RTC's Subtitle C recommendation for this waste. EPA, therefore, has reconsidered the RTC tentative recommendation, focusing only on the remaining active generator (located in Garfield, UT).

Addressing the three questions considered in Step 1 of the decision making process:

- The sludge at the Garfield facility is EP-toxic for arsenic (7 out of 7 samples average 44 times the regulatory level), cadmium (6 of 7 samples average 3 times the regulatory level), and selenium (7 of 7 samples average 5 times the regulatory level). SPLP leach test concentrations, however, were below the subtitle C regulatory levels for all of the samples analyzed.
- One commenter argued that calcium sulfate sludge poses a large risk that should be controlled under subtitle C; however, based on a review of existing management practices and the arid setting of the Garfield facility, EPA believes that the hazards associated with calcium sulfate sludge at this site are low. Predictive modeling that accounts for the low net recharge and high evaporation rate, depth to ground water, and clayey subsurface at the site indicates that the potential for ground-water contamination is very low. Similarly, the potential for significant surface water contamination is negligible given the great distance of the sludge management units to the nearest surface water body (over 2 miles to the Great Salt Lake), and windblown dusting is significantly limited by the surface crust that forms on the dried sludge.
- No cases of documented damage caused by the sludge at the one active facility were discovered by EPA.

Even though the site-specific risk findings and lack of damage cases indicate that management of the sludge does not pose human health or environmental problems, the high intrinsic hazard of the sludge compelled EPA to consider additional factors before reaching a final regulatory determination. Therefore, EPA proceeded to Step 2 of its decision making process to examine whether more stringent regulation is necessary and desirable.

In Step 2, EPA found that current practices at the Garfield facility appear adequate to limit contaminant releases and associated risks in the future in the absence of subtitle C regulation. The sludge is well managed at present and the potential for releases appears to be precluded by the environmental conditions at this site. Specifically, potential releases to ground water are significantly limited by the site's very arid setting (liquids discharged to impoundments along with the sludge are expected to quickly evaporate and little precipitation and recharge is available to carry contaminants to the

subsurface), clayey subsurface, and depth to ground water (8 meters to the water table and 90 meters to the uppermost useable aquifer). Because the nearest surface water near the sludge units, the Great Salt Lake, is over two miles away, significant releases to surface water also should not be a problem. Finally, the potential for significant releases to air is limited because a surface crust forms on the dried sludge, largely preventing the wind from blowing dust into the air, and because the dried sludge is exposed to the wind only temporarily before it is stabilized and buried in an on-site landfill.

EPA also found in Step 2 that existing ate regulatory programs provide only mited controls over the management of alcium sulfate sludge. Some ommenters argued that the RTC's nalysis of state regulations gnificantly understates the regulatory equirements applicable to copper rocessing wastes. However, upon irther consideration of available formation and communication with ate officials, EPA concludes that the ates have been regulating copper rocessing wastes, including calcium ulfate sludge, only to a limited extent. lowever, as discussed below, the gency does not believe, based on vailable information, that this limited egulation has resulted in any nvironmental problems.

Finally, EPA also concluded in Step 2 nat Subtitle C regulation of calcium ulfate wastewater treatment plant ludge would impose significant and pecific requirements (e.g., liners, caps, round-water monitoring) that are irected at controlling releases/risks nat do not appear to exist or are therwise controlled and, thus, are not ppropriate given the special status of ne waste.

Based on these combined findings om Steps 1 and 2, EPA concluded that xisting sludge management practices at ne one facility in question currently mit the potential for damages. herefore, considering all of these ndings together, EPA concludes that ubtitle C regulation of calcium sulfate ludge is inappropriate given the xisting circumstances. (Accordingly, PA did not evaluate the questions ddressed in Step 3 of its decision naking methodology.) EPA may address ne generation and management of this ludge under the subtitle D program nder development for the mining ndustry.

This subtitle D determination differs om the RTC's tentative ecommendation for two reasons. First, otential human health and environmental problems at one copper processing facility were dropped from consideration because public comments indicate that the facility no longer generates and disposes of calcium sulfate sludge. Second, the Agency agreed with commenters that concerns expressed in the RTC about potential problems at new facilities that may open in the future are somewhat speculative. Therefore, EPA did not place as much weight on these concerns in making the regulatory determination as it did in the RTC.

Chloride Process Waste Solids from Titanium Tetrachloride Production. In the RTC, EPA tentatively recommended subtitle C regulation for this waste under Approach 1B. However, additional data submitted in public comments and reanalysis of the RTC data indicate that the waste is not EP-toxic for lead as indicated in the RTC [6] and, therefore, is EP-toxic only for chromium. In addition, this waste would currently be exempt from subtitle C regulation by 40 CFR 261.4(b)(6), which exempts wastes that are hazardous only because they exhibit the EP toxicity characteristic for chromium, contain only trivalent chromium, and are managed in non-oxidizing environments. For these reasons, EPA decided to reevaluate the RTC's tentative conclusions.

Considering the three questions in Step 1 of the Agency's decision making process, the Agency has made the following findings. First, the waste is characteristically hazardous only as a result of its chromium content, which is currently exempted from regulation under subtitle C of RCRA by § 261.4(b)(6)(i)(A). In addition, chromium concentrations in the waste solids measured using the SPLP leach test are below the EP-toxicity regulatory levels, as indicated by further analysis of the RTC data and information submitted in comments.

Second, based on an examination of existing conditions at the nine active titanium tetrachloride facilities, EPA found that current management of the waste solids may allow contaminants to migrate in the environment at certain sites, but that the potential for this migration to cause significant impacts is low. For example, there appears to be a potential for leachate from this waste to reach ground-water at half of the sites, but predictive modeling at the "most sensitive" site indicates that contaminant concentrations at the property boundary would be below drinking water standards. Similarly, the Agency's modeling predicts that concentrations of contaminants in surface waters near the sites would be well below human health and environmental protection benchmarks, and that the risks associated with the inhalation of windblown dust from the waste solids piles would be negligible.

One commenter argued that the risks posed by this waste are sufficiently high to warrant regulation under subtitle C. In particular, the commenter argued that chemical concentrations (e.g., of chromium, lead, radium, and arsenic) in the waste solids could be much higher than the few samples examined in the RTC, that the wastes threaten fragile ecosystems near several of the facilities, and that drinking water threats could exist if private wells were installed closer to existing facilities. While EPA agrees there is always a possibility that the waste could contain higher chemical concentrations than those reported, the Agency used 17 samples from 7 facilities and believes the resulting characterization of the waste is adequate. The Agency also recognizes that several sites are located near "fragile" ecosystems: Six of the nine active facilities are located within 1,600 meters (1 mile) of a wetland, one is located within 2,600 meters of an endangered species habitat, and three are located within 1,600 meters of a National Park, Wildlife Refuge, or Recreation Area. However, the Agency's conservative modeling predicts that it is very unlikely that contaminants released from the waste solids management units could migrate to these areas in harmful concentrations. Finally, EPA's ground-water modeling for the "worst-case" facility predicts that contaminant concentrations at the property boundary are below health-based and ground-water protection criteria. Therefore, it does not appear that releases to ground water would pose a serious threat to the environments surrounding each plant.

Third, EPA found no documented cases of damage attributable to titanium tetrachloride waste solids. No evidence of damages was uncovered in the RTC's comprehensive review of all nine active and two inactive titanium facilities, and no new damage case information was submitted in public comments.

Based on these findings, EPA concludes that regulation of titanium tetrachloride waste solids under RCRA Subtitle C is inappropriate under the

[6] The sole sample found to contain lead above the EP-toxic level was determined to be for the waste acids and entrained solids discharged to an on-site impoundment, not the titanium waste solids (the special waste) that settle to the bottom of the impoundment. EPA has determined, therefore, that this sample is not appropriate for use in characterizing the waste solids.

circumstances. (Accordingly, the Agency did not evaluate Steps 2 and 3 of the decision making methodology.) Current on-site management practices do not appear to pose a significant risk. In addition, management practices are likely to be improving because the waste is currently comanaged with waste acids from titanium tetrachloride production, a waste that recently became subject to subtitle C controls. EPA plans to follow closely the changes in management practices that are expected to result from the change in regulatory status of the waste acids, changes that in some cases may result in management of the waste solids in units subject to subtitle C requirements. At those facilities where the waste is not managed in units regulated under subtitle C, EPA believes that releases that may occur can be adequately addressed under subtitle D given the special status of these wastes. In addition, in the final Toxicity Characteristic rulemaking, EPA indicated that it would re-evaluate the trivalent chromium exemption in § 261.4(b)(6) (55 FR 11812, March 29, 1990). If EPA finds that this exemption is not protective of human health and the environment and if an examination of titanium tetrachloride waste management shows any continuing or new problems, the Agency will reconsider this subtitle D determination for chloride process waste solids from titanium tetrachloride production.

Today's subtitle D determination is warranted and differs from the RTC's tentative recommendation primarily due to changes in the data base used to characterize the waste, such that the waste only exhibits the toxicity characteristic of hazardous waste for chromium and is exempt from subtitle C regulation. As discussed above, consideration of changes in management practices for waste solids that are expected as a result of the classification of waste acids from titanium tetrachloride production as a hazardous waste supports a subtitle D decision. In addition, if the decisionmaking process had been carried to Step 2, the fact that the Agency modified Step 2 of its decisionmaking methodology (in response to public comments) to deemphasize consideration of potential threats that could exist at any new facilities that open in the future, would also have contributed to the change from the subtitle C tentative recommendation in the RTC to today's subtitle D regulatory determination.

Slag from Primary Lead Processing. In the Report to Congress, EPA tentatively recommended subtitle C regulation for lead slag under decision making Approach 1B. Further Agency analyses in response to public comments, however, provided a clearer picture of the three damage cases presented in the Report and the risks associated with one facility's practice of shipping its slag off-site for disposal. EPA, therefore, reconsidered the RTC's tentative recommendation to account for this additional information.

Addressing Step 1 in the Agency's decision making process, which evaluates whether management of the waste poses human health or environmental problems, EPA made four basic findings. First, lead slag is EP-toxic using results of the EP leach test; EP-toxicity leach tests show that lead exceeded the regulatory level at all five active facilities in a total of 27 out of 101 samples; the maximum lead concentrations exceeded the regulatory level by a factor of 19. Cadmium concentrations exceeded the regulatory level at two facilities, by as much as a factor of seven. Arsenic, mercury, and selenium concentrations also exceeded the regulatory levels at the one facility that is only a refinery (the other facilities are either combined smelters and refineries or, in the case of one facility, only a smelter). No samples analyzed using the SPLP test contained contaminants in concentrations above the EP-toxicity regulatory levels; however, the SPLP test has been shown on occasion to underestimate the concentration of leachable lead in a sample.

Second, current practices for managing lead slag at the five active lead processing facilities appear to limit the potential for significant impacts caused by the slag. The potential for lead slag to cause significant surface water contamination at all but one facility is limited by the use of control systems that retain and treat stormwater run-off from slag piles prior to discharge, or by an expected small contaminant loading that is well within the assimilative capacity of nearby water bodies and is subject to control under the Clean Water Act. Risk modeling indicates that stormwater erosion of a lead slag pile at one facility could result in surface water contamination. However, due to releases to ground water from unlined wastewater ponds at this facility, the site is presently being cleaned up under the Superfund program, and any potential surface water impacts associated with erosion from the slag pile will be addressed as part of the site's overall Superfund response. EPA's recently promulgated stormwater regulations (55 FR 47990, November 16, 1990) under the Clean Water Act will also minimize the potential for adverse impacts of stormwater runoff from lead slag.

The Agency's modeling indicates that it is possible for some contaminants to leach from lead slag piles at two of the active facilities and migrate into underlying ground water. However, increased on-site concentrations of constituents in ground water are expected to be well within applicable drinking water standards. Air pathway modeling also indicates that it is very unlikely for lead slag piles to cause harmful concentrations of contaminants in the air at the nearest residences. One commenter contends that lead slag should be regulated under subtitle C because windblown dust from slag piles could pose a significant risk by resulting in an accumulation of contaminated dust in residential areas where people could be exposed directly. However, a Remedial Investigation/Feasibility Study at the facility in East Helena, MT has shown that slag management is a very minor contributor to windblown particulate matter and accumulated dust in the site environs.[7] As much as 95 percent of the lead particulate matter measured in air near the East Helena facility was found to come from ore processing areas and other sources, not the slag piles.

Third, there is a greater potential for human health and environmental risk at two off-site municipal landfills where lead slag from one facility is disposed, although the Agency has no evidence that such management does present a substantial hazard. Although the total quantity of slag that is shipped to these off-site landfills represents only 3 percent of the total quantity of slag that is generated, the slag that is shipped off-site is the highly concentrated refinery slag that is consistently EP-toxic for mercury, lead, cadmium, arsenic, and/or selenium.

Fourth, historical slag management practices have clearly caused ground-water contamination at one site, but steps have since been taken to help prevent this contamination from occurring in the future. The RTC reported damage cases at two other lead facilities, but close examination of the RTC data and information submitted in public comments has eliminated one of the damage cases and called the other one into question. Specifically, EPA's ongoing Superfund evaluation at the lead facility in East Helena, MT has

[7] Comprehensive Remedial Investigation/Feasibility Study—ASARCO Incorporated, East Helena, Montana, March 30, 1990.

demonstrated that ground-water contamination at that site has been caused by two on-site wastewater impoundments. Contribution to the problem from the lead slag pile is thought to be limited, though further study is planned. At the other site, located in Boss, MO, observed ground-water contamination is not clearly attributable to slag, as it too may have been caused by nearby wastewater impoundments. The Agency's risk modeling predicts that ground-water contamination from the slag pile at this site is unlikely.

Based on these findings, EPA concludes that the potential for lead slag to cause significant impacts is limited by the current management practices and conditions at the five active facilities, but there is some potential for adverse impacts that may be caused by the off-site disposal of relatively small quantities of lead slag from one facility. Therefore, EPA proceeded to Step 2 of its decision making process to evaluate whether more stringent regulation is necessary and desirable. In this step of the process, EPA found that:

- Current practices at the off-site landfills that are receiving lead slag for disposal may not be adequate to limit contaminant release and associated risk. As mentioned above, these are municipal landfills that may or may not be adequately equipped to contain contaminant migration from lead slag.
- In Nebraska, where all of the present off-site disposal of slag takes place, the slag could continue to be managed at off-site locations in the future with minimal state regulation. The other states where primary lead processing occurs have varying degrees of regulatory control. The State of Missouri, for example, where three facilities are located, has recently developed strengthened permitting, closure, maintenance, and financial assurance requirements for facilities that manage mineral processing wastes. In addition, stormwater run-off from lead slag piles into nearby surface waters is subject to control under the Clean Water Act in all three states where the slag is currently managed.
- Because subtitle C regulation would subject the slag to strict hazardous waste management standards, it would prevent the disposal of slag in municipal landfills. However, a subtitle C determination for this waste would also impose significant and specific requirements for on-site management (e.g., liners, closure and postclosure care, ground-water monitoring) that are directed at controlling releases/risks that do not appear to exist or are otherwise controlled at the five active lead processing facilities and, thus, are not appropriate given the special status of the waste. In particular, the Agency does not believe that it is appropriate to subject the entire industry to stringent subtitle C controls when any potential problems appear to be associated primarily with only 3 percent of the lead slag that is currently produced.

Based on the combined findings from Steps 1 and 2, EPA concludes that regulation of the waste under subtitle C is inappropriate under the circumstances. (Accordingly, EPA did not proceed to evaluate the questions addressed in Step 3 of its decision making process.) The Agency, therefore, will work to ensure that both on-site and off-site slag management practices are adequately protective under subtitle D and under the Clean Water Act. In particular, EPA will investigate further the offsite disposal practices used by the Omaha facility to determine the extent to which slag is currently co-disposed with municipal waste. If the management of this waste does prove to be problematic, EPA may, for example, classify co-disposal of the slag with municipal wastes as open dumping under RCRA section 4004. Open dumping is a prohibited practice under criteria promulgated under section 4004.

This determination differs from the RTC's tentative recommendation primarily because the Agency closely reexamined the three lead slag damage cases discussed in the Report to Congress in response to public comments. As outlined above, this examination determined that controls have already been established at one site to address the problem, that another case appears to be mainly if not entirely due to wastes other than lead slag, and that attribution of the third case to slag management practices is questionable. Therefore, an important factor in tentatively recommending Subtitle C regulation in the RTC has been removed.

Process Wastewater From the Production of Hydrofluoric Acid. EPA tentatively recommended subtitle C regulation for hydrofluoric (HF) acid process wastewater under Approach 1A and 1B in the Report to Congress. Additional data submitted in public comments and follow-up with the State of Louisiana, however, confirm that the documented damages cited in the Report are attributable to phosphoric acid wastewaters, and not HF process wastewater as reported in the RTC. EPA also found that two of the three active HF acid production facilities neutralize their wastewater. Accordingly, EPA has reconsidered the RTC's tentative recommendation.

Reconsidering the three questions addressed in Step 1 of the Agency's decision making process, the Agency reaches three basic findings. First, all nine samples of process wastewater analyzed (from two of three active facilities) exhibited the hazardous waste characteristic of corrosivity. However, no constituent concentrations exceeded EP-toxicity regulatory levels (all eight inorganic constituents with EP toxicity regulatory levels were measured in concentrations that were no more than 0.6 times the regulatory levels).

Second, as the RTC and one commenter who argued for subtitle C regulation pointed out, there is a relatively high potential for process wastewater to migrate into shallow ground water at the three active facilities. However, EPA does not believe that this migration will pose significant health risks, either because the shallow ground water is not likely to be used at close downgradient distances or because the waste management units are equipped with controls (e.g., a monitoring well network and slurry walls) to detect and help contain ground-water contamination.

One commenter identified a number of factors that would, according to the commenter, tend to make risks higher than presented in the RTC (e.g., the presence of shallow ground water, the current lack of liners beneath existing impoundments, the potential for changes in population and land use patterns leading to higher risks in the future, the wastewater's corrosivity, and the close proximity of each existing facility to wetlands). All of these factors were considered in the RTC and contribute to EPA's concern that shallow ground water near existing units may be affected. However, EPA does not agree that the RTC understates the potential impacts associated with this contamination, because the concentrations of contaminants in the wastewater are generally low. No constituents in the wastewater were measured in concentrations above the subtitle C regulatory levels, and few exceeded the highly conservative risk screening criteria used in the RTC by more than a factor of 10. Therefore, although the ground-water may become contaminated above levels of concern in the immediate vicinity of waste management units, contaminants are not expected to migrate downgradient to potential human or ecological exposure points.

Third, new data provided in comments appear to indicate that shallow ground water at one of the active facilities has been contaminated

with sulfate, total dissolved solids (TDS), and fluoride.[8] Concentrations of sulfate and TDS in a few wells surrounding wastewater management units exceed upgradient concentrations and secondary drinking water standards (designed to prevent an unpleasant taste). Fluoride concentrations in the ground water exceed background concentrations but do not exceed the health-based drinking water criterion. Contamination above the sulfate and TDS standards appears to have migrated at least 50 meters downgradient from the units. No significant effect on pH has been observed, however, even though the very low pH of the wastewater would appear to pose the greatest threat. In addition, no data are available on the concentrations of metals and other constituents with subtitle C regulatory levels, but any contamination by these constituents is expected to be minor because concentrations in the wastewater are low, as discussed above. No other cases of documented damage attributable to HF acid process wastewater are known to exist.

Based on these findings, EPA concluded that additional waste management controls for HF acid process wastewater might be appropriate, and proceeded to Step 2 of its decision making process. In this step of the process, the Agency found that:

- Current practices at two of the three active facilities are probably adequate to limit contaminant release and associated risk. One of the two manages the wastewater in a surface impoundment bounded by a slurry wall and conducts ground-water monitoring, while the other neutralizes the wastewater prior to using it for gypsum transport.
- It does not appear that existing state controls adequately address the management of this waste at all facilities. Of the three states where active facilities are located (LA, TX, and KY), Louisiana appears to be most comprehensive in its regulation of hydrofluoric acid process wastewater. The other two states impose less stringent requirements, though Kentucky recently proposed new solid waste regulations that may address process wastewater more directly.
- Though the corrosivity of the wastewater is a potential concern, it does not appear to pose a significant problem at the three active facilities based on available ground-water monitoring data. In addition, the concentrations of RCRA Appendix VIII constituents in the waste are low enough that they are not expected to result in exceedances of applicable standards in ground water. Regulation under subtitle C would also impose significant and specific requirements (e.g., liners, financial responsibility) that are not appropriate given the special status of the waste.

Based upon the combined findings of Steps 1 and 2, EPA concludes that regulation of process wastewater from hydrofluoric acid production under subtitle C is inappropriate. Although the waste exhibits the hazardous waste characteristic of corrosivity, the low pH of the wastewater does not appear to pose significant human health or environmental hazards at the three active facilities. Moreover, the only constituents which were found in the wastewater at significant levels (e.g., sulfates, fluoride) are not listed in appendix VIII of part 261. Thus, aside from corrosivity, subtitle C would not identify or list this waste as hazardous under subtitle C. Consequently, to the extent that state programs are determined to be inadequate, the Agency plans to pursue methods within the developing subtitle D mining wastes program to control risks posed by this waste. (Accordingly, EPA did not proceed to evaluate the questions addressed in Step 3 of its decision making process.)

This determination differs from the RTC's tentative recommendation primarily because the Agency closely reexamined the reported damage case in response to public comments. As outlined above, this examination demonstrated that the damages described in the RTC are actually attributable to a different waste, rather than to HF acid process wastewater. Therefore, the primary reason for tentatively recommending subtitle C regulation in the RTC has been removed.

Phosphogypsum and Process Wastewater from Phosphoric Acid Production. The Report to Congress considered two special wastes from phosphoric acid production: Phosphogypsum and process wastewater. EPA believes that it is appropriate to address these two wastes together in this regulatory determination. Although the wastes do not necessarily have to be co-managed, all of the active phosphoric acid facilities presently manage the gypsum and wastewater together in one system, consisting of a phosphogypsum stack and associated impoundments.[9] Therefore, it is not possible to make a determination for one waste without, in practice, affecting the status of the other waste at all of the operating facilities. In addition, though the two wastes have distinct physical and chemical properties, it is very difficult to attribute environmental problems in the vicinity of the waste management units to one waste or the other. Moreover, given the existing co-management of the wastes, it is also appropriate to evaluate the two wastes together from the standpoint of alternative management practices and cost/economic impacts.

In the Report to Congress, EPA tentatively recommended Subtitle D-Plus regulation for both phosphogypsum and process wastewater. Since publishing the RTC, EPA has conducted a supplemental analysis of management technologies and state regulations for the two wastes, and received and evaluated public comments on the RTC and supplemental analysis. In addition, in response to public comments, EPA has more closely evaluated existing ground-water monitoring data for the active phosphoric acid facilities and analyzed the potential costs associated with the corrective action provisions in RCRA sections 3004(u) and 3008(h). EPA therefore reconsidered the RTC's tentative recommendation to account for this additional information.

Addressing Step 1 in the Agency's decision making process, which evaluates whether management of the wastes poses human health or environmental problems, EPA made three findings.

First, both the gypsum and process wastewater exhibit a characteristic of hazardous waste, but the gypsum appears to do so only rarely. Out of 11 facilities with data on the composition of phosphogypsum, only the gypsum at the facility in Rock Springs, WY exhibits the characteristic of EP-toxicity. Two out of two samples of phosphogypsum from this facility contained concentrations of chromium that exceed the toxicity characteristic regulatory level, by a factor of six, on average. This appears to be a characteristic restricted to gypsum derived from the processing of certain phosphate rock mined in Utah and processed at the Rock Springs facility. Available data indicate that the concentrations of chromium and other EP constituents in gypsum at facilities in Louisiana and Florida, which process rock from Florida, and facilities in Idaho and North Carolina, which process locally derived rock, are usually one to

[8] This information does not constitute a documented damage case.

[9] The gypsum is slurried to the stack using process wastewater and large quantities of the wastewater are held in the interstitial pore spaces within a phosphogypsum stack.

two orders of magnitude below the regulatory levels.

In contrast, the process wastewater routinely exhibits the hazardous waste characteristic of corrosivity (i.e., it has a pH of less than 2). Out of 15 facilities with data, all process wastewater samples examined at six facilities had a pH less than 2 and most samples examined at six other facilities had a pH below 2. All of the pH values available for the other three plants with data are greater than or equal to 2. Process wastewater at three out of six facilities with data also exhibits the toxicity characteristic. A total of 19 of 19 wastewater samples from the three cilities contained cadmium ncentrations that exceed the gulatory level (by a factor of four on erage), and two out of two samples m one of the facilities also contained romium concentrations that exceed e regulatory level (by a factor of two, average).

Second, existing practices for anaging phosphogypsum and process astewater appear to pose substantial ks of environmental contamination d impacts through the ground-water d surface water pathways. nsidering the hydraulic head created gypsum stacks and process astewater impoundments and the net charge, depth to ground water, and bsurface permeability at the 20 active cilities, EPA believes that there is a derate to high potential for ground-ater contamination across the dustry. This potential for ground-water ntamination is limited significantly at e one Wyoming facility, which has uipped its waste management units th synthetic liners and a seepage llection ditch, but the units at most ner facilities are either unlined or only ed with the clay and silt that turally exist in the area. EPA's ncern about potential ground-water ntamination at the 11 facilities in entral Florida is compounded by the esence of underlying karst in the deep oridan Aquifer; karst is prone to form verns or solution cavities that can rve as contaminant migration thways. Available data indicate that e background ground-water quality is itable for drinking [10] and that there is either a private or public well, where potential human exposures could occur, within 1,600 meters (1 mile) downgradient of the waste management units at 14 of the 20 active facilities. In addition, 15 of the active facilities are located within 1,600 meters of a wetland and 16 facilities have waste management units within 500 meters (less than a third of a mile) of a surface water body where contamination could pose ecological threats. Phosphogypsum does not appear to pose a significant air pathway risk. Radon emissions to the air from gypsum stacks are controlled under the Clean Air Act at a level designed to ensure "acceptable" risk within an "ample margin of safety" (see 54 FR 51654, December 15, 1989). Windblown dust releases from gypsum stacks also appear to be effectively precluded by the crust that forms on the dried gypsum solids.

Third, a close examination of available monitoring data reveals that there are numerous cases of documented ground-water contamination across the industry. For example, out of 16 facilities with data, the phosphogypsum stacks and/or process wastewater ponds at 13 facilities appear to have caused groundwater contamination that exceeds background levels and primary (i.e., health-based) drinking water standards. Contamination by constituents with toxicity characteristic regulatory levels is seldom evident more than 500 meters from the waste management units, but other contaminants with health-based limits (gross alpha radiation, radium, and sodium) have migrated in potentially harmful concentrations over greater distances. Based on a review of the monitoring data and plant configurations, EPA believes that contamination above primary drinking water standards has migrated or is likely to migrate beyond the facility property boundary (unless corrective measures are implemented) at 12 of 15 facilities with data.

Based on these findings, EPA concluded that management of phosphogypsum and process wastewater poses potential health and environmental problems. Therefore, EPA proceeded to Step 2 of its decision making process to examine whether more stringent regulation is necessary or desirable. In this step, EPA found that:

- Current phosphogypsum and process wastewater management practices are often not adequate to limit contaminant release and associated risk. As discussed above, current management practices generally consist of disposal or storage in large unlined piles and ponds, typically in areas that are conducive to ground-water contamination.
- Current state and federal regulations generally do not appear adequate to control current and likely future ground-water contamination. Although Florida is in the process of developing strengthened regulations, the State presently permits the special waste units to contaminate ground water, usually as far as, but sometimes beyond, the facility property boundary. Given the intrinsic hazards of the wastes, the widespread potential for contaminant release and migration, and the potential for human and ecological exposures in the vicinity of active facilities, EPA believes a more stringent regulatory approach is needed.
- EPA believes that regulation under subtitle C would impose significant and specific requirements that are directed at controlling the types of releases/risks that have been documented for phosphoric acid production wastes across the industry.

Based on the combined findings from Steps 1 and 2, EPA concluded that existing management practices create the potential for environmental problems and that more stringent regulation is both necessary and desirable. EPA therefore seriously considered subtitle C regulation for the phosphoric acid wastes and proceeded to Step 3 of its decision-making process to evaluate the operational and economic consequences of a subtitle C determination.

In Step 3 of the decision-making process, EPA examined the costs and impacts of the three regulatory scenarios examined in the RTC and the Supplemental Analysis, and used the insights gained thereby in deciding whether the economic impacts of subtitle C (or C-Minus) regulation might cause extensive and significant economic dislocations within the phosphoric acid production industry. Cost impacts were reevaluated subsequent to release of the RTC and were based upon an integrated management strategy for controlling risks posed by the two special wastes in combination. This departure from the Agency's initial approach was required by new knowledge gained through additional plant visits and analysis; these findings are summarized in the Supplemental Analysis and discussed further in comment response documents.

Extensive comments received on the Supplemental Analysis have cast doubt upon the engineering feasibility of some of the waste management alternatives

[10] Background data for the surficial aquifers dicate that shallow ground water at the sites is nerally drinkable, but low yields at the Florida es limit uses primarily to irrigation and livestock tering. Lower aquifers, where present, are nerally of equal or better quality, and appear to either current or potential public drinking water pplies.

presented in that document. Consequently, the Agency has based its cost analysis in support of today's regulatory determination on the use of lined phosphogypsum stacks and cooling ponds (Engineering Alternative 3 in the Supplemental Analysis). The technology required to implement this alternative has been amply demonstrated (i.e., is feasible), though the costs involved are higher than those of some of the other alternatives evaluated in the Supplemental Analysis. Because EPA is not confident at present that full subtitle C compliance is technically feasible for existing phosphoric acid plants, principally because of the predicted operational effects of the large-scale lime neutralization required for compliance (the only Engineering Alternatives that would comply with promulgated Subtitle C Land Disposal Restrictions (LDRs) for corrosive wastes rely on lime treatment), the cost and impact analyses conducted for today's notice focus exclusively on the Subtitle C-Minus and D-Plus scenarios.

EPA has estimated that the total industry-wide cost of compliance with the Subtitle C-Minus scenario (assuming implementation of Engineering Alternative 3) would be approximately $465 million annually, with an additional $15 million to $60 million required annually for corrective action, depending upon the analytical assumptions employed. Estimated annualized compliance costs for the Subtitle D-Plus scenario are approximately one-third lower, at about $330 million for the industry in total; corrective action costs under this scenario could range from $13 million to $48 million annually. These costs represent from 10.0 to 21.6 percent of the value of shipments (VOS) under Subtitle C-Minus, and from 8.2 to 15.2 percent of the VOS under Subtitle D-Plus (excluding corrective action costs), depending upon the facility involved. Costs of this magnitude exceed typical operating margins in the affected industry, could not be passed through, and hence, could not be sustained over an extended period.

As required by Section 8002(p)(7), EPA has also conducted an analysis of the impacts associated with the costs of regulatory compliance. Based upon the results of this analysis, the Agency has concluded that the costs and impacts of regulatory compliance under the Subtitle C-Minus and D-Plus scenarios would be highly significant for most phosphoric acid facilities, with C-Minus costs being particularly difficult to withstand. These costs would create economic hardship for and threaten the continued economic viability of many of the facilities in the industry. Consequently, the Agency has decided that while the management of phosphoric acid production wastes requires additional controls, hazardous waste controls under RCRA are too inflexible and costly for the industry to implement and remain economically viable. Even a less rigorous approach under the auspices of RCRA Subtitle D could impose costs and impacts that the domestic industry would find difficult to withstand. Therefore, the Agency has serious reservations regarding the economic feasibility of a traditional waste management program designed within the contours of the RCRA statute.

Given these facts and the need for action to address the risks posed by phosphoric acid production processes and associated wastes, EPA believes that a different approach is required. The Agency has therefore developed a two-pronged approach to address these wastes. First, the Agency will rely upon existing authorities under RCRA Section 7003 and CERCLA Section 106 to respond effectively to emergency situations that arise. In addition, EPA will accelerate the collection of facility-specific information, consider the risks posed by these facilities, and take appropriate action to contain or stabilize wastes at facilities that present a risk to human health and the environment. In this manner, EPA believes that it can respond appropriately to any problems that arise while developing a program that is both adequately protective of human health and the environment and economically feasible and achievable for affected industry.

Second, EPA believes that a regulatory program specifically designed to address the complex issues associated with phosphoric acid industry special wastes can be developed under authorities afforded by the Toxic Substances Control Act (TSCA). Like RCRA, TSCA provides a mechanism to address threats posed to human health and the environment and, unlike RCRA Subtitle C, does not contain prescriptive requirements. TSCA provides the additional and significant advantage of being broader in scope, and explicitly allows EPA to address various parts of the production and waste generation process itself. Therefore, EPA plans to proceed with examination of this problem under TSCA to consider how to develop a program that will address phosphoric acid production practices and processes to reduce the risks posed by phosphogypsum and process wastewater.

The TSCA regulatory investigation already underway will focus on developing risk management strategies to reduce or eliminate risks posed by phosphoric acid production wastes. EPA is evaluating the chemicals and the processes involved in phosphoric acid production and the resulting wastes to determine how TSCA authorities can best be used to reduce the toxicity and/or volume of these wastes. The Agency will analyze the efficacy and feasibility of some of the alternatives to current practices that were described in the Supplemental Analysis, with an emphasis on developing sound methods (in both a technical and economic sense) of reducing the toxicity and/or the volume of the special wastes. EPA will assess pollution prevention opportunities based on a phosphoric acid life-cycle analysis, the Supplemental Analysis, and other information obtained during the TSCA investigation. The investigation will also address the risk reduction potential and associated costs for identified regulatory options, such as restrictions on manufacturing, processing, or disposal. Depending on the results of this assessment, site specific risk reduction strategies may be considered as most appropriate. As specific wastes or toxicity reduction techniques are identified, EPA will work with the industry to implement the most promising alternatives as quickly as possible. EPA believes that by developing a tailored program under TSCA, the Agency will be able to more fully explore, promote, and enforce several promising pollution prevention and/or source reduction ideas (e.g., more efficient raw product filtration, fluosilicic acid recovery) than would be possible under a RCRA program.

In addition, EPA plans to further explore and evaluate containment strategies of various kinds, so that whatever wastes are generated will not result in contaminant releases to the environment. If information obtained or findings developed during the TSCA investigation are such that RCRA could better handle this matter, the Agency will revisit today's regulatory determination, and determine whether subtitle C regulation of the phosphoric acid special wastes remains inappropriate.

IV. Decision To Postpone Consideration of a Possible Ban on Elemental Phosphorus Slag Utilization

In the RTC, EPA found that the radionuclide content and potential for

radiation risk is a concern for slag from elemental phosphorus production. The primary basis for this finding was EPA's Idaho Radionuclide Study,[1] which estimated that average life-time cancer risks range from $4x10^{-4}$ to $1x10^{-3}$ in Soda Springs and Pocatello, Idaho as a result of the use of elemental phosphorus slag in a wide range of off-site construction applications. Based on these findings, EPA stated in the RTC that it planned to use the authority of RCRA section 3001(b)(3)(B)(iii) to ban the use of the slag in construction and/or land reclamation when the Agency issued its regulatory determination for mineral processing wastes. EPA solicited comments on the appropriate regulatory language that should be used and how such a ban should be implemented.

In response, five commenters questioned the validity of the Idaho Radionuclide Study. The commenters argued that the study was not conducted according to required procedures, has not been sufficiently peer-reviewed, contradicts epidemiological studies that show that cancer risks in Idaho are low, and suffers from several technical flaws. For example, according to the commenters, the data collection methodology was inadequate to support valid risk estimation, the study relies on a zero threshold low-dose risk model that is not supported by experimental evidence, and the study relies on aerial radiation measurements that exaggerate actual radiation levels. The commenters argued, therefore, that the Idaho study cannot be used as a basis for a decision to ban off-site uses of the slag.

Since the release of the RTC, the Idaho Radionuclide Study and supporting data have been distributed for review by industry, EPA's Science Advisory Board (SAB), and the Agency for Toxic Substances and Disease Registry. A public hearing on the study was also held in Soda Springs, ID on August 21, 1990. Because of the concerns raised, EPA has postponed its final determination on the validity of the study's conclusions until the Agency decides how to incorporate SAB's findings and after the Agency's review of information provided at the public hearing is completed. In addition, the Agency is postponing its consideration of a possible ban on elemental phosphorus slag utilization until it completes its review of the technical basis for such an action. EPA will propose a supplemental notice at the appropriate time.

[1] EPA, 1990, Idaho Radionuclide Study, Office of Research and Development, Las Vegas Facility, Las Vegas, NV, EPA/520/6-90/008, April 1990.

V. Regulatory Flexibility Analysis

The Regulatory Flexibility Act (RFA) of 1980 (Pub. L. 96-354), which amends the Administrative Procedures Act, requires Federal regulatory agencies to consider "small entities" throughout the regulatory process. The RFA requires in section 603 an initial screening analysis to be performed to determine whether a substantial number of small entities will be significantly affected by a regulation. If so, regulatory alternatives that eliminate or mitigate the impacts must be considered.

EPA conducted a detailed analysis of the facilities and companies that generate the 20 special wastes from mineral processing during the preparation of the Report to Congress. The Agency established at that time that no companies that meet the definition of "small business" generate any of the special mineral processing wastes. Also, EPA has not received any information in public comment on the Report that would contradict this finding, and therefore concludes that today's action will not adversely affect small mineral processing companies. Consequently, an explicit Regulatory Flexibility Analysis is not required.

VI. Agency Initiatives

To follow up on the findings that have resulted in today's regulatory determination, EPA plans to continue several initiatives that directly relate to some of the mineral processing wastes addressed in this regulatory determination. These initiatives include the following four activities:

(1) Evaluation of the radiation exposures and risks associated with the off-site use of elemental phosphorus slag;

(2) Review of hazards posed by wastes containing diffuse naturally occurring radioactive material (NORM);

(3) development of a management program under RCRA Subtitle D for mineral extraction and beneficiation wastes; and

(4) Development of a program under TSCA addressing the phosphoric acid industry.

As discussed in section IV of this preamble, in April 1990, EPA released the Idaho Radionuclide Study, which provided an assessment of the direct radiation exposures and risks associated with the use of elemental phosphorus slag in construction in Soda Springs and Pocatello, Idaho. A public hearing on the study was held in Soda Springs, ID on August 21, 1990. EPA has also requested its Science Advisory Board (SAB) and other scientific organizations to review the study's underlying data, methodology, and conclusions. The SAB is scheduled to issue its findings this year. When available, EPA will review these findings together with other scientific and public inputs to define needs for further study. Final conclusions from this study will be used to help evaluate the need for any added controls on the off-site use of elemental phosphorus slag.

In a separate study, EPA is presently evaluating the characteristics, risks, and regulatory control options under TSCA for diffuse NORM wastes. The scope of this study is much broader than the Idaho Radionuclide Study, and includes phosphate and elemental phosphorus wastes, metal mining and mineral processing wastes (including wastes from bauxite and aluminum, copper, zinc, tin, titanium, and zirconium and hafnium processing), and a variety of other wastes (e.g., coal ash, oil and gas production scale, water treatment sludges, and certain consumer items). The purpose of the study is to determine whether the routine management of these wastes pose a sufficient radiological hazard to warrant additional regulatory controls. EPA plans to complete the study in the summer of 1991, at which time the Agency will begin to evaluate whether any added controls are necessary to limit the radiation hazards, what authorities exist for such controls, and what the form and substance of a NORM waste program might be. As appropriate, EPA will evaluate authorities and opportunities to address NORM wastes under RCRA, the Toxic Substances Control Act, and other programs.

EPA is in the process of developing a RCRA Subtitle D program for mineral extraction and beneficiation wastes. EPA plans to include those mineral processing wastes determined here to warrant regulation under subtitle D under the regulatory "umbrella" for extraction and beneficiation wastes, making it the extraction, beneficiation, and mineral processing wastes program. As the development of this program proceeds, the Agency may find it necessary to control certain mineral processing wastes, such as waste acids, that have little in common with the majority of extraction and beneficiation wastes under a separate regulatory program.

Finally, as discussed in the regulatory determination for the phosphoric acid wastes, EPA plans to proceed with an examination of phosphogypsum and process wastewater management under TSCA. EPA will consider how to

develop a program under TSCA, including pollution prevention opportunities, that will address phosphoric acid production practices and processes to reduce the risks posed by these two wastes.

VII. Regulatory Determination Docket

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

The Docket is open from 9 a.m. to 4 p.m., Monday through Friday except for Federal holidays. The public must make an appointment to review docket materials. Call the docket clerk at (202) 475–9327 for appointments.

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

List of Subjects in 40 CFR Part 261

Hazardous waste, Waste treatment and disposal, Recycling, Reporting and recordkeeping requirements. Manifests.

Dated: May 20, 1991.

William K. Reilly,

Administrator.

PART 261—IDENTIFICATION AND LISTING OF HAZARDOUS WASTES

1. The authority citation for part 261 continues to read as follows:

Authority: 42 U.S.C. 6905, 6912(a), 6921, 6922, and 6938.

2. Section 261.4 is amended by revising the last sentence of the introductory text of paragraph (b)(7) to read as follows:

§ 261.4 Exclusions.

(b) * * *

(7) * * * For the purpose of § 261.4(b)(7), solid waste from the processing of ores and minerals includes only the following wastes:

* * * * * *

Note: The Following Appendices Will Not Appear in the Code of Federal Regulations.

Appendix A—Analysis of and Response to Public Comments on the Report to Congress

EPA received numerous public comments on the Report to Congress, including comments on the overall methodology used to evaluate the eight study factors and comments on the specific analysis and discussion of each of the 20 wastes. All of the comments are available for inspection in Docket No. F–90–RMPA–FFFFF. EPA has carefully considered each of these comments in developing this regulatory determination and includes in this appendix responses to certain major comments that have a particularly significant bearing on the Agency's final determination. All other comments and detailed responses are included in a supporting comment response background document, available for inspection in the RCRA docket.

I. Report to Congress Methodology

The Agency received a number of comments on the Report's scope (i.e., the particular wastes studied) as well as the approach that EPA used to evaluate five of the study factors: (1) Waste characteristics, generation, and current management practices; (2) potential danger to human health and the environment; (3) documented danger to human health and the environment; (4) compliance costs; and (5) economic impacts. Commenters did not raise significant methodological issues concerning the Agency's evaluation of Federal and State waste management controls or waste management alternatives and potential utilization.

A. Scope

Several commenters took exception to the Report's overall scope, with some stating that the scope was too narrow and some stating that the scope was too broad. The commenters that argued that the scope was too narrow said that EPA improperly narrowed the scope of the mining waste exclusion, leaving several mineral processing wastes potentially subject to subtitle C regulation when they should have been studied further in the Report to Congress. For example, one commenter said that certain wastes that exhibit a hazardous waste characteristic, such as coal tar wastes from historic town gas manufacturing, constituted exempt mineral processing wastes and should have been studied in the Report. The commenters that believed the scope was too broad said that EPA wrongly studied materials that are not solid wastes and thus not subject to RCRA regulation, such as some slags.

EPA believes the argument that the scope of the Report was too narrow is not an issue pertaining to the Report to Congress, but rather pertains to the scope of the Agency's final rulemakings interpreting the scope of the exclusion for mineral processing wastes. As EPA explained in the preambles to the rules as well as the Report to Congress, two final rules established the scope of the exemption for mineral processing, and EPA did not solicit further comment on this issue in the RTC. EPA also notes that the coal tar wastes mentioned in the comment are no longer generated (the last plant that manufactured gas for municipal use using coal closed in the 1970's) in high volumes (if they ever were), and the Bevill Amendment applies only to currently generated waste and historical stockpiles of currently generated waste. Moreover, the coal tar wastes remaining from historic town gas manufacturing are substantially different from the coal gas wastes studied in the Report to Congress, as the coal tar wastes have a different chemical makeup and were generated by different processes.

With respect to the argument that the scope of the Report is too broad, EPA acknowledges that some of the materials examined in the Report are not always solid wastes, depending on how they are managed in particular instances. In fact, if they are not defined as solid wastes under EPA's regulations, the Agency agrees that regulation under RCRA is not appropriate. However, the Agency believes that all of the materials examined are managed as a solid waste, as defined by RCRA regulations, at least part of the time at some facilities. Therefore, all of these wastes were appropriate for study in the mineral processing report.

B. Waste Characteristics, Generation, and Current Management Practices

One commenter argued that EPA's consideration of waste characteristics in the RTC did not recognize the variability in composition of a given waste from one facility to the next. According to the commenter, this variability provides support for a determination that subtitle C regulation is unwarranted because regulation under other state and federal authorities provides the flexibility necessary to address the geographic variability in waste characteristics (which subtitle C does not). For example, data for phosphogypsum and process wastewater from phosphate rock processing clearly demonstrate, according to the commenter, the variability of characteristics of these wastes and the relationship between that variability and the geographic origin of the phosphate rock being processed. The commenter went on to contend that the RTC used waste characterization data only to determine whether a waste contains constituents at concentrations of potential concern, ignoring the critical aspect of geographic variability.

EPA disagrees with this comment. Waste characteristics and the variability in chemical concentrations from one facility to the next were critical elements in the risk and cost analyses, as well as in the Agency's final decision making. Specifically, the variability in waste composition was

explicitly highlighted in the analysis of each waste's intrinsic hazard, and the facilities that were examined in the cost and economic impact portions of the analysis were selected as a function of whether their wastes exhibit a hazardous waste characteristic. If subtitle C regulation for a given waste warranted serious consideration based on an analysis of the study factors, EPA closely examined on a facility-by-facility basis the frequency and magnitude with which the waste exhibits a hazardous waste characteristic in order to reach a final regulatory determination.

C. Potential Danger to Human Health and the Environment

1. *Leaching Procedures.* Four commenters addressed the appropriateness of different laboratory leach tests used to measure contaminant concentrations in leachate from mineral processing waste samples. Three of the commenters objected to the RTC's use of data generated from the Extraction Procedure (EP) leach test. These commenters stated that EP leachate concentrations overestimate actual leachate concentrations because the EP test mimics an implausible mismanagement scenario in which mineral processing wastes are co-disposed with municipal solid waste in a municipal landfill and exposed to an organic leaching medium. In general, these commenters believed that analytical results from a distilled water leaching procedure or the Synthetic Precipitation Leaching Procedure (SPLP) would provide a more realistic assessment of the leachability of metals from mineral processing wastes under actual field conditions. In contrast, another commenter suggested that use of the EP leach test data is reasonable because, among other reasons, co-disposal with municipal wastes cannot be ruled out for some mineral processing wastes that are disposed off-site, and because at the time the RTC was being prepared, the EP leach test was the required procedure for determining whether a mineral processing waste would be regulated as EP toxic if the Bevill exemption was removed.

The Agency believes that the RTC's use of EP leach test data for mineral processing waste characterization and risk assessment is reasonable for three main reasons. First, use of the EP leachate data is a reasonably conservative approach. While several constituents were found to be present in higher concentrations in EP leachate than SPLP leachate for some samples that were tested using both procedures, results for the two tests are often similar (and for liquid wastes, they are identical since liquids are not leached, but simply compared directly to the appropriate regulatory concentration levels). There are also cases where EP leachate concentrations were found to be less than SPLP leachate concentrations. For example, the results of an EPA study [1] analyzing the validity of the SPLP test showed that the SPLP test has been shown on occasion to underestimate the amount of leachable lead in a sample.[2] Other constituents that are commonly present in higher concentrations in EP leachate than SPLP leachate include iron, zinc, aluminum, cadmium, copper, and nickel. In contrast, arsenic, vanadium, molybdenum, and barium are commonly found in higher concentrations in SPLP leachate than EP leachate. In addition to the fact that EP leachate concentrations appear reasonably conservative relative to the SPLP concentrations, the Agency believes use of the EP leachate data is reasonable because mineral processing wastes may be plausibly mismanaged in a municipal landfill in certain cases. For example, lead slag from one of the primary lead processing plants, and steel (basic oxygen furnace and open hearth furnace) air pollution control dust/sludge from one plant are presently shipped off-site for disposal in a municipal landfill. Given the existing regulatory regime, it is not inconceivable that other mineral processing wastes from other facilities could be disposed in a similar manner in the future.

Second, as noted by one of the commenters, the EP leach test at the time the RTC was being prepared was the legally required procedure for determining whether the mineral processing wastes under study exhibit the hazardous waste characteristic of EP toxicity. The test that has replaced the EP test, the Toxicity Characteristic Leaching Procedure, assumes the same mismanagement scenario and will also be used to determine the toxicity of wastes for regulatory purposes.

Third, the vast majority of available leachate data for mineral processing wastes are from EP leach tests. The amount of data from other laboratory leach tests or from samples of actual leachate collected in the field is insufficient to support a comprehensive evaluation.

The Agency recognizes that there are some uncertainties associated with using EP leachate data to estimate the concentrations of metals in leachate generated from the mineral processing wastes as they are currently managed. As a result, the differences between measured EP and SPLP leachate concentrations were factored into the Agency's decision making for this regulatory determination. Also, EPA acknowledges that the RTC's use of EP leachate data differs from the approach used in the Agency's previous rulemakings on mineral processing wastes (reinterpreting the scope of the Mining Waste Exclusion), but believes the reasons outlined above provide a sound basis for using the EP data in the analysis leading to the regulatory determination. In the previous rulemakings, the Agency used limited SPLP data in order to establish which wastes qualified as "low hazard" and thus were eligible for detailed study in the RTC (i.e., use of the SPLP data was a reasonable approach for selecting the wastes to be studies, because wastes that exhibit hazardous characteristics under the SPLP test are clearly not low hazard). For purposes of actually conducting a risk assessment, however, relying primarily on the EP leachate data is a reasonable, though more conservative approach. The overall conservativeness of EPA's risk assessment is discussed further below.

2. *Overall Conservativeness.* Five commenters stated that the risk assessment methodology in general relies on overly conservative assumptions that grossly overestimate risk and ignore contradictory real-life information. The commenters said the risk screening criteria used to evaluate the intrinsic hazard of each waste stream's composition are ultra-conservative, as they are based on worst-case assumptions regarding an unbroken chain of events that allow contaminant release, migration through the environment, and exposure to receptors.

While the Agency agrees that there are elements of the risk assessment methodology that tend to overestimate actual risks, these overestimates are offset somewhat by other elements of the methodology that tend to underestimate actual risks. The Agency acknowledges that most of the risk screening criteria are conservative, as stated throughout the RTC. However, the Agency used these criteria only for the purpose of analyzing the intrinsic

[1] Performance Testing of Method 1312—QA Support for RCRA Testing, U.S. Environmental Protection Agency, Environmental Monitoring Systems Laboratory, Las Vegas, NV, March 1989. Docket No. F–89–MWRP–F0002.

[2] Given recent data that indicate that lead is a health hazard at significantly lower levels than previously believed (U.S. Department of Health and Human Services, Toxicological Profile for Lead, Agency for Toxic Substances and Disease Registry, June 1990), EPA believes it is especially important that it not rely solely on a procedure that may underestimate lead leachability.

hazard of each waste stream. EPA interpreted an exceedance of the criteria only as an indication that the risks of a given waste should be evaluated in more detail, not by itself as proof that the waste poses a significant risk. If a waste contained constituents in concentrations above the screening criteria, the analysis was supplemented with additional evaluation of conditions at actual facilities, and then further, if this evaluation indicated that there were potential problems, the Agency conducted risk modeling in order to develop final risk conclusions. The RTC then proceeded to evaluate the risk conclusions together with the damage case conclusions before reaching an overall finding on the hazards associated with each waste.

Overall, EPA believes that the risk assessment, while conservative, was reasonable in that EPA factored the uncertainties created by key assumptions in the risk assessment methodology into the regulatory decision making process for each waste stream. The approach that EPA used to evaluate potential human health and environmental problems is outlined in section II of this preamble and applied in section III, which presents the rationale for the final regulatory determination for specific wastes.

3. *Modeling Inadequacies.* One commenter argued that the Agency's risk modeling was inadequate and significantly underestimated risks because it did not adequately consider a number of specific factors. Important factors that the commenter alleged were left out or considered incorrectly include site-specific soil-water distribution coefficients (Kd's), the transport of metals in ground water by colloids, metal-organic complexing during ground-water transport, ground-water flow through karst terrains, storm events, evaporation and subsequent concentration of metals in small surface water bodies, and the transport of contaminated storm-water run-off to surface water bodies.

In general, EPA acknowledges these modeling limitations but believes most of them were unavoidable, forced in part by necessary limitations in the scope/complexity of the risk assessment, as well as by limitations in the state of ground-water modeling as a science. For example, the Agency agrees that Kd values are highly site-specific, but believes that modeling each site using actual Kd's would have required prohibitively extensive field measurements and verification. As a result, the Agency used the next best approach—EPA used its best professional judgment to select representative Kd values for each site and each contaminant, based on a review of data in the literature and an examination of available data on the soil composition at each site. In addition, with the possible exception of a few experimental models, the Agency is unaware of any reliable techniques for modeling the migration of colloids or the flow of ground water through karst. Overall, the Agency believes that its risk modeling approach accounts for the factors noted by the commenter in the best way possible, considering the study's time limitations. When significant factors could not be considered in the quantitative modeling exercise, they were considered in a qualitative manner so as to not compromise the overall completeness of the risk analysis.

4. *Lack of Consideration of Off-Site Use/Disposal and Future Changes.* One commenter argued that the risk assessment was deficient because it did not consider the risks associated with off-site use or disposal of the mineral processing wastes. This same commenter said the risk assessment is also fundamentally flawed because it analyzes risks only in terms of existing conditions at each facility that generates the mineral processing wastes, not accounting for possible future changes in water use patterns or population distributions.

While the Agency acknowledges that it did not rigorously model the risks associated with off-site use/disposal or possible future locations of new facilities, it disagrees that the RTC did not consider these factors.[3] Based on a review of the past disposal practices and potential utilization of each waste, only about half of the mineral processing wastes are candidates for off-site use or disposal, including copper slag, elemental phosphorus slag, all four of the ferrous metal production wastes, fluorogypsum, lead slag, phosphogypsum, and zinc slag. In the case of elemental phosphorus slag, the RTC relied on monitoring and risk modeling conducted by EPA's Office of Radiation Programs to evaluate the potential radiation hazards associated with off-site uses; as discussed in section VI of this preamble, EPA is in the process of re-examining the validity of this off-site modeling for elemental phosphorus slag. For the other wastes, EPA evaluated the observed and potential hazards associated with off-site use or disposal in the context of the wastes' damage case record and intrinsic hazard analysis, and factored the results of this evaluation into the overall hazard findings in each waste-specific chapter of the RTC. For example, before reaching conclusions about the hazards posed by iron blast furnace slag, a waste that has been shipped off-site for disposal and a variety of uses for decades, EPA searched for and evaluated any evidence of environmental damage caused by the off-site management practices. The conservative risk screening criteria used to evaluate each waste's intrinsic toxicity also were developed using hypothetical scenarios that might occur if the wastes were mismanaged (e.g., scenarios in which an inactive waste pile is not closed or maintained and people are allowed to come into direct contact with the waste). Therefore, the Agency believes that both off-site activities and possible future changes have been accounted for in the overall hazard conclusion for each waste stream. EPA also notes, however, that, as a general matter, the use of site-specific risk modeling and evaluation is appropriate for high-volume special wastes which are typically managed on-site.

5. *Treatment of Radionuclides in the Report to Congress.* One commenter claimed that EPA's treatment of radionuclides is different with respect to the four wastes tentatively proposed for removal from the Mining Waste Exclusion and the sixteen other wastes. The commenter argued that EPA has determined that some radionuclide risk exists for some of the sixteen wastes but instead of recommending subtitle C regulation, EPA merely expressed that it plans to further investigate the potential for exposure and associated radiation risk. This commenter added that if further investigation is warranted before regulatory action is taken on some wastes, the same principle should apply to all the wastes.

EPA could not evaluate the risks associated with radioactive constituents for all of the wastes studied in the RTC because the necessary data were not available. In addition, there presently are no controls for risks from radioactive materials under RCRA subtitle C, as there is not a hazardous waste characteristic test for radioactivity and no radionuclides or radioactivity levels are listed in appendix VIII to 40 CFR part 261 (Hazardous Constituents). As a result, concerns about residual radioactivity

[3] As discussed elsewhere, EPA did examine potential changes in exposure scenarios at existing facilities. For example, the Agency's risk modeling examined potential groundwater exposure points at locations closer to the facility than known current well locations (e.g., at the facility boundary).

would not be resolved by removal of the Mining Waste Exclusion, because such an action would not result in subtitle C regulation unless the waste exhibits a RCRA hazardous characteristic.

To the extent that data were available on the radionuclide concentration in various wastes, EPA believes that it evaluated the data and made final regulatory determinations for the wastes in a consistent manner. That is, EPA uniformly compared available radionuclide concentration data for the wastes to risk screening criteria and developed conclusions on the intrinsic hazard of the wastes accordingly. The Agency then evaluated potential radiation risk as an element in the overall risk assessment for each waste, and combined the risk assessment conclusions with the other RCRA section 8002(p) study factors in accordance with the decision making methodology outlined in section II of this preamble in order to reach a final regulatory determination. Therefore, radiation risk was but one element in an overall evaluation process, and EPA consistently followed that process to reach appropriate determinations for each waste. To the extent that radioactivity appears to be a concern for a given waste, EPA believes that potential radiation risks should be addressed along with the waste's other potential threats within the regulatory framework determined to be appropriate (subtitle D in all cases). In addition, EPA is examining potential radiation risks associated with these and other materials in studies currently underway.

D. Documented Danger to Human Health and the Environment

One commenter contends that many of the damage cases cited in the RTC are not attributable to Bevill processing wastes. The commenter also stated that other damage cases cited by EPA resulted from historical management practices that have long since been discontinued by the mineral processing industry. A number of commenters made this assertion regarding specific mineral commodity sectors and wastes as well.

The Agency reexamined the RTC data and evaluated the information submitted in comments and eliminated some of the damage cases covered in the RTC for the purpose of this regulatory determination (see the comment-response background document in the docket for details). For example, EPA has eliminated the damage cases for lead slag at the ASARCO facility in East Helena, MT and for hydrofluoric acid process wastewater at the Allied facility in Geismar, LA because available information indicates that the contamination documented in the RTC is attributable to other wastes.

Furthermore, as discussed in the RTC, inclusion in the RTC of documented contaminant releases to the environment due to discontinued waste management practices does not necessarily demonstrate that releases from current management practices will occur. The Agency believes, however, that damage case information on past waste management practices is useful in demonstrating the potential for environmental and human health impacts, for two primary reasons. First, these damage cases provide information on combinations of management practices and site conditions that have resulted in environmental problems, which is useful for anticipating and avoiding future problems. Second, damage cases associated with past practices, like those associated with ongoing practices, are useful in demonstrating the kinds of impacts that can result when hazardous constituents are released from the wastes. If damage case information on past waste management practices was available, EPA evaluated the particular circumstances involved to determine if the case represents conditions that are likely to exist today. If, in EPA's judgment, a historical damage case did not apply to current management practices, it was used to supplement the risk conclusions in the sense that it could demonstrate how problems can occur in mismanagement scenarios, but it was not given the full status of a damage case in making the regulatory determination. However, if a historical damage case was found to represent today's management practices, it was considered equally with any damage cases for current management practices in developing the regulatory determination.

One commenter claimed that the Agency did not meet the standard set by Congress that damage cases should relate to the individual waste stream being studied. The commenter added that although relating damage to a specific stream may be difficult, it is essential if an analysis is to be meaningful.

EPA disagrees with this comment. As mentioned previously, the Agency reexamined the RTC data and evaluated the information submitted in comments and eliminated some of the damage cases covered in the RTC because the damages could not be attributed to a given waste stream being studied. In some of the cases that were retained for the purpose of this regulatory determination attribution to a sole waste stream was not possible, because wastes were co-managed, for example. However, the Agency believes that at least one of the special wastes being studied was contributing to the damages described in cases used for the regulatory determination. This view is based on EPA's review of available data on waste management practices and site conditions as reflected in state or EPA regional regulatory files.

One commenter argued that contrary to the Agency's position, the absence of damage cases is not a reliable indicator of the absence of potential hazard from the wastes studied in the Report. The commenter stated that the lack of damage cases can be attributed to two factors: Deficiencies and flaws in EPA's methodology for identifying damage cases, and inadequacies within state programs for identifying damage cases.

The Agency has reviewed these comments and maintains the view that its damage case investigation effort was comprehensive and thorough. Many sources were utilized to obtain information on facilities, including the National Priorities List (NPL) and other lists; federal, state, and local regulatory agencies; public interest or citizen's groups; and professional and trade associations. In addition, EPA followed up on general and specific examples cited in comments and has not found any additional damage cases. For example, EPA has reviewed the evidence suggested by one commenter linking observed damages to ferrous metal production wastes, and concludes that any such damages are not attributable to any of the four ferrous metal production wastes studied in the Report. The Agency acknowledges that although damages may have occurred at some facilities not identified in the Report, documentation of these damages was not available or non-existent. This is precisely why the RTC's findings about the hazards of each waste stream are based on both an analysis of damage cases and risks in the absence of any known damages. Moreover, EPA believes that the lack of documented damages for a given waste stream does not necessarily signify a lack of hazard from that waste stream, but believes that the attribution of damage cases to a waste stream is the most concrete evidence of such a hazard.

E. Estimation of Compliance Costs

1. *Incorrect Cost Estimates.* Several commenters claimed that EPA had seriously underestimated the total compliance costs associated with subtitle C regulations by failing to consider several pertinent elements,

including: The cumulative financial impact of federal and state regulations (including the recent Bevill rulemakings); hydrogeological investigations that may include the construction of systems of ground-water monitoring wells; location requirements at facilities within a 100-year flood plain; land disposal restriction requirements; neutralization; recycling; remedial work to control releases; and closure activities. One commenter, on the other hand, asserted that EPA overstated the cost associated with compliance by assuming that more facilities exhibit hazardous waste characteristics than are indicated by available data. For example, the commenter stated that the Agency incorrectly assumed that wastewater at every facility would be regulated as hazardous, even though the wastewater may not actually exhibit hazardous waste characteristics at each operating plant.

The Agency generally disagrees with those commenters who argued that EPA underestimated compliance costs associated with subtitle C regulation. As part of its analysis, EPA did, in fact, address many of the cited compliance cost elements. In the Report to Congress, EPA accounted for ground-water monitoring systems, neutralization of wastes, location standards, land disposal restrictions (in some cases), and closure requirements. The cumulative impact of previous rulemakings is not relevant to the issue of whether the special mineral processing wastes studied in the Report to Congress can be managed under RCRA subtitle C without excessive additional costs being incurred by the regulated community. That is, the costs and impacts of regulating non-special mineral processing wastes under subtitle C have no relevance to today's regulatory determination. EPA acknowledges that, at certain facilities, corrective action requirements could result in potentially significant costs for some wastes and, thus, has given further consideration to the associated costs (further discussion of this issue is presented below).

On the other hand, EPA acknowledges that compliance costs may be overstated in certain instances in which wastes were assumed to exhibit a hazardous characteristic when in fact they may not. The Agency used this conservative assumption to overcome data limitations (i.e., a lack of EP-toxicity test data for some facilities) and to demonstrate the estimated magnitude of compliance costs at potentially affected facilities. While actual impacts may be less widely distributed, EPA believes that the approach employed was a reasonable way of demonstrating potential impacts to industry under subtitle C, as contemplated by the Bevill Amendment. In addition, the assumption of hazardousness at all facilities and the associated cost estimates did not affect the regulatory determination in a meaningful way (as discussed further below).

2. *Corrective Action Costs.* Several commenters complained that EPA failed to consider the appropriate costs associated with corrective action. Many of these commenters stated that by ignoring corrective action requirements under RCRA sections 3004(u) and 3008(h), EPA was failing to fulfill its statutory obligation under the Bevill Amendment, which requires EPA to study the costs of regulating Bevill wastes under subtitle C. A few of these commenters recommended that EPA revise its cost estimates to reflect necessary corrective action. One of these commenters also indicated that EPA has the information required to determine at least the range of likely corrective action costs.

In response to these comments, EPA has analyzed corrective action issues in further detail and estimated corrective action costs at certain facilities. EPA focused this analysis on only those wastes for which corrective action costs might influence the final regulatory determination: Phosphogypsum and process wastewater from phosphoric acid production. These are the only wastes for which application of EPA's decision making methodology required EPA to consider potential regulatory compliance costs. If cost had been a factor in the decision for the other 18 wastes, inclusion of corrective action costs would only have added support to the Agency's determination not to regulate these 18 wastes under subtitle C.

EPA's corrective action analysis reflects the probable response to the predominant source and type of contamination that has been observed at phosphoric acid facilities, namely contamination of underlying ground-water aquifers by the routine operation of gypsum stack-cooling pond complexes. The response strategy examined by EPA involves the installation of a ground-water containment system consisting of extraction wells (in some cases supplemented by a slurry wall) around the entire stack-pond complex. In this manner, contaminants entering the subsurface would be removed, thereby preventing them from further contaminating the affected aquifer(s). This strategy assumes that over time, existing contaminants present in the ground-water system would be diluted and/or attenuated to below MCLs (due in part to the gradual rise in ground-water pH caused by eliminating the continuous introduction of acidic process wastewater to an unlined stack/pond system), thereby obviating the need for active aquifer remediation activities over the entire contaminated area. The Agency has identified the facilities that would likely experience corrective action (under either a modified subtitle C or D situation), and has estimated the costs of implementing the response strategy described here. Details regarding EPA's methodology and the results of the analysis are provided in a Technical Background Document that they may be found in the supporting docket for today's notice. In general, corrective action costs are relatively modest [4], contrary to the unsupported statements of many commenters, and comprise approximately ten percent of total annualized compliance costs at the individual facility level.

3. *Land Disposal Restrictions Costs.* EPA received several comments stating that the Agency did not include specific estimates of costs associated with land disposal restrictions as they would apply to mineral processing waste types and sectors. One of these commenters argued that in the "third third" rule, EPA designates stabilization as BDAT for treating metal-bearing wastes, yet the Agency does not include stabilization costs in its RTC cost estimates. This commenter further argued that EPA should have considered the additional on- and off-site disposal costs associated with acquiring additional land for disposal on-site and transportation costs to a remote location.

Contrary to these assertions, EPA did evaluate land disposal restrictions costs for some of the wastes addressed in the Report to Congress, including sludges. These materials were assumed to be cement stabilized prior to disposal in subtitle C landfills. Moreover, the resulting increase in the volume of the wastes in question was explicitly factored into EPA's analysis, by calculating the incremental landfill volume required, adjusting the landfill

[4] The annualized compliance costs (ACC) of EPA's corrective action strategy for the twelve potentially affected facilities range from approximately $2.0 million to $6.9 million under the Subtitle C-Minus scenario, and from about $1.6 million to $5.7 million under the Subtitle D-Plus scenario.

design accordingly, and calculating the total cost of the necessary land disposal unit(s) for the wastes in question. In conducting the supplementary analysis of the phosphoric acid sector, the Agency also factored land disposal restriction costs (lime treatment) into the total costs for phosphogypsum disposal.

BDATs were not applied, and costs, therefore, were not calculated, for copper, lead, and zinc slags because of an assumption that slags, when generated, are similar to wastes that have been treated by vitrification (a BDAT). For this reason, stabilization as presumed to be an unnecessary anagement method for these wastes. stabilization is required, costs would crease, but this would not have fected the Agency's regulatory termination.) Transportation costs ere not factored in for on-site anagement because data in EPA's ossession and personal observations ade during site visits to a substantial mber of the facilities considered in e Report demonstrate that many, if not ost, potentially affected facilities own nd of adequate size contiguous with or ose to their existing waste anagement units to construct new its of sufficient capacity.

4. *Costs Associated With Replacing Waste Management Units.* Some ommenters argued that EPA failed to nsider the costs associated with placing subtitle C hazardous waste sposal facilities in the future (i.e., after e first operation is closed in year 15). hese commenters suggested that such osts, when discounted to the present, e significant (i.e., on the order of 25 ercent of the total compliance costs). EPA acknowledges this comment to e true. A 15-year life without placement of equipment or facilities as assumed for simplicity during the nalysis. Data provided by facility perators in response to the 1989 WMPF Survey and the Agency's nderstanding of relevant mineral mmodity markets suggest that an ssumed 15-year operating life is not nreasonable for some facilities. In her cases, however, it is unclear hether this is or is not a valid ssumption. In those cases, the emaining life of the facilities cannot be redicted with accuracy. EPA cknowledges that in situations in hich the facilities would continue to perate and would require new waste anagement units periodically, nnualized compliance costs would crease over those reported in the RTC, ven by 25 percent or more. In any event, such an increase does not effect today's regulatory determination.

5. *Accuracy of Cost Estimates.* EPA received several comments regarding the accuracy of its cost estimates. While many commenters argued that EPA provided inaccurate cost estimates for regulating the 20 special wastes, one commenter contends that, although EPA ignores many of the costliest elements of the subtitle C program, the Agency's economic analysis accurately demonstrates the high cost impacts of regulating Bevill wastes under subtitle C.

In its analysis, EPA employed an engineering design model and detailed cost analyses to develop realistic cost estimates of subtitle C regulation. After review of the comments and upon further analysis, EPA continues to stand by its cost estimates (as modified) as adequate and appropriate for their intended use as input to the regulatory determination, even though some cost considerations were excluded from the analysis for most wastes (e.g., corrective action). Furthermore, EPA notes that high costs alone are not determinative of appropriate regulatory status. Rather, the financial impact of such costs is the real measure of economic feasibility. Section F below provides additional comments on economic impacts.

6. *Maximum Flexibility.*

One commenter asserted that EPA should calculate subtitle C-Minus compliance costs on the basis of a realistic level of flexibility under RCRA section 3004(x) rather than on the maximum level of flexibility. Unless the maximum flexibility rules can be guaranteed, contends this commenter, firms may be faced with the unpalatable choice of investing in "maximum flexibility" waste disposal facilities in year one, only to find that they need "full subtitle C" facilities in year three.

As was clearly stated in the RTC, the purpose of EPA's evaluation of three regulatory scenarios was to demonstrate the range of potential compliance costs, not to articulate a new regulatory program (which was beyond the scope of the RTC). The Agency believes that using a hypothetical subtitle C-Minus scenario is appropriate for considering the feasibility of subtitle C regulation of special mineral processing wastes, because of the significant technical challenges that stringent regulation of special wastes (by definition) may pose. Moreover, the Agency believes that the "realistic" level of flexibility that may in fact be appropriate needs to be determined based on a detailed evaluation of site-specific conditions, which was not possible within the context of the RTC because of data limitations.

7. *Relative Costs of subtitle C, C-Minus, and subtitle D-Plus.* Several comments were submitted to EPA regarding the relative costs of the subtitle C, C-Minus, and subtitle D-Plus regulatory scenarios. Many of those who commented, recognizing the different cost implications of each scenario, encouraged a subtitle D determination, while others argued that because the differences in estimated costs among the scenarios for certain wastes are insignificant, a subtitle C determination should be promulgated. One commenter argues that with little cost difference, a subtitle C determination would offer greater environmental protection advantages. Another commenter stated that the differences between subtitle C-Minus and subtitle D-Plus regulation are likely to be especially apparent with respect to corrective action costs (which EPA did not include) because inclusion of the processing wastes under subtitle C-Minus may expose the facilities to the same corrective action requirements (and costs) as those under full subtitle C. This same commenter added that non-hazardous wastes should not be regulated under subtitle C (through application of corrective action) simply because such regulation is projected by EPA to be only slightly more costly than subtitle D regulations.

EPA responds that the cost of alternative management practices is but one of the study factors that EPA is required to consider; therefore, the regulatory determination is not being made on the basis of the comparative cost difference between subtitle C and D programs alone. The Agency does recognize that similar corrective action requirements might be applied under both subtitle C and C-Minus, and has examined the associated costs (as discussed above).

In addition, EPA notes that the regulatory scenarios that were used to estimate potential compliance costs were developed with consideration of the environmental protection that they would afford. Thus, it is not the case that subtitle C regulation necessarily would provide more environmental protection that the other scenarios considered. For example, in some cases, adequately protective design and operating standards for new waste management units under subtitle C-Minus and D-Plus have been defined by EPA to be identical.

F. Estimation of Economic Impacts

1. *Inaccurate Use of Price Data.* One commenter identified a specific concern

with EPA's use of estimated mineral prices in 1995, with no explanation as to how they were derived other than that they were reported by an EPA subcontractor. This commenter claimed that EPA did not verify its data by contracting industry sources.

Contrary to the commenter's claim, the Agency used industry experts retained for this purpose to estimate projected 1995 prices. Industry and affected facility input and review prior to the publishing of the RTC were not possible because of procedural constraints. Affected parties were, however, encouraged to review the RTC estimates during the public comment period. In response to comments received, EPA has in fact made corrections to the prices reported in the RTC for refined lead and merchant grade phosphoric acid, which had resulted from calculation and transcription errors; estimated impacts on the corresponding facilities and sectors have been revised in support of today's regulatory determination. As no alternative long-term price projections were suggested by commenters for the remaining primary mineral commodities, estimated long-term real prices remain as reported in the RTC.

Furthermore, the Agency notes two points that reduce the importance of the use or accuracy of the 1995 projected prices. First, while the prices are important in assessing the overall magnitude of the economic impacts, their accuracy will not greatly affect the difference between or relative impacts of subtitle C versus D regulation; that is, the magnitude of the impacts will be affected to a far greater extent than the relative differences between scenarios. Second, if the prices as used are potentially underestimated (in many cases, estimated 1995 prices are lower than current prices), the impacts in the RTC are overestimated because the estimated value of shipments (price multiplied by production quantity) would be smaller and the cost as a percentage of value of shipments, therefore, larger. This is the case for the majority of the sectors, and is consistent with EPA's objective of performing a conservative and defensible analysis. Only in the titanium tetrachloride sector were prices projected to increase significantly, raising the possibility that EPA's estimated value of shipments was overstated and the impacts on that sector were, therefore, underestimated. However, given the strength of that sector (as evidenced by the planned construction of several new domestic plants), EPA believes that the long-term projection of prices for that sector are reasonable and that impacts are not significantly understated.

2. *Impact on Industry.* Several commenters argued that industries producing primary copper, lead, zinc, and elemental phosphorus would be adversely affected by a subtitle C regulatory determination because the regulations would generate additional and substantial annual fixed costs that would have to be met regardless of market conditions. Several of these commenters argued that these costs are likely to remain fixed even in periods of slack demand, contributing to depressed profits during such periods. A few of these commenters further argued that a decreased profit margin would make the market less desirable to investors, thereby discouraging the overall economic growth of the industry.

EPA recognizes that increased costs that cannot be passed along reduce profits at all times, irrespective of market conditions. The costs of adequate environmental protection are, however, simply a component of the total cost of doing business. In trying to evaluate future trends and market conditions, the Agency did conduct qualitative analyses of sectors for which it believed the industry was subject to potentially significant compliance costs, and included the results of these analyses in the RTC. For example, the impacts discussions for the copper, ferrous metal, lead, phosphoric acid, titanium tetrachloride, and zinc sectors included examinations of both the present and future general competitive position of domestic producers, and the potential for compliance cost pass-through (discussed more fully below). EPA believes that its discussion of future trends and market conditions has adequately addressed the concerns regarding long-term impacts.

3. *Pass-Through Potential.* Several commenters indicated that EPA should not assume that the mineral processing industry can pass on the costs of new regulatory requirements to the product consumer in the form of higher prices. A few of these commenters noted that the world market sets the commodity prices; if American producers raise their prices, consumers will look to international markets, where products could be obtained at lower prices. These commenters agreed that higher pricing on mineral processing products could be devastating to the industry.

EPA understands that higher prices in any market can cause adverse impacts on the affected industry. EPA believes, however, that the commenters' suggestions that all mineral processors in all commodity sectors are "price takers" having no ability to pass on cost increases and therefore having to absorb them internally, is demonstrably untrue.

In general, the pass-through of compliance costs follows the path of least market resistance. Where all facilities in the affected sector face similar compliance costs and produce commodities for which there are few alternative supply sources or substitute materials, there is a high likelihood that moderate compliance costs can be passed forward in the form of higher product prices. On the other hand, where only a small proportion of facilities in a sector are affected, or alternative supplies or substitute materials are abundant, the opposite may be true. Similar possibilities exist in input and labor markets where the regulated sector may be able to negotiate wage or price concessions in order to remain in operation or continue operating at current levels. In all cases, the ability to pass through compliance costs depends on the initial incidence of compliance costs within the affected sector and the concentration and interdependency of buyers and sellers in relevant input and product markets. In the RTC, EPA discussed the market factors that, in combination, determine the extent to which regulatory compliance costs can be passed through for each affected commodity sector. In general, EPA found little substantive information or data in the comments received that suggested that the Agency's preliminary findings with respect to pass-through potential were incorrect.

II. Decision making Methodology for the Regulatory Determination

One commenter argued that EPA's second approach, which recommends that the Agency not regulate any of the wastes studied in the RTC as hazardous because of the potential for improved state mineral processing programs, is not authorized by the statute, is factually insupportable, and unlawful, adding that the authority for EPA's second approach does not arise from the study factors in section 8002(p) of RCRA and that EPA's regulatory determination must be directed by the specific provisions of the Bevill Amendment. This commenter further argued that states cannot regulate mineral processing wastes adequately without a national hazardous waste designation, stating that there are no federal programs for nonhazardous waste in place and no statutory authority to ensure that state nonhazardous waste programs adequately regulate mineral

processing wastes. This same commenter stated that EPA's assertions in the RTC about the success of individual state mineral processing waste management control efforts are uncertain and impossible to assess at the present, and therefore cannot support the use of EPA's second approach. In addition, this commenter stated that by delaying regulatory action with EPA's second approach, EPA would substantially undermine the two principal objectives of RCRA: Overall protection of human health and the environment and the minimization of generation and land disposal of hazardous waste. Finally, the commenter argued that if the Agency decides to consider factors beyond the eight listed in section 8002(p), then it must consider all objectives and goals of the RCRA statute, not just a select few.

On the other hand, several commenters encouraged EPA to apply Approach 2 to its regulatory determination, stating that the development and maintenance of strong state programs and federal regulations under other statutory authorities is, in fact, mandated by RCRA. These commenters further argued that the flexibility offered by Approach 2 for regulation of the mineral processing industry is essential to its continued strength and growth, which the Bevill Amendment was enacted to ensure. Other commenters argued that the "other factors" discussed for Approach 2 were, in fact, embodied in the study factors and should be considered in Approach 1.

As was stated in section II of this preamble, EPA generally agrees that its regulatory determination should be based on the eight study factors outlined in section 8002(p) of RCRA, as embodied in the Report to Congress, as well as the public comments and additional information received in response to the Report (and developed by EPA to supplement the Report in response to comments). EPA also agrees that, to the extent that the Agency were otherwise to conclude that subtitle C regulation was warranted based upon consideration of all of these factors and information, that it would be improper to look outside the Report to Congress, public comments, and supplemental technical information to justify a different determination. Therefore, EPA has decided not to employ Approach 2 as outlined in the Report to Congress in making today's regulatory determination, and has instead employed an Approach 1 methodology (modified slightly, as discussed in the main text).

EPA also agrees somewhat with commenters who asserted that the so-called "additional factors" upon which Approach 2 was based are, in large part, already embodied within the contours of the inquiry that Congress intended for EPA to make in the Report and regulatory determination. The Report identifies (1) the development and maintenance of strong state mining and mineral processing regulatory programs, and (2) the facilitation of an integrated federal mining regulatory program as the key considerations under Approach 2. Section 8002(p)(5) instructs EPA to consider "alternatives to current disposal methods" as a factor in developing the Report and regulatory determination. Certainly, consideration of alternative state regulatory schemes, in addition to federal schemes, is contemplated by this section. In addition, facilitation of a potential integrated federal mining program was actually considered by EPA in its cost estimates (reflected in the "subtitle D-Plus scenario").

Nonetheless, EPA does not believe that it should rely on possible improved state programs to determine that subtitle C is not warranted unless EPA is confident that such programs are being developed and can address the problems associated with mineral processing wastes that may pose a significant risk. Thus EPA disagrees that section 8002(p) requires EPA to consider these factors in any way that would supplant a decision the Agency makes under the decision making methodology outlined in Approach 1.

In any event, EPA notes that the issue is effectively moot. As discussed in the section III of this preamble, EPA has been able to make its regulatory determination for all 20 wastes on the basis of a slightly modified Approach 1 alone. Subtitle C was found not to be warranted for any of the wastes analyzed. Thus, even if EPA were to employ Approach 2 as originally conceived in the Report, it would not change any of the decisions made today.

III. Wastes for Which Regulation Under RCRA Subtitle D is Generally Supported

Nine of the twenty special mineral processing wastes studied in the Report to Congress were found to pose few if any risks to public health or the environment. EPA tentatively recommended a subtitle D regulatory determination for these wastes in its Report and continues to believe that subtitle C regulation is unwarranted. The Agency received no comments on the Report suggesting a contrary position. The nine wastes include: (1) Red and brown muds from bauxite refining; (2) gasifier ash from coal gasification; (3) process wastewater from coal gasification; (4) slag tailings from primary copper processing; (5) fluorogypsum from hydrofluoric acid production; (6) treated residue from roasting/leaching of chrome ore; (7) process wastewater from primary magnesium processing by the anhydrous process; (8) basic oxygen furnace and open hearth furnace slag from carbon steel production; and (9) iron blast furnace slag. Therefore, the Agency is today finalizing its decision, as proposed in the RTC, for these nine wastes.

IV. Wastes for Which the Regulatory Determination is Contested

EPA received numerous comments regarding the Report's recommended regulatory determination for 11 wastes: (1) Slag from primary copper processing; (2) slag from elemental phosphorus production; (3) air pollution control dust/sludge from iron blast furnaces; (4) air pollution control dust/sludge from basic oxygen furnaces and open hearth furnaces from carbon steel production; (5) phosphogypsum from phosphoric acid production; (6) process wastewater from phosphoric acid production; (7) slag from primary zinc production; (8) calcium sulfate wastewater treatment plant sludge from primary copper processing; (9) process wastewater from hydrofluoric acid production; (10) slag from primary lead production; and (11) chloride process waste solids from titanium tetrachloride production. As discussed in section I.C.3 of this preamble, the Report tentatively recommended, based on decision making Approach 1, that the first seven of these wastes be regulated under subtitle D, while the last four be regulated under either subtitle C or D, depending on the scenario modeled.

The comments focused on the Report's analysis of the section 8002(p) study factors for each of these wastes, as well as the Report's tentative conclusions. EPA received at least one comment arguing that subtitle C regulation of each of the 11 wastes is warranted. The Agency has considered each of the comments it received, sometimes conducting additional analyses in response, and all of the comments and additional information have been taken into account in developing this final regulatory determination. EPA's responses to these comments are in the supporting comment-response background document.

Appendix B—Analysis of and Response to Public Comments on the Notice of Data Availability

I. Engineering Feasibility and Cost of Alternative Management Practices for Phosphogypsum and Process Wastewater From Phosphoric Acid Production

A. Subtitle C-Minus and D-Plus Scenarios as the Basis for the Regulatory Determination

Twenty commenters questioned the appropriateness of using the Subtitle C-Minus and D-Plus scenarios as a basis for the regulatory determination. Specifically, the commenters contend that because these two scenarios are hypothetical and because regulatory requirements for the scenarios have not been established, the two scenarios cannot be used as a basis for a regulatory determination, and costs estimated for these two scenarios cannot be used to make a decision as to whether or not regulation under the existing subtitle C program is warranted. Furthermore, the commenters believed that the Agency assumption (and cost estimates resulting from that assumption) that certain sub-scenarios for management of process wastewater and/or phosphogypsum would be identical under a C-Minus scenario and a D-Plus scenario is illogical. The commenters concluded that EPA must make its decision between the subtitle C and subtitle D programs and not on variations (i.e., C-Minus and D-Plus) of the two programs.

EPA disagrees with these comments. Section 3004(x) of RCRA allows the Administrator to modify certain subtitle C requirements, *at his discretion*, so as to "take into account the special characteristics" of the wastes in question. Such modifications are "hypothetical" and have not been "established" to the extent that to date, none of the special wastes to which section 3004(x) applies have been regulated under RCRA subtitle C. As discussed at length in the RTC, the Subtitle C-Minus scenarios articulated in the RTC and in the Supplemental Analysis represent realistic (though maximal) application of the regulatory flexibility provided by the statute. The Agency has provided cost estimates for implementation of section 3004(x) flexibility because it believes that a tailored subtitle C program is less costly and may be less burdensome to industry so as to address the risks posed by phosphoric acid industry special wastes. The Agency recognizes that the contours of a prospective subtitle D program for mineral processing wastes have yet to be established. Nonetheless, EPA believes that for analytical purposes, it was appropriate to consider one possible approach to such a program, to estimate the costs and impacts that would result from implementation thereof, and to compare these estimates to those of the other regulatory scenarios, in order to develop an understanding of the potential differences between environmentally protective approaches to special wastes management under the provisions of the two potentially applicable portions of the RCRA statute. Finally, the fact that, in the Agency's view, adequately protective tailored approaches to waste management under subtitle C and subtitle D are very similar in terms of requirements and their costs does not in any way invalidate EPA's analysis. Rather, this suggests only that: (1) Current management controls are inadequate in some cases (as discussed at length in the RTC and elsewhere in today's notice, (2) that even under a Subtitle D program, certain site conditions and waste management practices (such as are found at many phosphoric acid plants) would require fairly stringent controls and changes in current practice to adequately protect the environment, and (3) that the flexibility afforded by section 3004(x) can be employed to develop management standards that are achievable while also ensuring protection of human health and the environment.

B. Technical Feasibility of Engineering Alternatives

The Agency received comments on several aspects of the feasibility of the engineering alternatives (discussed in the NODA). Several of the comments are summarized below; the remainder are addressed in the supporting comment response background document.

1. Use of Undemonstrated Technologies. Several commenters objected to EPA's presentation of engineering alternatives that incorporate certain technologies that are considered by the industry to be undemonstrated, unproven, and/or experimental. The commenters contend that waste management scenarios that utilize undemonstrated technologies cannot be used as alternatives to current waste management practices under the definition of section 8002(p) of RCRA. The commenters contend that each of the "Subtitle C compliance scenarios" (Engineering Alternatives 1, 2, and 7) incorporate one or more technologies that are not currently demonstrated in the industry as feasible. These technologies include the following:

- Segregation (hydraulic separation) of waste management units for process wastewater and phosphogypsum (Alternatives 1, 2, and 7);
- Neutralization of phosphogypsum slurry, disposal of limed gypsum on existing stacks, and return of transport water to the production process (Alternatives 1, 2, and 7);
- Recovery of fluosilicic acid from the reaction stage of phosphoric acid production (Alternatives 2 and 7); and
- Use of cooling towers and indirect cooling via heat exchangers to effect a closed-loop cooling system in lieu of a process wastewater cooling pond.

As an example of undemonstrated technology, the commenters stated that even though lime neutralization of process wastewater is used at some plants before NPDES-permitted discharge, neutralization of all process wastewater and subsequent recycle to the production process has not been successfully demonstrated at an existing plant. Because this technology and the other technologies are undemonstrated in the industry in the manner in which they are intended to be used in the engineering alternatives, the commenters argued that the subtitle C engineering alternatives cannot be used as a basis for a regulatory determination to regulate the industry under subtitle C.

EPA largely disagrees with these comments. The commenters' proposed definition of "demonstrated" is extreme and contrary to long-standing Agency policy. While EPA agrees that there must be an expectation that a given technology will perform adequately if it is to serve as the basis for a regulatory decision, the Agency does not agree that current use of the technology in the industry being examined is necessary. In fact, it is very often the case that technologies and techniques that have been developed elsewhere for different purposes are used by the Agency for achievement of new pollution control standards. This type of "technology transfer" is at the very heart of such programs as Clean Water Act Effluent Guidelines development and establishment of Best Demonstrated Available Technology (BDAT) requirements under the RCRA Subtitle C Land Disposal Restrictions.

With regard to the specific technologies that comprise engineering alternatives 1, 2, and 7, EPA believes that most, if not all, of these technologies have been demonstrated in other industrial applications and that their technical feasibility is not in question. The fact that they are not in

use in the phosphoric acid industry is more reflective of an absence of strong regulatory controls and associated financial incentives than of the feasibility or availability of the technologies themselves. Specifically, EPA has at least anecdotal evidence that closed loop cooling and recovery of FSA from the reactor/flash cooler system have been successfully employed in other industries and in foreign phosphoric acid plants, respectively.

Moreover, EPA wishes to make clear that it believes that the commenters have misinterpreted the Agency's response to the statutory requirement to examine "alternatives to current disposal methods" and "the costs of such alternatives" (RCRA section 3002(p), study factors 5 and 6). As pointed out by the commenters, in the RTC, EPA discussed a number of alternatives to current waste management practices, focusing on techniques that have been applied on a commercial scale to reduce the quantity and/or toxicity of the special wastes considered in the Report. The intent of this discussion was to achieve *partial fulfillment of study factors 5 and 8 (potential utilization) by focusing on proven* means of source reduction and waste minimization as an alternative to on-site waste management. For most of the 20 special wastes considered in the RTC, opportunities for recycling and commercial use are quite limited, for various reasons. In contrast, EPA's approach to responding to the remainder of study factor 5 as well as study factor 8 was to articulate and estimate the costs of on-site waste management under alternative *regulatory* scenarios. The Agency believes that this context was and is the most relevant to the key decisions to be made (Subtitle C vs. Subtitle D regulation) based upon the findings of the RTC and subsequent analysis. Thus, there is no direct linkage between EPA's criterion for discussion of a waste management alternative or opportunity for utilization and the development and analytical implementation of the regulatory scenarios presented in the RTC and the Supplemental Analysis. Accordingly, EPA categorically rejects the commenters' assertion that a given technology, device, and/or practice must currently be in use within the domestic phosphoric acid industry in order for it to be considered "technically feasible." The Agency further rejects the commenters' suggestion that EPA's own methodology as articulated in the RTC compels such an approach, because commenters have misconstrued the Agency's analytical methods and underlying rationale.

The Agency acknowledges that there are significant uncertainties regarding the operational consequences of the lime treatment of phosphogypsum. Once again, however, commenters have based their arguments upon an inaccurate interpretation of EPA's analysis. The treatment of phosphogypsum contemplated in engineering alternatives 1, 2, and 7 assumes that the water being used to slurry the gypsum from the filter to the neutralization mixing basin would be *treated* process wastewater, not the "pond water" that is currently managed at active facilities.

Consequently, the laboratory test results reported by the commenters in support of their argument are, in the Agency's view, of questionable relevance, and by no means demonstrate that treated gypsum would present significant disposal and other operational problems.

Finally, EPA believes that the importance of the issue of segregation of the gypsum management and cooling water areas within a facility's waste management system has been overstated by the commenters. In the Supplemental Analysis, EPA discussed a number of different approaches for separately addressing contaminants contained in phosphogypsum slurry and contaminants condensed into cooling waters. In no case did EPA state (or even suggest) that a complete hydraulic separation between gypsum management units and cooling ponds would be either necessary or appropriate, even under a full subtitle C scenario. Indeed, the Supplemental Analysis recognizes that leachate will continue to be generated for many years from any existing gypsum stack. To the extent that this leachate or gypsum transport water (which would have been rendered non-hazardous under engineering alternatives 1, 2, and 7) might enter the cooling water pond, treatment or product recovery would occur through removal of this water to the treatment system or filter, respectively. In either case, "co-mingling" of separate hazardous wastes would not occur, obviating the need for complete hydraulic separation and any associated undesirable effects on plant water balance.

2. Feasibility of Lime Neutralization. Several commenters expressed doubt over the engineering feasibility of lime neutralization of both process wastewater and phosphogypsum, for several reasons, including the limited availability of lime to meet the demand that would be created and the formation of a silica gel that would interfere with waste management and production process operations.

Several commenters argued that the demand for lime imposed by any of the engineering alternatives that incorporate lime neutralization would place a severe burden on the United States lime production industry. The commenters stated that implementation of Engineering Alternative 1 (lime neutralization of all waste streams) would require the southeastern lime industry to triple its present capacity in the first year of implementation of the alternative to meet the additional demand. In addition to expressing their uncertainty over whether this demand could be met, the commenters also expressed concern over potential environmental impacts that the demand would create, including increased generation of carbon dioxide, increased fuel consumption, and the need for additional limestone strip mines.

In response to this comment, EPA has conducted additional analysis to determine whether implementation of Alternative 1 would impart significant impacts on lime supply, demand, and capacity within the relevant regions of the country. A description of this analysis and the results thereof may be found in the docket.[1] These results suggest several conclusions.

First, EPA agrees that adoption of engineering alternative 1 by the entire domestic industry would significantly increase the demand for lime in the regions of the country in which the active phosphoric acid plants are located, requiring an increase in lime production. In the western states (Idaho and Wyoming), this increase could probably be met through greater utilization of existing lime production capacity. In the south, uniform adoption of engineering alternative 1 would create demand in excess of regional supply, requiring shipments from other parts of the country (e.g., Ohio, Pennsylvania), installation of additional lime capacity, and/or imports of lime (probably from Mexico).

Second, the analysis of incremental lime demand presented by the commenters significantly overstates the impacts of new regulatory requirements, for several reasons. The estimates of lime demand presented by the commenters are substantially higher than EPA's estimates. Because the

[1] ICF Incorporated. 1991. Technical Background Document: Data and Analyses in Support of the Regulatory Determination for Special Wastes from Phosphoric Acid Production. Prepared for the Office of Solid Waste, US EPA.

reasons for this difference have not been adequately explained in the materials submitted to the Agency, EPA continues to believe that its lime consumption estimates for engineering alternative 1 are valid. Moreover, in comparing demand with supply, commenters were quite selective in terms of which states and lime plants were defined as being located within the same region as the phosphoric acid plants. EPA believes that lime produced in Virginia, Kentucky, Illinois, Indiana, Missouri, and Texas is also available (in a logistical and economic sense) to the potentially affected phosphoric acid facilities, particularly those located in Louisiana, Texas, and North Carolina. Therefore, the gap between potential demand and existing supply is substantially narrower than that suggested by the commenters.

Third, the Agency acknowledges that implementation of any alternative that substantially increased the demand for lime would result in increased energy consumption and releases of carbon dioxide, a "greenhouse" gas, to the atmosphere. Because many lime and limestone producers are operating at levels substantially below their capacity, however, EPA is not convinced that opening of additional limestone mines would necessarily be required to any significant degree as a result of implementation of the engineering alternatives, though additional production from existing mines would clearly be needed.

Finally, and most importantly, the comments focus on a worst-case scenario under which every plant would lime treat all of its special wastes. Under a tailored subtitle C (C-Minus) program, this is but one option among many. EPA believes that most facility operators, when provided with the incentive to comply in a least-cost manner, would develop alternatives to lime treating all of their wastes, thus greatly reducing the amount of lime required and the importance of this issue.

Commenters also stated that a colloidal silica gel would be created during the neutralization of process wastewater and phosphogypsum. The commenters argued that this gel is likely to remain in suspension in both the gypsum transport water and the cooling pond process wastewater, which may pose significant problems in the operation of plant equipment when these waters are returned to the production process. In particular, several commenters stated that the gel would potentially "blind" (clog) the phosphogypsum filter when the treated gypsum transport water is returned to the filter and reused as filter washwater, resulting in decreased efficiency, increased downtime, and lost production. Commenters also indicated that they were unaware of any demonstrated technology to remove the gel from the phosphogypsum filters.

EPA is not convinced that the catastrophic operational effects predicted by the commenters would occur on a widespread and continuing basis if lime treatment of the special wastes were to be instituted, particularly if FSA recovery were to be practiced. Commenters have assumed that the engineering alternatives contemplated by EPA would involve continual treatment of process wastewater and phosphogypsum as they are *currently* generated, when in fact the alternatives were developed to address management of new waste streams having different chemical characteristics resulting from treatment and/or product recovery. Therefore, the appropriate question is whether lime treatment of process wastewater that has *not* reached a high equilibrium concentration of chemical contaminants would result in significant gel formation, not whether lime treatment of currently generated "pond water" would create such operational problems.

Nevertheless, EPA does have some concerns about the efficacy of a lime treatment strategy. For example, the Agency recognizes that for a period of time (perhaps one to two years), treatment of existing pond water would occur. To the extent that gel formation took place, operational difficulties might be significant. Because, however, implementation of today's decision does not require that lime treatment be implemented, EPA does not believe that resolution of this issue (which would require additional research) is necessary prior to a determination of the appropriate regulatory status of the special wastes from phosphoric acid production.

3. Feasibility of Separate Management of Phosphogypsum and Process Wastewater. Commenters expressed concern over the technical difficulty inherent in separately managing phosphogypsum and process wastewater so that no hydraulic communication between the two "circuits" is permitted. Because the integrated management of these two wastes is employed at all existing facilities and is, according to the commenters, essential to maintaining a negative water balance (i.e., zero discharge through NPDES outfalls), the commenters believed that the separate management of these two wastes is an undemonstrated technology that cannot be used to support a regulatory determination. One commenter performed a computer modeling study to predict his facility's water balance under Engineering Alternatives 1 and 7 and predicted that separate management of process wastewater and phosphogypsum at the facility would require treatment and discharge of excess process wastewater. Commenters indicated that the potential increase in discharge created by segregated management would be contrary to the objectives of the Clean Water Act effluent guidelines as well as NPDES requirements for the industry. Furthermore, the commenters pointed out that the Agency addressed neither the feasibility nor the cost of implementing separate management of the wastes.

As discussed above, the Agency has never suggested that it would require complete hydraulic separation of the areas dedicated to gypsum disposal and process water cooling. In addition, the computer simulation results submitted by the commenter assume no changes or adjustments in the operation of the plant, an assumption that is contrary to standard industry practice. Plants continually monitor water balance and modify their water management activities as needed to comply with discharge limits and operational requirements. EPA has received no convincing evidence that suggests that a new water balance could not be developed for affected plants, though admittedly, new equipment and piping might be necessary in some situations. Accordingly, EPA believes that the potential impacts on plant water balance and associated regulatory significance of the issue as suggested by the commenters are substantially overstated.

4. Land Required To Implement Subtitle C Compliance Alternatives. Some commenters contend that adequate amounts of land are unavailable to implement the subtitle C compliance alternatives (Alternatives 1, 2, and 7); hence, the commenters stated that implementation of these alternatives under subtitle C is infeasible. The commenters contend that the implementation of these alternatives would require the construction of new waste management and treatment units and expansion of existing waste management units on land that is in addition to acreage already occupied at the facilities. Specifically, the commenters stated that in order to implement Alternative 1 (lime

neutralization of all waste streams), additional land would be required for: (1) Extra filter capacity; (2) lime receiving and slaking facilities; (3) a 50-acre gypsum transport water pond; (4) an additional 50 acres of cooling ponds; (5) a cooling water neutralization basin; (6) a larger stack; and (7) cooling water sludge ponds. Many of the facilities that commented claimed that they did not have enough land available to accommodate all of these units, and many of these facilities reported that they could not purchase adjacent property of sufficient size.

EPA continues to believe that the availability and cost of land needed for regulatory compliance are not critical issues. As discussed in more detail below, the Agency believes that the commenters' estimates of the size of new required waste management units are significantly overstated. Also, additional land required for many of the items listed by the commenters (e.g., extra filter capacity, lime receiving and slaking facilities, neutralization basin) is quite modest in extent, particularly within the context of the vast scale of a domestic phosphoric acid plant (all of which are hundreds or thousands of acres in size). Moreover, to the extent that substantial new acreage is required for additional waste management units, and could be acquired that was not adjacent to the facility, i.e., the units could be sited at some distance from the plant. EPA believes that the incremental costs of managing the phosphoric acid wastes in this manner would be modest because the wastes are already piped (in slurry and liquid form) considerable distances (hundreds of yards) at some plants. Therefore, the Agency believes that "extending the pipeline," even for several miles, is not a significant issue, from either a feasibility or cost standpoint.

c. Costs of Engineering Alternatives

The Agency received comments on several aspects of the estimated costs of the engineering alternatives. Several of these comments are summarized below; the remainder are addressed in the supporting comment response background document.

1. Operating Year. Commenters argued that EPA significantly understated the costs of the engineering alternatives by basing its calculation of annual incremental compliance costs per ton of P_2O_5 output on a 365-day production year. The commenters contend that it is not possible for phosphoric acid facilities to operate 365 days in a year and that, due to necessary maintenance, facilities operate, on average, 330 days per year.

Data submitted by individual facility operators in EPA's 1989 National Survey of Special Wastes from Mineral Processing Facilities demonstrate that most phosphoric acid plants operated for more than 350 days in 1988. Nonetheless, EPA recognizes that individual production lines within a given plant are subject to considerable down time for maintenance and repairs. Because the model plant used to evaluate the engineering alternatives in the Supplemental Analysis was based on a single production line, the Agency has revised its cost estimates to reflect the commenter's suggestion that a 330 day operating year be employed.

2. Capital Cost for Neutralization Sludge Ponds. Commenters argued that EPA seriously understated the capital cost of installing sludge disposal impoundments necessary to manage the calcium fluoride sludge that would be generated by lime neutralization of the cooling water component of process wastewater. The reasons given by the commenters are:

(1) EPA's capital cost was sufficient for only one year of sludge storage;

(2) The capital cost does not include the cost of acreage needed to provide adequate residence time for settling of solids in the treated cooling water; and

(3) Lining of the impoundment was not included and would be required.

EPA generally disagrees with this comment. The Agency recognizes that it did not provide complete information concerning engineering design assumptions in the Supplemental Analysis; this omission occurred because of extreme time constraints. EPA believes that many of the commenters' concerns arise from incorrect (though, in many cases, reasonable) inferences that they have made based upon the limited information that was available to them. First, the sludge settling/disposal impoundments referred to by the commenter were indeed designed to accommodate a 15 year accumulation of process wastewater treatment sludge. For engineering alternative 1, the impoundment was designed to contain 118,271,000 cubic feet of sludge (generation rate of 7.8 million cubic feet or 180 acre-feet per year). Using the same cost engineering model as employed for the RTC, EPA estimated that this impoundment would cover 64 acres (80 acres total, allowing for site preparation activities), and have a depth of 42 feet (14 foot dug out depth, 28 foot berm height).

Furthermore, as clearly stated in the Supplemental Analysis, the Agency believes that the volume of the sludge disposal impoundment (the vast majority of which would be available in the early years of operation) coupled with the large volume of the existing cooling pond, would provide adequate residence time for solids removal (settling) from the treated process wastewater stream. Commenters have provided no evidence or a rationale supporting their contention that EPA's assumptions in this regard might be invalid; EPA concludes, therefore, that its approach as described in the Supplemental Analysis was and is reasonable. Therefore, the Agency believes that the commenters' suggestion that the actual area required for treated process wastewater and sludge management (1,272 acres versus EPA's estimate of 80 acres) is significantly in error.

Finally, EPA does acknowledge that there is a distinct possibility that the sludge settling impoundments required under Alternative 1 would require composite liners, at least for facilities located in the State of Florida. Florida ground-water protection standards (which incorporate federal MCLs) allow individual permit writers, at their discretion, to require the installation of liners under new units to ensure adequate protection of the ground-water resource. Because the concentrations of lime-treated process wastewater contaminants such as sulfate and sodium are likely to be an order of magnitude or more above MCLs (they are *not* removed to any significant extent by lime treatment [2]), EPA has concluded that liners would probably be required as a permit condition for any CaF_2 sludge disposal impoundment(s) that would be built in Florida as part of a regulatory compliance strategy. Therefore, to the extent that such impoundments would actually be constructed in response to new regulations, EPA has underestimated the associated compliance costs in the Supplemental Analysis.

3. Cost of Separate Management of Phosphogypsum and Process Wastewater. The industry commenters stated that EPA failed to consider the capital costs and operating and maintenance costs involved with separately managing the cooling water and phosphogypsum slurry circuits. The commenters further contend that separate management of these waste streams would necessitate a major retrofit of current waste management units at existing production facilities.

[2] As depicted in the Supplemental Analysis, Exhibit 1, p. 12, and as suggested by numerous additional data submitted to the docket.

The commenters estimated that the cost necessary to separate the gypsum and cooling water circuits (capital cost) at EPA's model plant would be at least $10 million.

As discussed above, the Agency has never stated that it would require complete hydraulic separation of the areas dedicated to gypsum disposal and process water cooling. Accordingly, EPA does not believe that a plant retrofit to achieve separation of these areas would be necessary or required.

D. Economic Impacts of Alternative Waste Management Practices

In general, all of the industry commenters considered implementation of the various alternatives under subtitle C to be economically intractable. Based on their analysis of the economic impacts they believe would be imposed by the implementation of engineering alternative 1, the commenters concluded that: (1) Implementation of the alternative would eliminate the industry's export markets; (2) it is possible that foreign producers could penetrate the domestic market; and (3) incremental compliance costs could not be reasonably passed on to suppliers, workers, or consumers. The commenters believed that these conclusions would apply equally to impacts posed by engineering alternatives 2 and 7.

EPA recognizes that implementation of engineering alternatives 1, 2, and 7 under a subtitle C framework would impose cost impacts that might be difficult for members of the domestic industry to withstand. The real issue, however, is the magnitude and distribution of the impacts that might be imposed by tailored subtitle C standards. Under the Subtitle C-Minus scenario presented in both the RTC and the Supplemental Analysis, facilities could achieve compliance by adopting strategies to either contain or reduce/eliminate contaminants in their special wastes. Presumably, they would do so in a manner that minimized costs, given their own operational strategies and site-specific conditions. Therefore, the cost estimates provided in the Supplemental Analysis should be viewed as upper-bound estimates; it is likely that actual costs and associated impacts would be lower (at least on a per ton P_2O_5 basis) than those estimated for the model plant.[3] This fact, coupled with diminished relevance of the cost impacts of full subtitle C regulation, suggests that many of the claims made by commenters are overstated.

II. Other Wastes Addressed in the Notice of Data Availability

EPA received no comments on the additional information regarding gasifier ash and process wastewater from coal gasification. However, the Agency did receive two comments addressing the supplemental analysis of basic oxygen furnace dust/sludge from carbon steel production. The Agency has taken the comments into account in developing this final regulatory determination. EPA's detailed responses to the comments are available for inspection in the docket.

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[3] While this is true, estimated costs under the Subtitle D-Plus scenario are also very high.