

Background Information Document

Financial Test Options Analysis
for Hard Rock Mining Industry under CERCLA 108(b)

TABLE OF CONTENTS

<u>1. Executive Summary.....</u>	<u>3</u>
1.0 PURPOSE	3
1.0.1 REGULATORY BACKGROUND	3
1.0.2 ANALYTIC CHARGE	4
1.1 FINANCIAL TEST OPTIONS EVALUATED	4
1.2 RESULTS OVERVIEW	6
<u>2. Limitations and Qualifications.....</u>	<u>9</u>
2.0 COST ESTIMATES.....	9
2.1 FINANCIAL DATA AVAILABILITY	9
2.2 CREDIT RATINGS	9
2.3 US ASSETS	10
2.4 CORPORATE FINANCIAL TEST AS COMPARED TO CORPORATE GUARANTEE	10
<u>3. Data and Data Sources.....</u>	<u>12</u>
3.0 UNIVERSE OF COMPANIES.....	12
3.0.1 MULTIPLE SOURCES OF SUBJECT COMPANIES.....	12
3.0.2 PARENTAL OWNERSHIP HIERARCHY OF SUBJECT COMPANIES	15
3.1 ITERATIVE DATA COLLECTION PROCESS	15
3.1.1 DETAIL OF BANKRUPTCY DATA REQUESTS.....	16
3.1.2 DETAIL OF FINANCIAL DATA REQUESTS.....	17
3.1.3 DETAIL OF RATINGS DATA REQUESTS	17
3.2 ANALYTIC UNIVERSE SUMMARY STATISTICS	18
3.2.0 POPULATION OF COMPANIES	18
3.2.1 ACTIVE VERSUS BANKRUPT COMPANIES	18
3.2.2 TARGET VERSUS PARENT COMPANIES	19
3.2.3 SMALL VERSUS NON-SMALL COMPANIES	19
3.2.4 PRIVATE VERSUS PUBLIC COMPANIES	20
3.2.5 RATED VERSUS UNRATED COMPANIES.....	21
3.3 FINANCIAL AND RATINGS DATA DESCRIPTIVE STATISTICS	21
3.3.1 FINANCIAL DATA	21
3.3.2 RATINGS DATA	21
3.3.3 DATA FOR SMALL BUSINESSES	22
3.3.5 DATA FOR PRIVATELY HELD COMPANIES	23
3.4 ENVIRONMENTAL OBLIGATION COST ESTIMATE	23
3.5 HIERARCHICAL NAICS 212 COMPANY DATABASE	23
<u>4. Analytic Method.....</u>	<u>24</u>
4.0 OVERVIEW OF ANALYTIC METHOD.....	24
4.1 PERFORMING FINANCIAL TESTS	26
4.1.0 TESTING THE TARGET NAICS 212 COMPANY	26
4.1.1 TESTING THE PARENTAL HIERARCHY OF FAILING NAICS 212 COMPANIES.....	26

4.1.2 EXHAUSTING THE PARENTAL HIERARCHY OF FAILING NAICS 212 COMPANIES	27
4.1.3 NAICS 212 COMPANIES WITHOUT ADEQUATE FINANCIAL AND RATINGS DATA	27
4.2 ESTIMATING DEFAULT RISK ACCRUING TO GOVERNMENT	27
4.2.0 NRSRO HISTORICAL DEFAULT STUDIES	28
4.2.1 APPLICATION OF HISTORICAL DEFAULT RATES TO NAICS 212 UNIVERSE	29
4.2.2 ALTMAN Z-SCORE AS MEASURE OF FINANCIAL HEALTH FOR UNRATED COMPANIES	29
4.2.3 ESTIMATION OF PROBABILITY OF DEFAULT AT THE COMPANY LEVEL	31
4.2.4 CALCULATION OF GOVERNMENT RISK	32
4.3 ESTIMATING COSTS ACCRUING TO INDUSTRY	32
4.3.0 ANNUAL COMMISSION FEE CALCULATION	33
4.3.1 CASH COLLATERAL CALCULATION	33
4.3.2 CASH COLLATERAL OPPORTUNITY COST CALCULATION	34
4.3.3 COMPANY WACC CALCULATION	35
4.3.4 TOTAL COST TO INDUSTRY OF OBTAINING A THIRD PARTY INSTRUMENT	36
4.3.5 OTHER COSTS ACCRUING TO INDUSTRY	38
<u>5. Additional Consideration: The Cyclical Nature of the Hard Rock Mining Industry.....</u>	<u>39</u>
5.0 THE CYCLICAL NATURE OF THE HARD ROCK MINING INDUSTRY (NAICS 212)	39
5.0.1 FINANCIAL TEST CONSIDERATIONS FOR HARD ROCK MINING (NAICS 212) COMPANIES PRIOR TO BANKRUPTCY	39
5.0.2 CREDIT RATING DECLINES AND BANKRUPTCIES OF COMPANIES RECEIVING A BBB RATING	39
<u>Appendix A: Applied Example of Analytic Method – Anonymized Data</u>	<u>A-1</u>
<u>Appendix B: Bankruptcy and Ratings Considerations for Hard Rock Mining (NAICS 212) Companies.....</u>	<u>B-1</u>

1. Executive Summary

1.0 PURPOSE

This background document was prepared by U.S. EPA's Office of Resource Conservation and Recovery (ORCR) in support of EPA's efforts to promulgate financial responsibility regulations under Section 108(b), 42 U.S.C. 9608 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980. EPA's evaluation is limited to a comparison of impacts to industry and the government under different financial test scenarios with the sole purpose of facilitating EPA's selection of a financial test for the Rule.¹ The data, options and analyses summarized herein pertain only to the hard rock mining industry (NAICS 212).² This document evaluates four financial test scenarios, as designed by EPA.

- **Chapter 1** summarizes the financial tests that formed part of EPA's evaluations.
- **Chapter 2** summarizes assumptions, limitations and considerations underpinning analysis of EPA's financial test scenarios.
- **Chapter 3** describes the data sources and data available to analyze the capability of firms, within NAICS 212 sector and potentially subject to EPA's proposed rule, to comply with EPA's array of financial test scenarios.
- **Chapter 4** summarizes the analytic method underpinning EPA's calculation of aggregate default risk accruing to the government and aggregate cost accruing to industry for EPA's array of financial test scenarios.
- **Chapter 5** discusses factors that may influence EPA's findings.

Supplemental appendices appear at the end of this document.

1.0.1 REGULATORY BACKGROUND

Section 108(b), 42 U.S.C. 9608 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended in later years, requires that the Environmental Protection Agency (EPA) identify classes of facilities that must demonstrate evidence of financial responsibility. Moreover, the statutory language of CERCLA requires that the Agency address promulgation of regulations that require classes of facilities to establish and maintain evidence of financial responsibility consistent with the degree and duration of risk associated with their activities.

In July 2009, the Agency issued notice of action. Specifically, through the Federal Register, EPA noticed that it was identifying classes of facilities within the hard rock mining industry as the first set of classes

¹ For the Regulatory Impact Analysis of this rule see *Regulatory Impact Analysis of EPA's Proposed CERCLA Section 108(b) Rulemaking Establishing Financial Responsibility Requirements for Certain Classes of Mines and Associated Mineral Processing Facilities within the Hardrock Mining Industry*.

² North American Industry Classification System (NAICS) codes are six-digit codes that identify industry sectors and sub-sectors. The first two digits identify the industry sector, the third digit the industry sub-sector, the fourth digit the industry group, the fifth digit the industry, and the sixth digit provides additional nation-specific detail. NAICS 212 refers to the "Mining (except oil and gas)" industry sub-sector.

for which EPA would develop financial responsibility requirements under CERCLA 108(b). For purposes of its action, the Agency delineated that facilities within the hard rock mining sector subject to these requirements are those which extract, beneficiate or process metals (e.g., copper, gold, iron, lead, magnesium, molybdenum, silver, uranium, and zinc) and non-metallic, non-fuel minerals (e.g., asbestos, gypsum, phosphate rock, and sulphur).³

In a subsequent Federal Register notice, dated January 6, 2010, EPA issued an advanced notice of public rulemaking in which the Agency identified additional classes of facilities, beyond those in NAICS 212, as subject to the development of financial responsibility requirements under CERCLA 108(b). These classes of facilities fall within three industries, including the Chemical Manufacturing industry (NAICS 325), the Petroleum and Coal Products industry (NAICS 324), and the Electric Power Generation, Transmission, and Distribution industry (NAICS 2211).⁴

Consistent with EPA's proposed rule, Financial Responsibility Requirements for the Hard Rock Mining Industry, this background document focuses solely on NAICS 212. It does not evaluate facilities or companies within the additional listed NAICS codes, nor does it evaluate potential financial test scenarios for these additional NAICS codes. This document makes no implicit or implied representation that the tests discussed herein are appropriate for firms other than those that fall within NAICS 212.

1.0.2 ANALYTIC CHARGE

EPA analyzed the pass/fail rates of four financial test scenarios, including tests promulgated under other Federal statutes such as the Resource Conservation and Recovery Act (RCRA), as well as a mix of test elements used by financial practitioners. The goal of EPA's analysis was to compare the pass/fail rates of these tests (and test elements) for the universe of active companies within NAICS 212 that may be subject to financial responsibility requirements under CERCLA 108(b), as well as the universe of inactive companies within NAICS 212 that, but for bankruptcy, would have been subject to similar provisions under CERCLA 108(b). In particular, to support the evaluation of the four financial test approaches, EPA analyzed companies within NAICS 212, including both active and inactive (bankrupt) companies, for which data were publicly available or otherwise available for fee from third-party practitioners. EPA's evaluation also attempts to gauge the reliability of the four financial test scenarios as predictors of financial distress and possible default.

1.1 FINANCIAL TEST SCENARIOS EVALUATED

EPA evaluated four financial test scenarios, incorporating financial metrics, to assess the ability of the tests to predict the likelihood of bankruptcy. These first of the options considered includes the RCRA corporate financial test at 40 C.F.R. 264.143(f), wherein a company that passes either Alternative 1 or Alternative 2 of the test is able to self-insure its financial responsibility obligations. The remaining three options include new credit-rating based tests designed by EPA specifically for purposes of the rulemaking. The requirements of each financial test scenario are summarized in Exhibit 1 on the following page.

³ 74 Fed. Reg. 37213-37219 (July 28, 2009).

⁴ 75 Fed. Reg. 816-832 (January 6, 2010).

Exhibit 1. Summary of Financial Test Options and Scenarios Evaluation by EPA

FINANCIAL TEST ELEMENT	RCRA SUBTITLE C 264.143(f) OPTION		INVESTMENT GRADE RATING TEST OPTION	HIGHER-THAN-INVESTMENT-GRADE RATING TEST	
	ALTERNATIVE 1	ALTERNATIVE 2		BASE VERSION	FINAL VERSION (CO-PROPOSED AS AN ALTERNATIVE 2 ND OPTION FOR THE RULE)
Credit Rating ¹	Not Required	Most recent bond issuance of at least BBB- (Standard & Poor's) or Baa3 (Moody's)	Rating of BBB- or better from Standard & Poor's or the equivalent from a Nationally Recognized Statistical Rating Organization (NRSRO)	<ul style="list-style-type: none"> ▪ Rating of at least A- or higher from Standard & Poor's, or equivalent from a Nationally Recognized Statistical Rating Organization (NRSRO); no third-party financial instrument required. ▪ Rating of BBB, BBB+ or equivalent from a Nationally Recognized Statistical Rating Organization (NRSRO); 50 percent of obligation must be assured through an EPA-approved third-party financial instrument. 	<ul style="list-style-type: none"> ▪ Rating of at least A- or higher from Standard & Poor's, or equivalent from a Nationally Recognized Statistical Rating Organization (NRSRO); no third-party financial instrument required. ▪ Rating of BBB, BBB+ or equivalent from a Nationally Recognized Statistical Rating Organization (NRSRO); 50 percent of obligation must be assured through an EPA-approved third-party financial instrument.
Financial Metrics	<ul style="list-style-type: none"> ▪ TL/NW < 2.0 ▪ (NI + DDA)/TL > 0.1 ▪ CA/CL > 1.5 	Not Required	Not Required	Not Required	Not Required
Coverage Ratio	TNW & NWC ≥ 6 times C/PC and plugging & abandonment costs	TNW ≥ 6 times C/PC and plugging & abandonment costs	Not Required	Not Required	TNW ≥ 6 times the amount of financial responsibility obligations to be covered by the financial test.
Tangible Net Worth Limitation	≥ \$10 million	≥ \$10 million	Not Required	Not Required	Not Required
US Assets Limitation ²	<ul style="list-style-type: none"> ▪ ≥ 90% of TA; or ▪ ≥ 6 times C/PC and plugging & abandonment costs 	<ul style="list-style-type: none"> ▪ ≥ 90% of TA; or ▪ ≥ 6 times C/PC and plugging & abandonment costs 	Not Required	Not Required	<ul style="list-style-type: none"> ▪ ≥ 90% of TA; or ▪ ≥ 6 times the amount of financial responsibility obligations to be covered by the financial test
Key:	TL = Total Liabilities CL = Current Liabilities	TA = Total Assets CA = Current Assets	NW = Net Worth TNW = Tangible Net Worth	NI = Net Income NWC = Net Working Capital	DDA = Depreciation, Depletion, and Amortization C/PC = Closure / Post-Closure
Notes:					
¹	For purposes analysis, EPA assessed companies' long-term issue credit ratings as reported by Standard & Poor's, and long-term corporate family ratings as reported by Moody's.				
²	Due to limited data availability on firms' composition of domestic versus foreign assets, EPA's analyses assume that analyzed firms are able to pass US Asset limitation requirements, where applicable. For additional discussion and analysis of the implications of this requirement, see Chapter 5.				

1.2 RESULTS OVERVIEW

The remainder of this summary offers charts that summarize the aggregate results from EPA’s evaluation of the four financial test scenarios. The results illustrated rely on financial and ratings data available for companies within NAICS 212. EPA apportions the results into two bins:

- 1) The default risk accruing to the government by virtue of allowing “passing” companies with a non-zero probability of default to self-assure all or part of their environmental obligations.
- 2) The cost accruing to industry by virtue of companies being unable to satisfy the financial test thresholds and having to procure an EPA-approved financial responsibility instrument.

Exhibits 2 and 3 compare the financial test scenarios evaluated by EPA:

Scenario 1 – No Financial Test. This scenario assumes that, irrespective of dollar value, no company will be allowed to self-assure its environmental obligations through a financial test. All risk is hedged through an EPA-approved third-party financial responsibility instrument. For purposes of evaluation, EPA assumes the use of a letter of credit as the prevailing third-party financial instrument.

Scenarios 2a through 2d – Financial Test Scenarios. These scenarios evaluate the four financial test scenarios summarized in Exhibit 1 on the previous page.

Scenario 3 – No Regulation. This scenario assumes that, irrespective of financial health, companies will not be required to procure a third-party financial responsibility instrument. Under this scenario, all environmental obligation default risk accrues to the government.

EPA’s evaluation is predicated on the availability of financial and ratings data on companies within NAICS 212. EPA recognizes that not all companies are publically traded, or have procured a long-term issue credit rating from a Nationally Recognized Statistical Rating Organization (NRSRO). As such, EPA conducted two simultaneous evaluations of the proposed financial test scenarios.

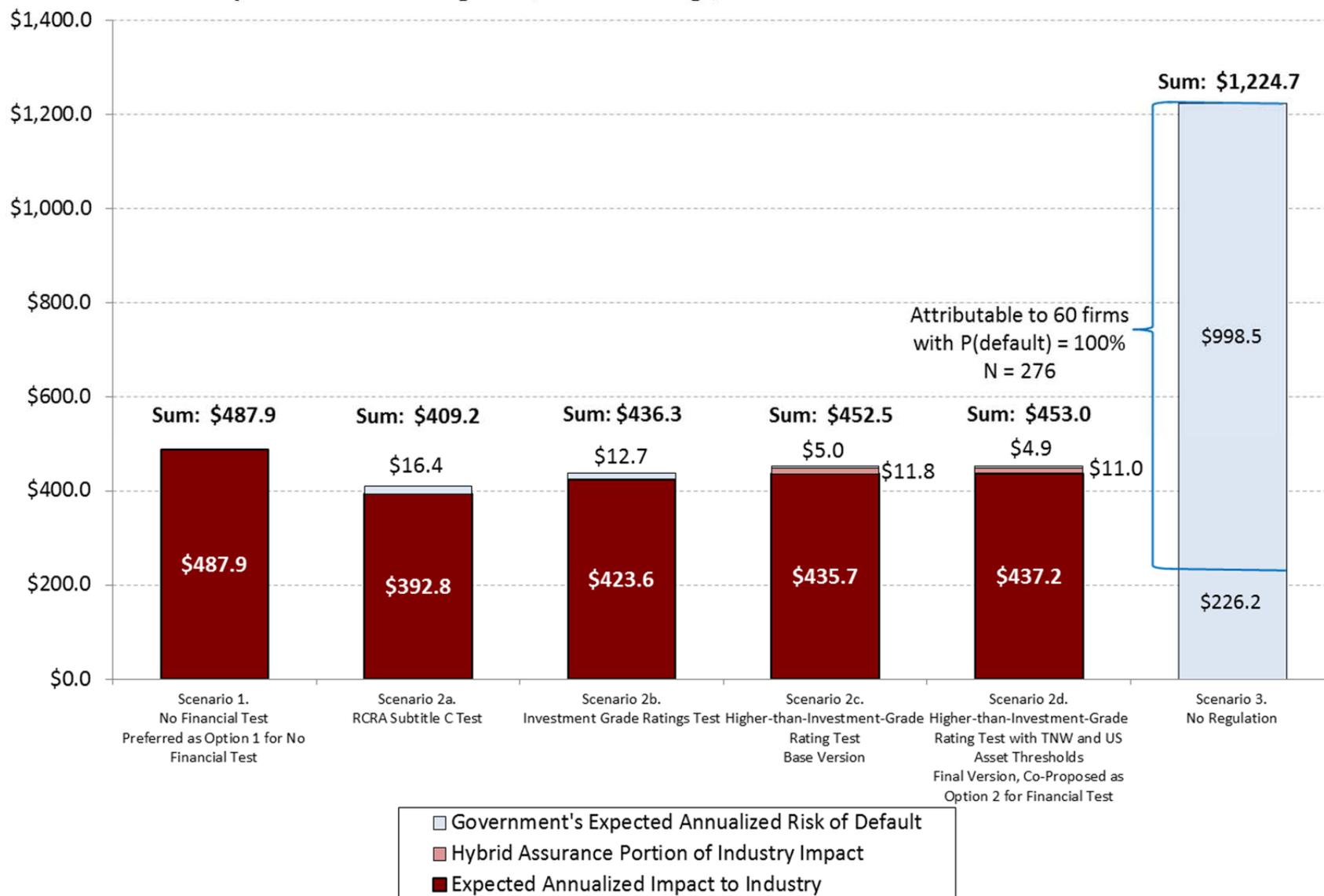
The first evaluation is based on *actual* long-term issue credit ratings data available for a candidate set of companies within NAICS 212. The results of this evaluation are evidenced in Exhibit 2 and are benchmarked against the “No Financial Test” and “No Regulation” scenarios.

The second evaluation is based on actual ratings and *implied* long-term issue credit ratings for companies that do not currently have a publically available rating.⁵ The results of this evaluation are combined with the results of EPA’s first evaluation, and are illustrated in Exhibit 3.

Exhibits 2 and 3 illustrate the overall annualized impact of the four financial test scenarios, benchmarked against the “No Financial Test” and “No Regulation” scenarios. EPA demarcates the default risk borne by the government from the impact borne by industry, wherein default risk to the government is represented in blue shading and the impact borne by industry is represented in red shading.

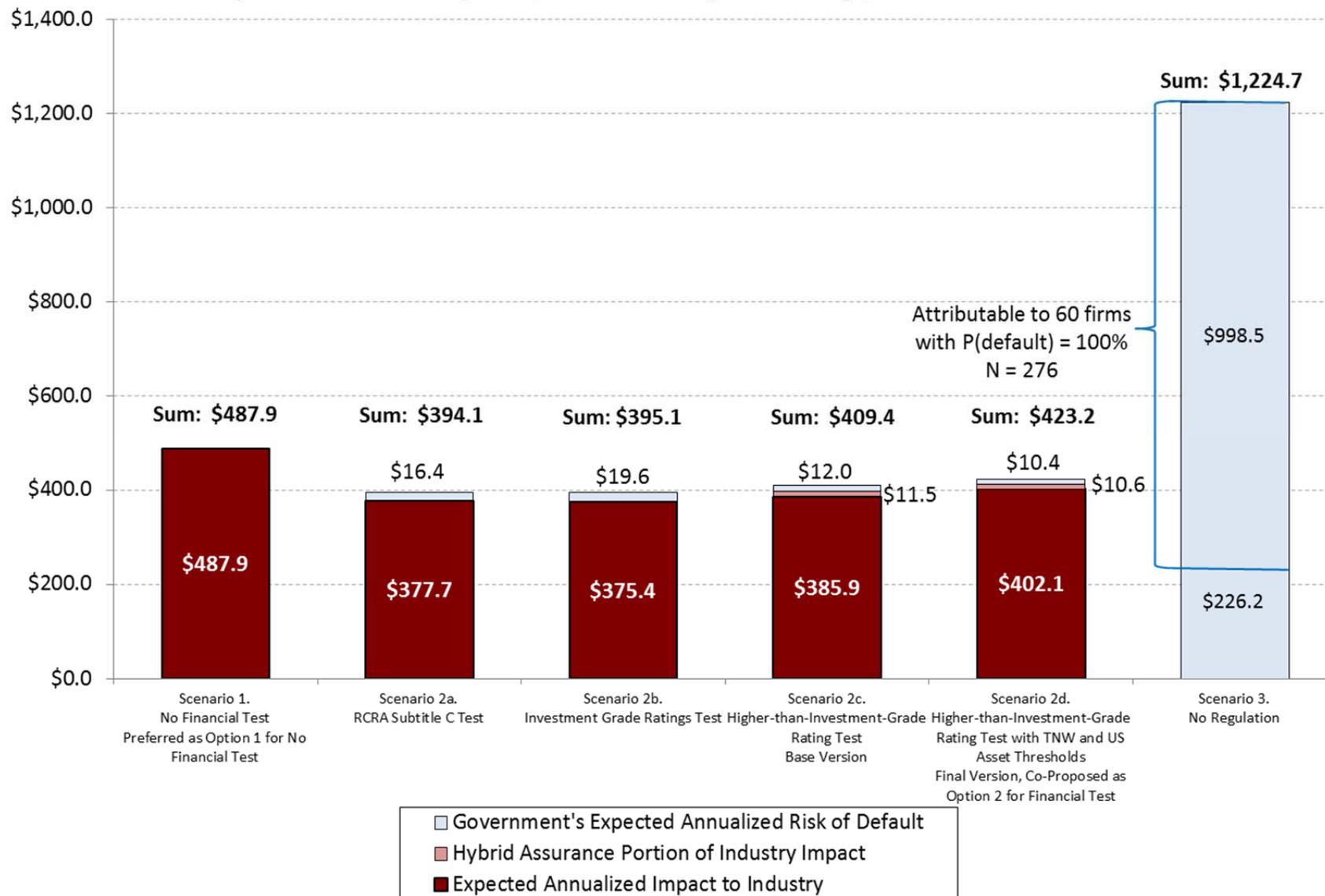
⁵ EPA derived implied long-term issue credit ratings using the Altman Z-Score as a measure of financial health. By calibrating the Altman Z-Scores to companies with issue credit ratings, EPA calculated an estimated issue credit rating for companies that were not rated by either Standard & Poor’s or Moody’s during the period of analysis. This approach increases the number of companies that likely will be able to “pass” financial tests with minimum ratings thresholds. See Chapter 4 for discussion of the calculation of implied ratings.

Exhibit 2. Summary of Annualized Impacts (Actual Ratings)



Note: Hybrid Assurance Portion of Industry Impact refers to the portion of industry cost borne by companies passing the “hybrid” portion of a financial test and purchasing a third-party financial instrument that covers 50 percent of their obligations.

Exhibit 3. Summary of Annualized Impacts (Actual and Implied Ratings)



Note: Hybrid Assurance Portion of Industry Impact refers to the portion of industry cost borne by companies passing the "hybrid" portion of a financial test and purchasing a third-party financial instrument that covers 50 percent of their obligations.

2. Limitations and Qualifications

2.0 COST ESTIMATES

A key input to any financial test is the estimated amount of obligations that needs to be assured by the test. Ideally, a company's ability to pass a financial test would be assessed against site-specific cost estimates driven by a risk-based engineering assessment. However, site- and company-specific cost estimates were not readily available for the candidate mining companies included in this analysis.⁶

In the absence of primary cost estimate data on a company-specific basis, EPA assumed a standard obligation of \$50 million per company. While this assumption allows for comparison of a company's cost accrual relative to other financial tests, it does not scale the obligation amount to the size of the company's operations. To the extent that this amount overstates actual obligations, specifically for smaller companies, the \$50 million coverage requirement may affect cost effectiveness determinations if there is a systematic relationship between company size and financial test passing rates. The use of a singular benchmark obligation amount allows for an effective examination of the differences between alternative financial tests, without the analytic complications that may arise between the intersection of differing obligation amounts and financial test requirements.

2.1 FINANCIAL DATA AVAILABILITY

The financial data elements necessary to run the various financial test scenarios were not available for all companies across all years. In particular, publicly available financial data for privately held companies are limited. To the extent possible, EPA attempted to adjust for missing information using companies' 10-K filings with the U.S. Securities and Exchange Commission, as well as data available through third-party information sources. See Chapter 3 for a more detailed discussion of data sources and data availability.

2.2 CREDIT RATINGS

Several of the financial test scenarios, including EPA's Co-Proposed Financial Test Option, include a rating component. For example, RCRA Subtitle C Alternative 2 requires an investment grade rating. For purposes of this analysis, and where available, EPA collected each candidate company's long-term issuer credit rating from Standard & Poor's, and each company's long-term corporate family rating from Moody's.

Where credit ratings were not publicly available for candidate companies within NAICS 212, this analysis relies on the relationship between available actual ratings and each company's Altman Z-Score to imply a credit rating for companies with available financial data, but for which no public credit rating was available.

⁶ Efforts to develop site- and company-specific cost estimates are ongoing. These efforts inform the Regulatory Impact Analysis (RIA) for the proposed rule, which estimates total economic impacts associated with the proposed rule. Because this document is intended to provide an analytic comparison of different financial test scenarios rather than assess the overall costs and benefits of the rule, it proceeds by assuming a similar environmental obligation level across each candidate firm within NAICS 212 in order to more effectively characterize the differences in financial test scenarios.

2.3 US ASSETS

Several financial test scenarios evaluated by this analysis include a U.S. assets-based coverage ratio (see Exhibit 1). However, limited U.S. asset information is available from Standard & Poor's. This information is used when available within the tests that include U.S. assets coverage ratios. For firms with no available U.S. assets information, the analysis assumes that the company is able to successfully "pass" all U.S. assets-related requirements. To the degree this is not the case for the firms lacking available U.S. assets data, the pass rates for the financial test scenarios that include U.S. assets-based coverage ratios may be overstated.⁷ Without a specific regulatory alternative precluding the creation of U.S. holding companies, companies with significant amounts of their assets located outside of the United States that wish to use the financial test with U.S. asset thresholds can (and do) establish U.S. holding companies that are capitalized sufficiently to pass the corporate financial test.

2.4 CORPORATE FINANCIAL TEST AS COMPARED TO CORPORATE GUARANTEE

This analysis assumes that, if possible, candidate companies will opt to use a self-insurance mechanism, be it a financial test or a corporate guarantee. Therefore, if a candidate company fails a particular financial test scenario, EPA assumes it would continue through its corporate hierarchy seeking to self-insure, i.e., from direct- to higher-tier corporate parent as applicable, through the use of a corporate guarantee. That is:

- 1) Company A is a direct subsidiary of Company B, which is a direct subsidiary of Company C. If Company A passes the test, results for Company A are included in our examinations above (Exhibits 2 and 3 of the Executive Summary).
- 2) If Company A fails the test, this analysis assumes that it would seek a Corporate Guarantee from its direct-tier parent company, i.e., Company B. If Company B passes the test, results for Company B are included in our examinations above (Exhibits 2 and 3 of the Executive Summary).
- 3) If both Company A and Company B fail the test, this analysis assumes that Company A would seek a Corporate Guarantee from its higher-tier parent, i.e., Company C. If Company C passes the test, results for Company C are included in our examinations above (Exhibits 2 and 3 of the Executive Summary).⁸

Where the analysis identifies instances of a higher-tier parent allowing a subsidiary to pass a financial test via a corporate guarantee, it applies iterative modeling in order to determine the maximum allowable

⁷ Review of the data suggests that those firms with available U.S. assets information have more than sufficient U.S. assets to pass all U.S. assets-related requirements. Where present, credit rating and tangible net worth (TNW) requirements generally determine a given firm's ability to pass a financial test scenario.

⁸ If no company in the corporate hierarchy (i.e., neither Company A, Company B, nor Company C) is able to pass the financial test, the lowest-tier company with available financial data is assumed to fail the test and purchase a third-party financial assurance instrument. (This assumption is necessary because company financial information is necessary to derive third-party financial assurance pricing within the analysis; therefore, the analysis cannot model companies without financial information purchasing financial assurance). In reality, higher-tier corporate parents unable to pass the financial test may purchase third-party financial assurance for a lower price than would be paid by their subsidiaries, to the extent that the corporate parents have greater financial wherewithal than their subsidiaries. By assuming that the lowest-level corporate entity with adequate data purchases the third-party financial assurance instrument, this analysis may therefore overestimate the costs accruing to industry.

coverage that can be provided by the parent. Specifically, this iterative modeling identifies all companies passing the financial test on behalf of multiple entities (i.e., itself and/or one or more subsidiaries), and then compares the maximum allowable coverage under each financial test scenario, based on the company's financials against the total corporate guarantees it is modeled as providing. Where the total guaranteed amount exceeds the company's maximum allowable coverage, the iterative modeling prevents the company from providing guarantees to any subsidiaries whose obligations would lead the company to exceed its maximum allowable coverage amount.

For example, Company A and Company B are both assessed in the financial test analysis. Company B is the direct-tier parent of Company A, and both are modeled with the standard obligation of \$50 million. Company B is able to pass a given financial test on the strength of its financials, while Company A is not. However, Company B's tangible net worth is approximately \$415 million. Therefore, while Company B is able to pass a financial test with a six times tangible net worth multiple ($\$50 \text{ million} \times 6 = \$300 \text{ million} < \$415 \text{ million}$), it is unable to provide coverage for Company A, as doing so would exceed its maximum allowable coverage amount ($[\$50 \text{ million} + \$50 \text{ million}] \times 6 = \$600 \text{ million} > \$415 \text{ million}$). Correspondingly, the iterative modeling concludes with Company B able to pass the financial test for itself, but unable to provide a corporate guarantee for Company A, who fails the test and must purchase third-party financial assurance.⁹

In the absence of company-specific cost estimate data, EPA is unable to determine the range of subsidiaries that a direct or higher-tier corporate parent may be able to collectively assure. Use of the \$50 million standard obligation therefore serves as a proxy for additional obligations assured by a single corporate parent, as each additional corporate guarantee adds an equivalent amount (i.e., \$50 million) to the total obligation amount compared against the parent's maximum allowable coverage.

⁹ As described in Exhibit 1, the Investment Grade Ratings Test and the default Higher-than-Investment-Grade Ratings Test do not include any coverage ratios. Therefore, parent companies able to pass these tests are modeled as able to provide corporate guarantees for all of their subsidiaries. The coverage ratio therefore appears to be an important component of a financial test that more closely aligns a parent company's financial wherewithal with the extent of obligations it is allowed to assure.

3. Data and Data Sources

3.0 UNIVERSE OF COMPANIES

This Chapter describes the process used to derive the universe of candidate firms within NAICS 212 that may be subject to this rule-making. Next, it summarizes the methodology used to develop a vertical ownership hierarchy for the potentially affected entities. Finally, it outlines the procedure used to gather other key company information, including information on a company's credit ratings, history of bankruptcy, financial performance, and size. These data underpin the analysis of the relative stringency and costs of each test option as described in Chapter 4. Exhibit 4 illustrates the data collection steps undertaken as part of this analysis.

3.0.1 MULTIPLE SOURCES OF SUBJECT COMPANIES

This analysis examines both the universe of active facilities in NAICS 212 that may be subject to financial responsibility requirements under CERCLA 108(b), as well as the universe of inactive firms that, but for bankruptcy, would have been subject to similar provisions under CERCLA 108(b). In so doing, the evaluation is able to best gauge the reliability of the various financial test scenarios as predictors of financial distress and possible default.

EPA began with a list of candidate firms in NAICS 212 that are potentially subject to the proposed rulemaking under CERCLA 108(b). As discussed above, in addition to active companies, EPA also is interested in inactive (bankrupt) companies for purposes of evaluating the predictive power of various financial test scenarios. EPA augmented various candidate company lists by requesting a master data pull from Standard and Poor's (S&P) of all companies having a primary NAICS code designation of *212 - Mining (except oil and gas)*.¹⁰ Details of the various company sources are provided below.

Department of Labor (DOL), Mining Safety and Health Administration (MSHA) List. All U.S. mines are required to apply for a mine identification number with DOL's MSHA before beginning mining operations. This list includes 914 corporate entities with commercially active mining operations in the U.S. as of calendar year 2007.¹¹

EPA Mining Team (Hoffman/Mahmud) Filter. EPA reviewed the MSHA List against a series of criteria to determine whether each mine facility fell within the definition of "hard rock mining facilities," as described in the July 2009 Federal Register notice. EPA considered various factors, such as the number

¹⁰ The July 28, 2009 Federal Register notice identifies two subsectors of the 212 NAICS code as potentially regulated – metal mining (2122) and non-metallic mining (2123). The data pull for the higher level NAICS code 212 may pull in additional companies outside of these two subsectors resulting in a broader data set than otherwise subject to the proposed rule.

¹¹ See MSEXcel Spreadsheet, entitled Mining Facilities Priorities.xls. Spreadsheet provided via electronic mail by Scott Palmer, EPA ORCR in support Work Assignment 3-41 under Contract EP-W-07-011 on April 30, 2010. See also, Hoffman, S. (EPA ORCR) and S. Mahmud (EPA OSRTI) 2009. "Mining Classes Not Included in Identified Hard Rock Mining Classes of Facilities." EPA Memorandum to The Record, dated June 29, 2009.

of facilities in active operation and production, extent of environmental contamination, number of sites on the CERCLA site inventory, government expenditures, corporate structure and bankruptcy potential, etc.¹²

EPA's Office of Site Remediation and Enforcement (OSRE) List. This list includes a total of 365 active and inactive (bankrupt) corporate entities.¹³ The list was developed from CERCLIS, and includes all sites associated with NAICS code 212 and reported in CERCLIS. For each entry, the list includes: 1) Company Name/Site Name; 2) Responsible Parties (RPs) with settlements for the listed site; and 3) RPs without settlements for the listed site.

National Priorities List (NPL) (55) List. This list includes a total of 55 sites on the NPL list.¹⁴

NPL (95) List. This list includes a total of 95 sites for which expenditure information from CERCLIS was provided to the Regulatory Impact Analysis (RIA) team.¹⁵

Historical Hard Rock Mining List. This list includes 251 sites. This list is intended to represent "all of the proven historical Mining and Mineral Processing sites identified within the CERCLIS Database." To our knowledge, this list encompasses sites that are non-NPL Removal Actions, as well as specially designated sites that were part of the ASARCO Bankruptcy case.¹⁶

Mining (NAICS 212) Pull. A master data pull from Standard and Poor's (S&P) for all companies (n = 185) having a primary NAICS code designation of 212 - *Mining (except oil and gas)*.¹⁷

¹² See also, Hoffman, S. (EPA ORCR) and S. Mahmud (EPA OSRTI) 2009. "Mining Classes Not Included in Identified Hard Rock Mining Classes of Facilities." EPA Memorandum to the Record. June 29, 2009.

¹³ See MSEXcel Spreadsheet, entitled Mining Sites 3.15.2010.xls. Spreadsheet provided via electronic mail by Chrisna Tan, EPA OSRE on April 15, 2010.

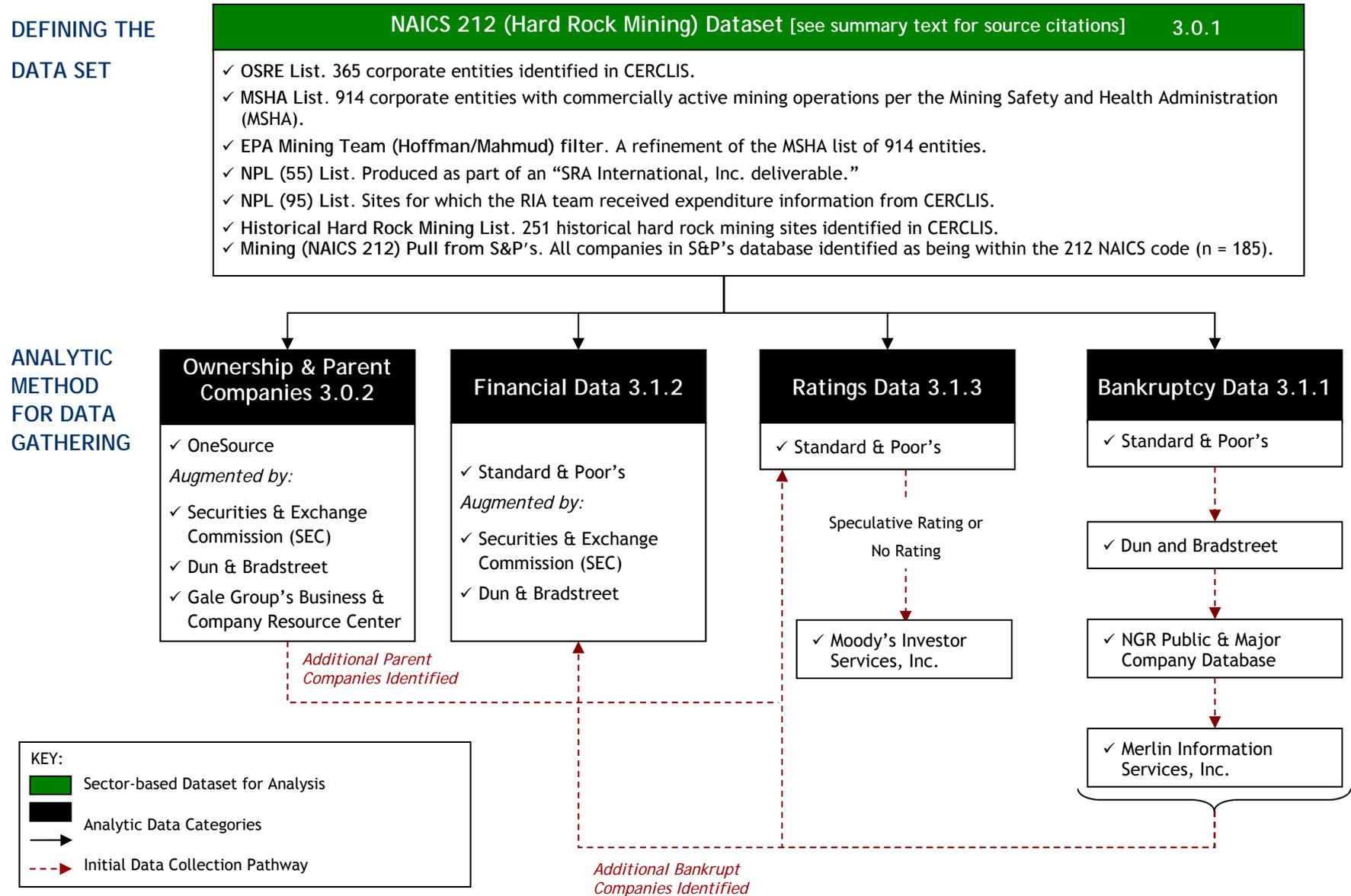
¹⁴ See MSEXcel Spreadsheet, entitled Mining Facilities Priorities.xls, developed by SRA International, Inc.. Spreadsheet provided via electronic mail by Scott Palmer, EPA ORCR in support Work Assignment 3-41 under Contract EP-W-07-011 on April 30, 2010.

¹⁵ See MS Access database, entitled Mining Site Exp.mdb (table entitled 00016 Final Site Exp). Database provided via electronic mail by Scott Palmer, EPA ORCR in support of Work Assignment 2-41 under Contract EP-W-07-011 on December 4, 2009.

¹⁶ See MSEXcel Spreadsheet, entitled Final List - 251 Historical Hard Rock Mining & Mineral Processes Facilities in CERCLIS.xls. Spreadsheet provided via electronic mail by Scott Palmer, EPA ORCR in support Work Assignment 3-41 under Contract EP-W-07-011 on June 17, 2010.

¹⁷ Standard & Poor's Capital IQ Compustat data services are located online at: <http://www.standardandpoors.com/products-services/capitaliq-compustat/en/us>.

Exhibit 4. Model of Data Collection Procedures



3.0.2 PARENTAL OWNERSHIP HIERARCHY OF SUBJECT COMPANIES

The mutually exclusive union of the multiple company lists provided in Section 3.0.1 and collected throughout 2010 resulted in the identification of 1,145 unique entities. Using this list of unique entities, EPA worked with a third-party data vendor, OneSource Information Services, Inc. (OneSource), to identify corporate ownership structures.¹⁸ For each entity that OneSource was able to match to a company in its database, OneSource identified the entity's ownership type and corporate structure, including direct, higher-tier, and ultimate corporate parents.¹⁹ For each company within the corporate hierarchy, OneSource identified whether it was privately held or publicly traded, and provided its corresponding NAICS codes. EPA augmented the resulting data set using information included in company filings with the Securities and Exchange Commission (SEC), Dun and Bradstreet (D&B), and the Gale Group's Business and Company Resource Center.²⁰

3.1 ITERATIVE DATA COLLECTION PROCESS

After the combined list of potential NAICS 212 companies was sent to OneSource for identification, the resulting list of 614 identified companies and their higher tier parent entities were sent to various bankruptcy data vendors and S&P for financial, ratings, and bankruptcy data collection. This process was repeated for any additions to the universe at any step in the data collection process in order to develop a snapshot of the corporate hierarchies and ownership characteristics present in the industry.

Data for companies listed as belonging to NAICS code 212 also were requested from S&P in addition to the list resulting from the OneSource data pull (see Section 3.0.2). The resulting companies not appearing in the original EPA combined list of NAICS 212 companies underwent a second round of data collection for identification of their corporate hierarchy via OneSource databases and subsequently a return of the identified parent companies back to S&P for collection of their financial and ratings data. This iterative data process is detailed in Exhibit 4, above.

The end result of the original "waves" of the iterative data collection process was a universe of 322 "target" firms owning facilities within NAICS 212. The universe also included direct and ultimate corporate parents for each of these 322 firms, where such parents were identified and financial data for these parents were available. The array of data for these companies, both target companies and their parents, if any, as detailed in Exhibit 4, was compiled between 2010 and 2012.

However, routine data update and verification tasks conducted after 2012 indicated that the hard rock mining industry (NAICS 212) routinely undergoes major merger and acquisition events. Therefore, to reflect updated data, EPA conducted an additional wave of iterative data collection in 2014 and 2015, focusing specifically on the 322 target firms and their hierarchy of corporate parents. This wave focused on examining the assets and holdings of the 322 target firms and their parents and identifying relevant

¹⁸ OneSource Information Service Inc., located online at: <http://www.onesource.com>.

¹⁹ The remaining entities could not be matched to a company in OneSource's database. In many cases, the entities on the EPA lists consisted of specific mining sites or locations, with inadequate identifying information to link them to a specific corporate entity or corporate parent. To the extent these entities were not matched to a company during subsequent data pulls, e.g., from Standard & Poors, Dun & Bradstreet, etc., they are excluded from subsequent analysis.

²⁰ Dun and Bradstreet, located online at: <http://www.dnb.com/us>; Gale Group databases, located online at: <http://www.gale.cengage.com/>.

ownership and corporate structure changes that had occurred since the original data collection waves in 2012.

3.1.1 DETAIL OF BANKRUPTCY DATA REQUESTS

For purposes of data gathering, EPA defined bankruptcy as companies that have filed under either Chapter 7 or Chapter 11 of the U.S. Bankruptcy Code. Given the variety of sources available for bankruptcy information and the data limitations inherent to each of these sources, EPA followed an iterative process to identify which candidate firms fell within the bankrupt category. Specifically, EPA developed the dataset of candidate mining firms through each data source in waves, whereby companies were removed from subsequent reviews as bankruptcy years were identified. Data sources underpinning EPA's data gathering efforts related to bankruptcy include:

- **Standard & Poor's.** In addition to financial information, S&P also tracks whether a company previously entered bankruptcy protection, including year of bankruptcy. These data are available dating back to at least 1991.²¹
- **Dunn & Bradstreet.** D&B collects several fields associated with business bankruptcy, including date of bankruptcy and type of filing. According to communications with D&B representatives, these data are available for the past 25 years.²²
- **Merlin Information Services.** Merlin provides access to public records, including bankruptcy information managed by other third-party organizations. Merlin's databases draw from the U.S. Bankruptcy Courts; bankruptcy data are available dating back to at least 1992.²³
- **New Generation Research Bankruptcy Yearbook.** New Generation maintains two bankruptcy databases. EPA used the Public and Major Company Database, which contains bankruptcy information for all public companies and private companies with assets greater than \$100 million. Data are available dating back to 1986.²⁴
- **Public Access to Court Electronic Records (PACER).** The PACER service is the official electronic public access service for US Appellate, District and Bankruptcy court records and documents. PACER allows users to obtain case information directly from the US Bankruptcy Courts. EPA used PACER to confirm or supplement bankruptcy information received from other sources.²⁵
- **Targeted Company Research.** As part of the additional data collection wave after the universe of 322 target firms in NAICS 212 had been identified, EPA also conducted targeted company research on each company in the universe to confirm its bankruptcy status as reported in another

²¹ See Footnote 17 above.

²² See Footnote 20 above.

²³ Merlin Information Services is located online at: <https://www.merlindata.com/index.asp>.

²⁴ New Generation Research Bankruptcy Yearbook is located online at: <http://www.bankruptcydata.com/>.

²⁵ PACER is located online at: <http://www.pacer.gov/>.

data source or identify additional information potentially not reflected in the other data sources listed above.

3.1.2 DETAIL OF FINANCIAL DATA REQUESTS

For the combined union of the above-described mining lists and iterative data processes, EPA requested S&P financial data for each target company and affiliated corporate parents from 1981 to 2010 in the initial data collection waves, and then S&P financial data for each target company and affiliated corporate parents from 2011 through 2014 in the additional data collection waves.²⁶ For each company on the list and tracked in S&P's database, EPA requested from S&P the financial data elements necessary to run each company through the financial test scenarios considered as part of the proposed rulemaking. Exhibit 1 in the Executive Summary lists the financial data elements each financial test scenario analyzed, as requested from S&P. To the extent necessary, EPA augmented the financial data provided by S&P, using information included in company financial reports filed with the SEC, as well as available data from D&B.

EPA also investigated other potential sources of financial data for private companies that might not otherwise be captured by S&P's database or SEC filings, such as company-level weighted average cost of capital (WACC) or intangible assets. However, specific financial information available through these data sources varied on a company-by-company basis. Often, the financial information available was inadequate to calculate the Altman Z-Score or calculate the various financial metrics in each financial test scenario. For an example of the shape of the data set received from S&P, see Appendix A, Step 1.

3.1.3 DETAIL OF RATINGS DATA REQUESTS

Also as part of its data request to S&P, EPA requested credit rating information by corporate entity from 1981 to 2010. Specifically, EPA requested the "long-term credit rating," which is a current opinion of an issuer's overall ability to meet its financial commitments with maturities of greater than one year. The long-term credit rating also provides an opinion as to the relative likelihood of default of an issuer. EPA supplemented these ratings data received from S&P with ratings data from Moody's Investor Services (Moody's).²⁷ While other Nationally Recognized Statistical Rating Organizations (NRSROs) also provide corporate credit ratings, this analysis focuses on ratings from S&P and Moody's because a number of existing financial responsibility rule-makings specifically identify these two NRSROs. For example, the RCRA Subtitle C financial test regulations require a rating from S&P or Moody's for purposes of passing Alternative II of the financial test.²⁸

Following 2010, internal rearrangement at S&P ended the capability to include company credit ratings in financial data requests. Therefore, for the present analysis, EPA researched S&P long-term credit ratings for all target and parent companies identified as part of the NAICS 212 universe. These ratings were again supplemented with ratings data directly researched from Moody's.

²⁶ The additional data collection waves in 2014 and 2015 omitted updates to the bankruptcy data, because such data did not inform the pass/fail results of NAICS 212 companies under various financial test scenarios considered in this analysis.

²⁷ Moody's Investor Services credit ratings search is located at: <http://www.moodys.com/page/lookuprating.aspx>.

²⁸ 40 CFR 264.143(f).

3.2 ANALYTIC UNIVERSE SUMMARY STATISTICS

As the iterative data collection process continued, the size of the universe variously increased and decreased as certain entities could not be identified in any company databases, while other entities entered the analysis through the iterative company identification process. This section chronicles the progression of company-level data gathered across the various intermediate stages and summarizes the universe of company-level data used for analysis.

3.2.0 POPULATION OF COMPANIES

As mentioned in the introduction to this section, at various stages of the data collection process, the number of entities ebbed and flowed as companies entered and exited the analytic universe based on data availability. Specifically, entities entered the analysis via one or more of three main avenues:

- 1) Identification as a direct- or higher-tier parent of a target mining company;
- 2) Identification as having a NAICS code in the mining sector; or
- 3) Identification as an independent subsidiary of a previously identified mining entity.

Entities exited the analysis via one or more of three main avenues:

- 1) Failure to be identified in any data vendors' databases;
- 2) Identification as a non-independent entity (e.g., a mine *facility* owned and operated by an independent mining company); or
- 3) Identification as a non-mining entity.

Exhibit 5. Population of NAICS 212 Universe – Results of Iterative Data Collection & Review Process

Total Entities from Lists	Unique Entities from Lists	Companies Matched by OneSource	Companies Matched by S&P*	Companies Entered into Financial Test Analysis**
1,680	1,145	614	367	322
<p>* Companies for which S&P provided financial data for either the subsidiary or its parent companies. ** Represents the array of "target" companies identified as subject to the financial test analysis, contingent on the availability of adequate financial data for financial test analysis for either the company or one or more of its parent companies.</p>				

3.2.1 ACTIVE VERSUS BANKRUPT COMPANIES

Through the iterative data collection process, EPA identified 56 bankrupt companies within NAICS 212. Of the 56 bankrupt companies, financial data were available for 23 of them. For one additional bankrupt company, financial data were available for the company's corporate parent, but not the company itself. Therefore, of the 56 companies within NAICS 212 identified as entering bankruptcy between 1986 and

2016, 24 are included in the analysis. The breakdown of bankruptcies in the NAICS 212 universe, as well as the financial analysis universe, appears below.²⁹

Exhibit 6. Financial Data Availability for Companies within NAICS 212 Having Had a Bankruptcy

Total Bankruptcies	Bankrupt Target Companies with Available Financial Data	Bankrupt Target Companies with Financial Data Available for Corporate Hierarchy*
56	23	24
* Includes companies where financial data was available for the target company, or was not available for the target company but was available for one or more corporate parents.		

3.2.2 TARGET VERSUS PARENT COMPANIES

Because the financial tests modeled allow for a corporate guarantee by a direct- or higher-tier parent company, more companies than solely the list of target companies within NAICS 212 were included in the financial analysis. In some cases, target companies without available financial data were included in the analysis because financial data were available for one or more companies within their established corporate hierarchies. Many of these companies tend to be privately-held subsidiaries with direct- or higher-tier corporate parents that are publicly traded. Allowing the analysis to consider corporate guarantees and apply the financial test to the corporate parents of firms within NAICS 212 yielded a greater number of companies able to be included in the analysis of financial test scenarios (see Section 2.4 for a discussion of how corporate guarantees are considered in the analysis).

However, some firms within NAICS 212 and their corporate parents (if any) lack adequate available financial data to be included in the analysis of financial test scenarios. These 46 corporate hierarchies without adequate financial data are therefore not included in the analysis. As a result, of the 322 companies and corporate hierarchies identified as having some financial data from S&P (see Exhibit 5), **276** had adequate financial data for inclusion in the analysis of financial test scenarios, as shown in Exhibit 7 below (i.e., 146 plus 44 plus 86 equals 276 corporate hierarchies).

Exhibit 7. Parental Hierarchy Data Company Count for NAICS 212 Financial Universe

S&P Data for Target Company Only	S&P Data for Multiple Hierarchy Levels	S&P Data for Parent Company or Companies Only	Inadequate S&P Data for Financial Test Analysis
146	44	86	46
Note: Figures listed in the first three columns of this table reflect the number of corporate hierarchies with adequate financial data from S&P to include the hierarchy in the financial test analysis. The fourth column reflects the remaining of the 322 corporate hierarchies without adequate data for inclusion in the analysis.			

3.2.3 SMALL VERSUS NON-SMALL COMPANIES

EPA identified the number of small companies in the population of candidate mining companies using the Small Business Administration's (SBA) size standards.³⁰ These size standards prescribe a threshold by

²⁹ Prior to the most recent data updates conducted in 2014 and 2015, there were 54 total bankrupt companies in NAICS 212 identified between 1986 and 2010. Of the 54 bankrupt companies, financial data were available for 24 of them, and financial data were available for corporate parents of another five companies, bringing the total corporate hierarchies with a bankrupt company and available financial data to 29. The data updates conducted in 2014 and 2015 revised the universe to exclude certain companies no longer engaging in hard rock mining activities. Therefore, some of the 29 corporate hierarchies with bankruptcies previously included in the universe for analysis are no longer included in the current universe, and the current universe includes other corporate hierarchies that entered bankruptcy after 2010 not captured in the original array of 29.

NAICS code, based on a company's sales revenue or number of employees. Using data provided by S&P, EPA determined whether a candidate company qualified as small based on its primary NAICS code. The results of this assessment are shown in the table below.

Exhibit 8 below includes both target companies as well as corporate parents of target companies that appear in the analysis: in total, **420** unique companies across the 322 corporate hierarchies identified as eligible for the financial test analysis based on the availability of adequate financial data (see Exhibits 5 and 7) were assessed for small business status. Given inadequate financial information necessary to determine small business status for some of the companies, Exhibit 8 identifies only those companies affirmatively identified as small businesses based on the SBA size standards for their primary S&P-identified NAICS codes.

Exhibit 8. Small Business Count of NAICS 212 Financial Universe

Identified Small Business	Identified Non-Small Business	Unknown Small Business Status
88	166	166
Note: Small business identification done by assessing a company's financial data relative to the SBA small business size standard for a company's primary NAICS code as identified by S&P. Companies with inadequate data to compare against the small business size standard are considered to be of unknown small business status.		

3.2.4 PRIVATE VERSUS PUBLIC COMPANIES

In general, privately held companies display different financial characteristics than publicly traded firms. For example, most privately held companies do not maintain public credit ratings with NRSROs like Standard & Poor's or Moody's. In addition, privately held companies may be smaller in size with respect to assets and sales revenues, than their publicly traded counterparts. To determine the specific impact of the various financial test scenarios on candidate companies that are privately held, EPA examined the universe of companies within NAICS 212 regarding ownership type.

In general, financial information for privately held firms is not publicly available, and tends to be limited to summary financial information, e.g., total sales revenues. Notwithstanding these general data limitations, EPA was able to collect adequate financial data to run the various financial test scenarios for a small subset of firms identified as privately held. Specifically, EPA collected financial information at either the subsidiary or parent level for 92 privately held companies in the corporate hierarchies of the 322 target firms within NAICS 212. A breakdown of ownership type within the NAICS 212 universe of 420 companies in the financial test scenarios analysis appears below in Exhibit 9.

Exhibit 9. Ownership Type Summary of Target and Parent Companies in NAICS 212 Universe

Private Companies	Public Companies
92	328

However, as mentioned above, not all of the 322 target firms within NAICS 212 have adequate financial data across them and their corporate parents for inclusion in the financial test analysis. Of the 276 corporate hierarchies with adequate data included in the analysis of financial test scenarios, 62 corporate hierarchies include financial data for privately held companies at the subsidiary or parent level.

³⁰ Small Business Administration size standards are located online at: <http://www.sba.gov/category/navigation-structure/contracting/contracting-officials/eligibility-size-standards>.

3.2.5 RATED VERSUS UNRATED COMPANIES

75 percent of companies within NAICS 212 (either at the subsidiary or parent level) do not maintain credit ratings either with Standard & Poor's or with Moody's Investor Services. As credit rating is an integral metric in most of the financial tests modeled in this analysis, the lack of available credit ratings by NRSROs became a necessary hurdle to overcome. Exhibit 10 below summarizes the availability of credit ratings in the NAICS 212 financial universe.

Exhibit 10. Availability of Credit Ratings in the NAICS 212 Financial Universe

S&P	Moody's	Both Available	No Rating
6	22	77	315
1.4%	5.2%	18.3%	75%

3.3 FINANCIAL AND RATINGS DATA DESCRIPTIVE STATISTICS

Using the database of financial information gathered across the population of firms subject to this rulemaking, EPA calculated descriptive statistics of the companies within NAICS 212 along various dimensions, including the distributions of various financial metrics and credit ratings characteristics. To the extent possible with the financial data available, the universe of candidate firms was synthesized according to company characteristics, such as small versus non-small and private versus public ownership. The tables that follow in this section summarize these descriptive statistics. The universe featured in the tables below reflects 254 firms within the NAICS 212 financial universe at both the subsidiary and parent level with adequate available financial data for inclusion in the analysis of financial test scenarios.

3.3.1 FINANCIAL DATA

The distribution of financial data points across the candidate firms informed the general characterization of the industry as a whole.

Exhibit 11. Summary of Major Financial Data Points for NAICS 212 Financial Universe (\$ million)

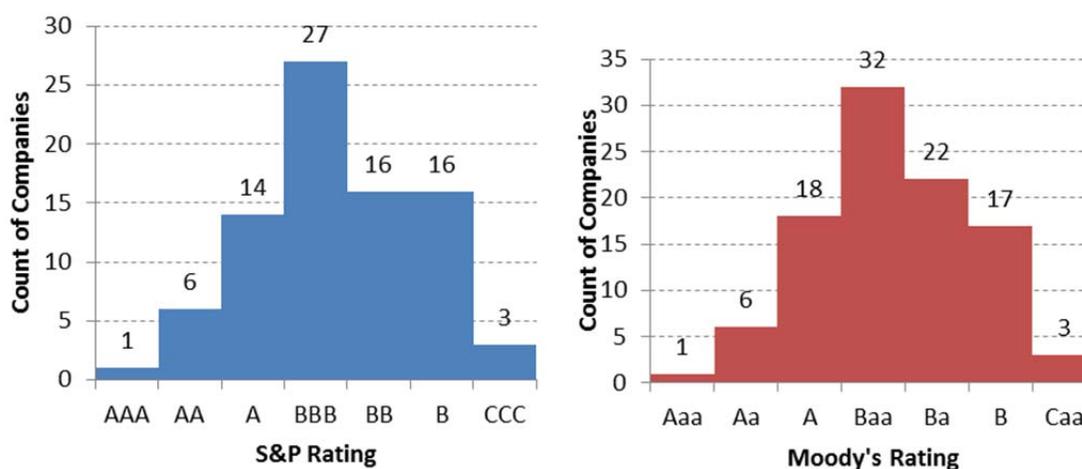
Financial Measure*	Mean	Standard Deviation	Minimum	Maximum
Total Assets	\$11,678	\$32,398	\$0.006	\$305,690
Total Liabilities	\$6,030	\$16,493	\$0.004	\$175,283
Tangible Net Worth	\$3,966	\$13,643	(\$7,971)	\$145,788
Net Income	\$501	\$2,507	(\$9,860)	\$23,451
Operating Cash Flow	\$1,151	\$3,501	(\$631)	\$35,002
Market Equity**	\$11,584	\$31,802	\$0.001	\$239,028

* n = 254 subsidiary and parent companies in the NAICS 212 financial universe with adequate data for inclusion into the analysis of financial test scenarios. Statistics calculated for the most recent data year available for each company with data adequate for inclusion into the analysis of financial test scenarios.

** n = 206 subsidiary and parent companies in the NAICS 212 financial universe with adequate data for inclusion into the analysis of financial test scenarios for which the market value of equity was provided by S&P. As this financial measure does not directly factor into the financial test analyses, companies lacking this value in the S&P dataset were still eligible for inclusion into the analysis of financial test scenarios.

3.3.2 RATINGS DATA

The distribution of credit ratings across the candidate firms informed the general characterization of the industry, as well as the characteristics of rated companies.

Exhibit 12. Distribution of Credit Ratings for NAICS 212 Companies³¹

Note: Histograms depict the count of ratings observed for the most recent year of all rated companies. See Exhibit 10 for additional information on the count of rated companies.

3.3.3 DATA FOR SMALL BUSINESSES

The comparative distributions of the financial measures in Exhibit 13 across small and large companies illustrate the characteristics of small businesses within NAICS 212.

Exhibit 13. Distribution of Financial Data by Small Business Status (\$ million)

Financial Measure*	Small Business n = 88		Not Small or Unknown Small Business Status n = 166	
	Mean	Standard Deviation	Mean	Standard Deviation
Total Assets	\$268	\$597	\$17,726	\$38,768
Total Liabilities	\$100	\$198	\$9,174	\$19,708
Tangible Net Worth	\$164	\$425	\$5,981	\$16,538
Net Income	(\$13)	\$63	\$773	\$3,069
Operating Cash Flow	\$13	\$65	\$1,747	\$4,205
Market Equity**	\$165	\$434	\$8,210	\$19,378

* Total n = 254 subsidiary and parent companies in the NAICS 212 financial universe with adequate data for inclusion into the analysis of financial test scenarios. Statistics calculated for the most recent data year available for each company with data adequate for inclusion into the analysis of financial test scenarios.

** Total n = 206 subsidiary and parent companies in the NAICS 212 financial universe with adequate data for inclusion into the analysis of financial test scenarios for which the market value of equity was provided by S&P. As this financial measure does not directly factor into the financial test analyses, companies lacking this value in the S&P dataset were still eligible for inclusion into the analysis of financial test scenarios. Of these 206 companies, 66 are small businesses and the remaining 140 are not small or of unknown small business status.

Note: Determination of "small business" is done on a company-level basis as defined by SBA. See Section 3.2.3 and Footnote 30 for additional information.

³¹ The credit ratings distributions for NAICS 212 companies per S&P and Moody's appear to be similar and generally comparable. This suggests a level of agreement about the distribution of risk for *rated* NAICS 212 companies.

3.3.5 DATA FOR PRIVATELY HELD COMPANIES

While the availability of privately held companies' data is limited, the small subset of companies with available financial data (23 to 32 companies depending on data point) can be compared to the population of publicly held companies.

Exhibit 14. Distribution of Financial Data by Ownership Type (\$ million)

Financial Measure*	Private Companies n = 32		Public Companies n = 222	
	Mean	Standard Deviation	Mean	Standard Deviation
Total Assets	\$1,303	\$2,509	\$13,173	\$34,393
Total Liabilities	\$986	\$1,749	\$6,757	\$17,515
Tangible Net Worth	\$233	\$833	\$4,504	\$14,514
Net Income	(\$24)	\$206	\$577	\$2,672
Operating Cash Flow	\$42	\$141	\$1,306	\$3,712
Market Equity**	\$777	\$1,500	\$12,943	\$33,501

* Total n = 254 subsidiary and parent companies in the NAICS 212 financial universe with adequate data for inclusion into the analysis of financial test scenarios. Statistics calculated for the most recent data year available for each company with data adequate for inclusion into the analysis of financial test scenarios.

** Total n = 206 subsidiary and parent companies in the NAICS 212 financial universe with adequate data for inclusion into the analysis of financial test scenarios for which the market value of equity was provided by S&P. As this financial measure does not directly factor into the financial test analyses, companies lacking this value in the S&P dataset were still eligible for inclusion into the analysis of financial test scenarios. Of these 206 companies, 23 are private and the remaining 183 public companies.

See Section 3.2.4 for additional information.

3.4 ENVIRONMENTAL OBLIGATION COST ESTIMATE

A key input into the modeled financial tests is the estimated amount of environmental obligations that need to be assured by a particular financial test scenario. Ideally, a company's ability to pass a particular financial test would be assessed against site-specific cost estimates driven by a risk-based engineering assessment. However, such site- and company-specific cost estimates were not readily available for the candidate mining companies included in this analysis.

In the absence of site-specific cost estimates, EPA assumes a standard obligation of \$50 million for each company analyzed. That is, in the case of a parent company along with two independent subsidiary companies, all three of which appear as target companies in the analysis of financial test scenarios, each of the three companies will be assigned the standard \$50 million obligation.

3.5 HIERARCHICAL NAICS 212 COMPANY DATABASE

The data collected as described throughout this Chapter were aggregated into a master NAICS 212 company database to facilitate the analysis, as described in Chapter 4. The database contains the array of financial and ratings data for each target company, and also identifies the direct- and ultimate-tier parent companies for each target company, along with their financial and ratings data. Therefore, the database uses a hierarchical structure to support analysis of whether target companies within NAICS 212 are able to pass a given financial test, but also, if they are unable to pass a test, whether their parent companies may do so on the basis of their own financial and/or ratings data.

4. Analytic Method

4.0 OVERVIEW OF ANALYTIC METHOD

The assessment of the comparative cost effectiveness of the various financial test scenarios considered as part of this rulemaking relies on a three-step process. The first step is to combine regulated companies into one of two bins for each financial test scenario, including:

- 1) Companies deemed by the financial test to be financially healthy and capable of self-assuring their environmental obligations, and
- 2) Companies deemed not financially healthy enough to self-assure, and therefore are required to seek a third party financial instrument to cover environmental obligations.

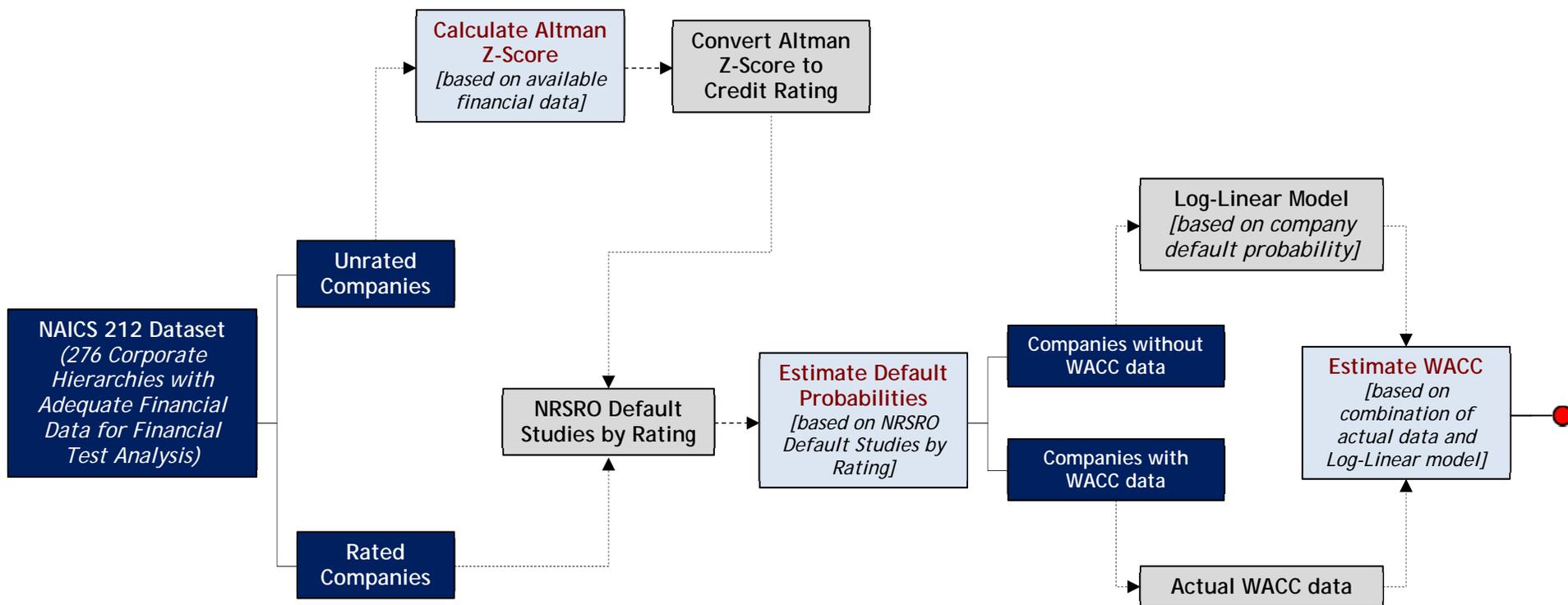
The second step in the analysis is to estimate the probability that these companies will default on their obligations, thereby forcing the government to potentially incur the full cost of the defaulting companies' obligations. Although a successful financial test should only allow companies with a very low probability of default on their obligations to self-assure, there is always a nonzero probability that even the healthiest of companies could default on their obligations. This nonzero probability of default accrues to the government as default risk. That is, for each company allowed to self-assure its environmental obligations, the government incurs the expected cost of those obligations should the company indeed default on its obligations. Each self-assuring company's probability of default multiplied by its total dollar amount of environmental obligations equals the expected financial risk incurred by the government. The total default risk to the government can be calculated by summing the expected cost for each company allowed to self-assure across the regulated universe.

The third step is to calculate the cost accruing to industry. Under any financial responsibility framework, the expected cost to industry is the cost associated with obtaining and maintaining a financial assurance instrument, whether self-assurance or a third-party mechanism. All else being equal, a rational business actor will seek the least costly financial alternative. For most companies, the least costly financial alternative is a financial test or corporate guarantee allowing self-assurance of the full environmental obligation. The cost of a financial test for companies that already have audited financial statements as part of their normal business operations and maintain a credit rating is expected to consist of only minor administrative costs.³² Therefore, the bulk of industry costs are expected to be incurred by companies that must seek third-party financial instruments, such as letters of credit or trust funds.

The details of these three steps appear in the sections below. Additional information is available via detailed, anonymized company-level examples in Appendix A at the end of this document. A step-by-step crosswalk to the applied examples included in Appendix A is provided at the end of each section.

³² EPA, *Estimating Costs for the Economic Benefits of RCRA Noncompliance*, December 1997. For companies without ratings, EPA applied an estimated cost of \$70,000, while the cost of an audit was modeled at \$500,000 for private, unrated companies. The estimate of audit costs may overstate these costs as the estimate is for a small firm, and includes the cost of complying with Sarbanes-Oxley. Sarbanes-Oxley compliance is not a requirement of the CERCLA 108(b) rule. Source: William R. Kinney, Jr. and Marcy L. Shepardson, *Do control effectiveness disclosures require internal control audits? A natural experiment with small US public companies*, April 26, 2010.

Exhibit 15. Model of Analytic Flow



WACC = Weighted Average Cost of Capital, used as a proxy for the internal rate of return for a company to estimate the opportunity cost of collateral set aside for a third-party financial assurance instrument. For additional information on the use of WACC in this analysis, see Section 4.3.3.

4.1 PERFORMING FINANCIAL TESTS

Within this analysis, each financial test scenario is assessed for every company in the potentially regulated universe in each year where data are available through statistical programming using the combined financial and ratings data hierarchical database described in Chapter 3. Accompanying detailed company-level examples in Appendix A summarize **anonymized data** in order to protect the financial data of the companies that underwent analysis. The narrative below should be read in conjunction with the detailed company-level calculation examples provided in Appendix A. To assist the reader, corresponding citations to relevant calculation steps are provided throughout this document.

4.1.0 TESTING THE TARGET NAICS 212 COMPANY

EPA's assessment of the financial test scenarios begins with the company data identified in the iterative data collection process described in Chapter 3. Each company's financial data is assessed according to the requirements of the proposed financial test (see Exhibit 1) by translating the requirements from narrative prose into Boolean logic capable of being tested by a computer program. The goal of this step is to declare each potentially regulated NAICS 212 company as either "passing" or "failing" the financial test scenario in question, for each year for which financial data are available.³³

Additionally, some financial test scenarios, such as the Higher-than-Investment-Grade Ratings Test, allow for a hybrid component whereby a portion of the obligation is allowed to be self-assured while the remaining balance must be accounted for through the use of a third-party financial instrument. The analysis determines, where relevant, whether a given company falls into this "hybrid" option whereby it self-assures only a portion of its obligation, and must cover the remainder through a third-party instrument.

For the purposes of this analysis, all passing companies are assumed to seek self-assurance of the full amount allowed by the financial test, unless otherwise dictated by the financial test scenario itself. The costs associated with these companies are assessed in Section 4.2 below as default risk accruing to the government. Failing companies (who must purchase a third-party instrument), or companies that pass the "hybrid" feature of the test (and, in so doing, must finance half of their obligations through a third-party instrument) continue through to the next step of the financial test assessment as follows.

[For an applied example of this step, see **Appendix A, Step 4**, specifically the top table in each table array.]

4.1.1 TESTING THE PARENTAL HIERARCHY OF FAILING NAICS 212 COMPANIES

In order to allow for the possibility that a company can use a corporate guarantee from a direct- or higher-tier parent company to qualify for self-assurance of environmental obligations under a financial test, the financial testing algorithm climbs the corporate ownership hierarchy of companies that fail the proposed financial tests when using their own financial data. To contemplate a corporate guarantee, the direct- or higher-tier parent companies' financial data are tested in a manner parallel with their potentially regulated NAICS 212 subsidiary. If the parent company's data result in a passing adjudication, the subsidiary

³³ While the computer programming is able to assess the ability of a company to pass a given financial test in all years for which data are available, the present analysis focuses only on the company's ability to pass the test given its most recent available annual financial data.

company is assumed to seek a corporate guarantee in order to self-assure its environmental obligations.³⁴ Parent companies that fail the financial test continue through the corporate hierarchy as per the next section.

[For an applied example of this step, see **Appendix A, Step 4**, specifically the middle and bottom tables in each table array.]

4.1.2 EXHAUSTING THE PARENTAL HIERARCHY OF FAILING NAICS 212 COMPANIES

Potentially regulated NAICS 212 companies whose own financial data, as well as the financial data of their direct-tier corporate parent, fail to meet the requirements of the proposed financial test are tested at each successively higher tier of corporate ownership until the ultimate parent company's data are tested. If the potentially regulated NAICS 212 company, its direct-tier parent company and its higher-tier parent companies all fail the proposed financial test, then the company is not afforded the option of self-assurance. The analysis then imputes the cost of obtaining a third party financial instrument as detailed below in Section 4.3.

[For an applied example of this step, see **Appendix A, Step 4**, specifically the middle and bottom tables in each table array.]

4.1.3 NAICS 212 COMPANIES WITHOUT ADEQUATE FINANCIAL AND RATINGS DATA

Because this analysis contemplates the possibility of a corporate guarantee when assessing the pass/fail rates of various financial test scenarios, a larger universe of companies are available for analysis. As described in Chapter 3, some companies identified through the iterative data collection process, e.g., privately held companies, do not have adequate financial and ratings data in order to assess each proposed financial test scenario. Additionally, some data points required for analysis were missing from S&P data pulls and could not be located in publicly available financial statements. However, if a higher tier parent had adequate financial and ratings data points available for analysis, those data were used in order to assess its NAICS 212 subsidiary for the purposes of this analysis. For the 276 corporate hierarchies in the present analysis, 86 lacked adequate financial data to perform the financial test analysis on the company at the subsidiary level, and these hierarchies' abilities to pass a given financial test are assessed only at the corporate parent level.

[For an applied example of this step, see **Appendix A, Step 4.A1**, company 10 and its corporate parent, company 10-P, which represent a subsidiary entering the analysis by virtue of their parent companies' data.]

4.2 ESTIMATING DEFAULT RISK ACCRUING TO GOVERNMENT

In order to estimate the default risk accruing to the government for companies afforded the option to self-assure their environmental obligations, an estimate of the probability of default was calculated for each company entering the analysis. Additionally, when calculating the cost accruing to industry via companies required to seek third party financial instruments, the costs associated with that requirement

³⁴ In the case where a subsidiary may only be able to "hybrid pass" and self-assure a portion of its obligations, but its parent company is able to fully pass and self-assure the full array of obligations via a corporate guarantee, the analysis assumes that the parent company does so, rather than the subsidiary self-assuring a portion of the obligations and purchasing a third-party instrument for the remainder.

are also indexed to each company's probability of default. More detailed explanations of this calculation are provided in the sections below.

[For an applied example of this step, see **Appendix A, Steps 6A through 6D.**]

4.2.0 NRSRO HISTORICAL DEFAULT STUDIES

To estimate the probability of default, this analysis relies on reports of historical default rates by ratings categories published by NRSROs on an annual basis.³⁵ These studies provide information on the number and rate of corporate defaults by ratings level. Specifically, the studies provide data on recent defaults, the rates at which companies' ratings change, and industry-specific trends.

In general, financial practitioners rely on credit ratings to determine the near- and long-term financial viability of companies. An issuer credit rating reflects a company's overall capacity to pay its obligations, or simply stated, provides a measure of the likelihood of the company's default on all of its financial obligations.³⁶ When deriving ratings, the agencies consider a number of quantitative and qualitative factors.

To truth test the accuracy of their ratings, the agencies carefully track a company's ratings over time, noting if and when the rated companies default on their obligations. Over the past twenty years, Standard and Poor's, Moody's and Fitch have observed a clear correlation between ratings and defaults. The higher the rating, the lower the observed frequency of default, and vice versa.³⁷

Notably, the ratings agencies' definition of "default" encompasses more than just bankruptcy. Specifically, default is defined as:³⁸

- 1) Failure to make timely payment of principal and/or interest on any financial obligation;
- 2) The bankruptcy filing, administration, receivership, liquidation, or other winding up or cessation of business; or
- 3) The distressed or other coercive exchange of an obligation.

As shown in Exhibit 16, Standard and Poor's, Moody's, and Fitch have collected extensive information on companies and defaults. In particular, the agencies have tracked rating and default information for more than 23 years, for more than 16,000 issuers.

Exhibit 16. Summary of Source Company Data Used in NRSRO Ratings Studies

Data Point	Standard & Poor's (S&P)	Moody's	Fitch
Data Time Frame	1981-2013	1983-2008	1990-2008
Number of Entities Considered	16,857	Approx. 20,000	Not specified
Number of Observed Defaults	2,241	Approx. 3,000	Not specified

³⁵ Standard and Poor's, *2013 Annual Global Corporate Default Study and Rating Transitions*, March 19, 2014. Moody's Investors Services, *Corporate Default and Recovery Rates, 1920-2014*, February 2013. Fitch Ratings, *Fitch Ratings Global Corporate Finance 2013 Transition and Default Study*, March 17, 2014.

³⁶ Standard and Poor's, *2013 Annual Global Corporate Default Study and Rating Transitions*, March 19, 2014.

³⁷ Standard and Poor's, *2013 Annual Global Corporate Default Study and Rating Transitions*, March 19, 2014. Moody's Investors Services, *Corporate Default and Recovery Rates, 1920-2014*, February 2013. Fitch Ratings, *Fitch Ratings Global Corporate Finance 2013 Transition and Default Study*, March 17, 2014.

³⁸ Fitch Ratings, *Fitch Ratings Global Corporate Finance 2014 Transition and Default Study*, March 17, 2014.

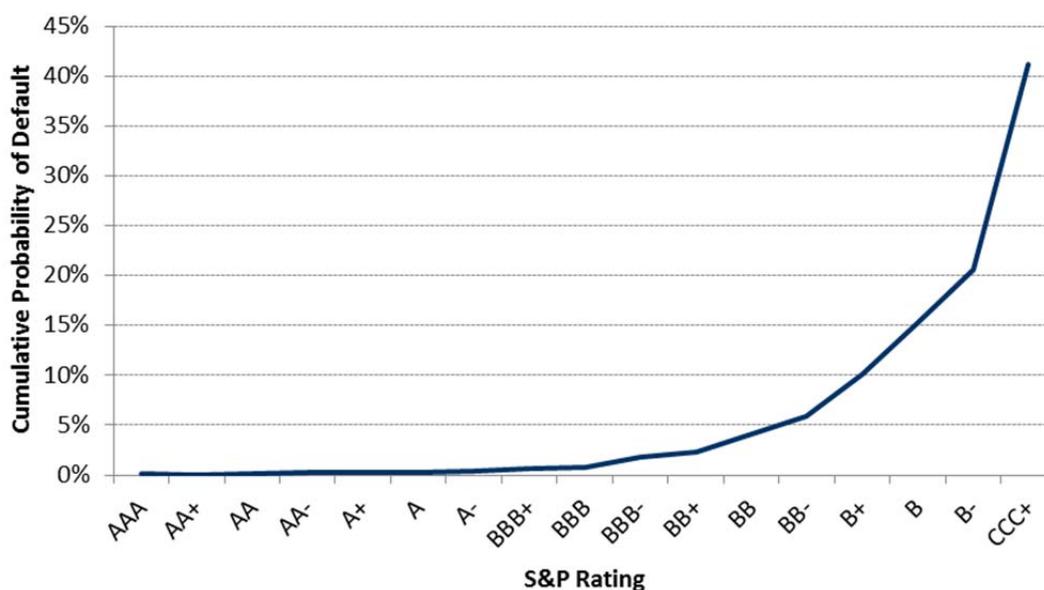
Source: Moody's Investors Services, *Corporate Default and Recovery Rates, 1920-2013*, February 2014.
Standard and Poor's, *2013 Annual Global Corporate Default Study and Rating Transitions*, March 19, 2014.
Fitch Ratings, *Fitch Ratings Global Corporate Finance 2013 Transition and Default Study*, March 17, 2014.

4.2.1 APPLICATION OF HISTORICAL DEFAULT RATES TO NAICS 212 UNIVERSE

Using the data collected and summarized in Exhibit 16, NRSROs are able to calculate historical default rates based on the number of known rated companies and the number of known defaults. These default rates reflect **the percentage of companies that defaulted within a specific time period, by rating level**. As shown in Exhibit 17, at a Standard and Poor's rating of AA, the three-year default rate is 0.09 percent, indicating that 0.09 percent of companies that were rated AA at the beginning of the three-year period defaulted within three years.³⁹

[For an applied example of this step, see **Appendix A, Step 3**, which matches associated historical probabilities of default to rated companies. For purposes of this analysis, rated companies are assigned the probability of default within three years associated with their credit rating category.]

Exhibit 17. Standard & Poor's Cumulative Default Probability by Rating (Horizon = 3 Years)



4.2.2 ALTMAN Z-SCORE AS MEASURE OF FINANCIAL HEALTH FOR UNRATED COMPANIES

As shown in Chapter 3, Section 3.2.5, relatively few companies in the financial data universe had available credit ratings. For the subset of unrated companies, EPA assessed whether other financial data or metrics available across the universe of companies could be used to apply these default rates to the set of unrated companies.

This analysis uses a revision of the original Altman Z-score, published in 2005, to apply default rates to unrated companies subject to analysis.⁴⁰ The original Altman Z-score equation is a continuous value

³⁹ Standard and Poor's, *2013 Annual Global Corporate Default Study and Rating Transitions*, March 19, 2014.

⁴⁰ Altman, Edward I., *Corporate Financial Distress: A Complete Guide to Predicting, Avoiding, and Dealing With Bankruptcy*. John Wiley & Sons: 1983.

calculated as the weighted average of five financial ratios.⁴¹ The weights for each ratio were estimated using discriminant analysis on a matched sample of 66 manufacturing firms divided into two groups, distressed (bankrupt) and non-distressed.

The 2005 Altman Z-score revision originates from a study focused on the financial health of companies in emerging markets.⁴² In this study, Altman re-specifies his original manufacturing-specific formula into a general form applicable across a wider array of industries. Altman used a calibration of the revised Altman Z-score (referred to as the Z''-Score) to S&P long-term credit ratings in order to estimate ratings for foreign companies as shown in Exhibit 18.⁴³ The calibration showed a high degree of accuracy for the foreign companies that had available ratings from U.S. ratings agencies

Exhibit 18. Calibration of Revised Altman-Z Score with S&P Credit Rating⁴⁴

	Z''-Score	Rating	Z''-Score	Rating	
Safe zone	> 8.15	AAA	5.65 – 5.85	BBB-	Grey zone
	7.60 – 8.15	AA+	5.25 – 5.65	BB+	
	7.30 – 7.60	AA	4.95 – 5.25	BB	
	7.00 – 7.30	AA-	4.75 – 4.95	BB-	
	6.85 – 7.00	A+	4.50 – 4.75	B+	
	6.65 – 6.85	A	4.15 – 4.50	B	Distress zone
	6.40 – 6.65	A-	3.75 – 4.15	B-	
	6.25 – 6.40	BBB+	3.20 – 3.75	CCC+	
	5.85 – 6.25	BBB	2.50 – 3.20	CCC	
			1.75 – 2.50	CCC-	
		< 1.75	D		

Because the Altman Z-score is regularly used as a diagnostic tool to measure the financial health of firms and identify firms with a higher likelihood of bankruptcy, it is highly correlated with the probability of default. A company's Altman Z-Score places it on a spectrum from bankruptcy likely to bankruptcy unlikely (see distribution of Z-scores for the NAICS 212 dataset in Exhibit 19).

[For an applied example of this step, see **Appendix A, Step 3.**]

⁴¹ The component ratios are: 1) Working Capital / Total Assets, 2) Retained Earnings / Total Assets, 3) EBIT / Total Assets, 4) Equity/Total Liabilities, 5) Sales/ Total Assets.

⁴² Altman, Edward I. "An emerging market credit scoring system for corporate bonds," *Emerging Markets Review*, Vol. 6, 2005, p. 313.

⁴³ The Altman Z''-score is calculated as $Z''\text{-score} = 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4 + 3.25$, where:

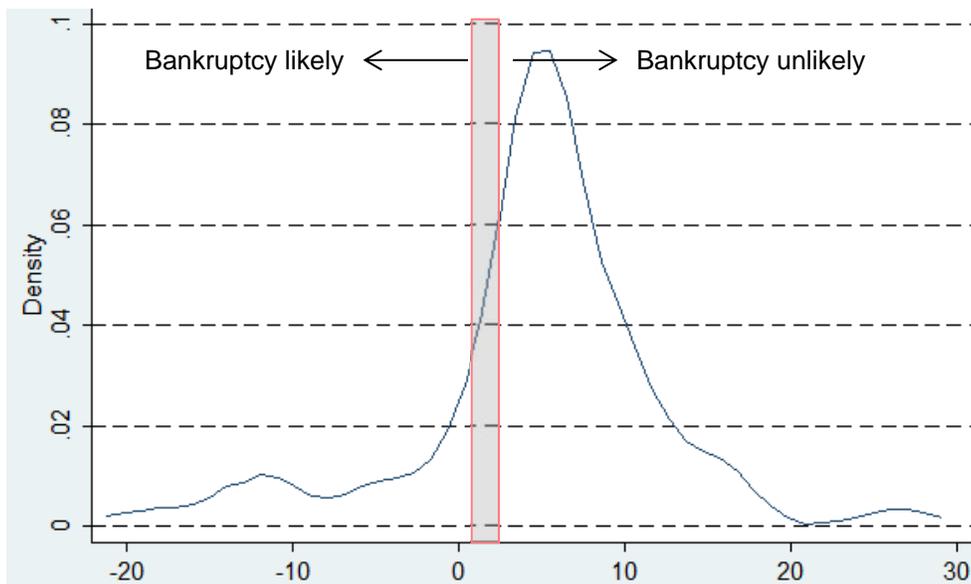
X_1 = Working Capital / Total Assets;

X_2 = Retained Earnings / Total Assets;

X_3 = Earnings Before Interest and Taxes / Total Assets; and

X_4 = Book Value of Equity / Total Liabilities.

⁴⁴ *Ibid.*, pg. 314.

Exhibit 19. Distribution of Revised Altman Z-Score in NAICS 212 Financial Universe

4.2.3 ESTIMATION OF PROBABILITY OF DEFAULT AT THE COMPANY LEVEL

To estimate government risk, each company able to pass a given financial test and self-assure its obligations (or, in the case of a corporate parent passing the test and providing a corporate guarantee, self-assure the obligations of a subsidiary) requires an estimated probability of default. This analysis derives the probability of default as follows:

- **For rated companies**, each company's S&P credit rating is compared to the three-year probability of default for the rating based on the S&P 2013 corporate rating and default study, as shown in Exhibit 18.⁴⁵ If a company is not rated by S&P, but has a rating from Moody's, its Moody's rating is converted to an equivalent S&P rating and then matched to the appropriate three-year probability of default from the S&P corporate rating and default study. Companies with neither an S&P nor a Moody's rating are considered unrated for the purposes of this analysis, per EPA technical direction.
- **For unrated companies**, each company's financial data are used to derive an Altman Z-score using the revised Z-score formula (referred to as the Z''-score). The resulting Z''-score is a single figure corresponding to one of the ranges in Exhibit 18, wherein each range corresponds to a single credit rating. Thereby, each company's Z''-score is translated to a credit rating, and the analysis then applies the three-year probability of default for that credit rating based on the S&P 2013 corporate rating and default study.

[For an applied example of this step, see **Appendix A, Step 2** for the calculation of the Altman Z''-score, and **Appendix A, Step 3** for the estimation of probability of default for both unrated and rated companies.]

⁴⁵ Standard and Poor's, *2013 Annual Global Corporate Default Study and Rating Transitions*, March 19, 2014.

4.2.4 CALCULATION OF GOVERNMENT RISK

As described in Section 4.0 above, the estimate of aggregate government risk for each financial test scenario is simply the expected cost of the environmental obligations associated with companies allowed to self-assure. With probability of default values for both rated and unrated companies, the subset of companies allowed to self-assure are culled from the master list of NAICS 212 companies. Their company-specific probability of default values are multiplied by the standard environmental obligation of \$50 million in order to calculate the default risk associated with each company. The sum of these company-specific default risk values is the aggregate default risk accruing to the government.

For example, a rated company with an AA- rating has a 0.20 percent chance of default within three years based on the 2013 S&P corporate rating and default study. If this company passes the financial test, the incremental three-year risk accruing to the government is 0.20 percent multiplied by the company's environmental obligation (\$50 million), or \$0.1 million. Similarly, if the company were unrated, but had a Z'-score based on its financial data between 7.00 and 7.30 (see Exhibit 18), it is assumed to have a probability of default equivalent to that of a company with an AA- rating, or 0.20 percent.⁴⁶

[For an applied example of this step, see **Appendix A, Step 6A through 6D.**]

4.3 ESTIMATING COSTS ACCRUING TO INDUSTRY

This analysis focuses on modeling the cost of a letter of credit for the subset of companies expected to fail a particular financial test scenario and procure a third-party financial instrument, or for those only able to self-assure a portion of their obligations via a "hybrid pass" option under a given financial test.

The cost of the third-party financial assurance instrument is scaled to companies' probability of default, as estimated in Section 4.2.3. Financial institutions price financial instruments, such as letters of credit, by demanding a higher rate of return for companies with higher probabilities of default. Generally, this "price" is in the form of cash collateral equal to a percentage of the face value of the financial instrument. As a result, the price of third-party instruments tends to be less for companies in stronger financial health, and more for companies in weaker financial health. Research into the pricing terms of third-party instruments, particularly letters of credit, confirms a price structure that is predicated on corporate financial strength.⁴⁷

Based on this research, EPA modeled two components associated with the cost of obtaining a letter of credit:

1. **Annual commission fee** to maintain the letter of credit. In general, this fee is expressed as a percentage of the face value of the letter of credit, and accrues on an annual basis.

⁴⁶ As shown in Exhibits 2 and 3 of the Executive Summary, this analysis estimates industry costs and risks accruing to the government under both an actual ratings scenario, and an actual plus implied ratings scenario. In the latter scenario, the same methodology used to estimate probabilities of default for unrated companies is used to "imply" ratings for these companies in order to assess their ability to pass a given financial test with a ratings requirement were these companies to apply for and receive a rating from an NRSRO.

⁴⁷ EPA bases these pricing terms on previous economic benefit work, as well as conversations with some banks. See Discussions with financial representatives of Bank of America and Citizens Bank, March 2005. Also see EPA, *Estimating Costs for the Economic Benefits of RCRA Noncompliance*, December 1997, available online at http://www.dep.state.fl.us/waste/quick_topics/publications/shw/HWRRegulation/inspection/enforcement/ebn1297%281%29.pdf.

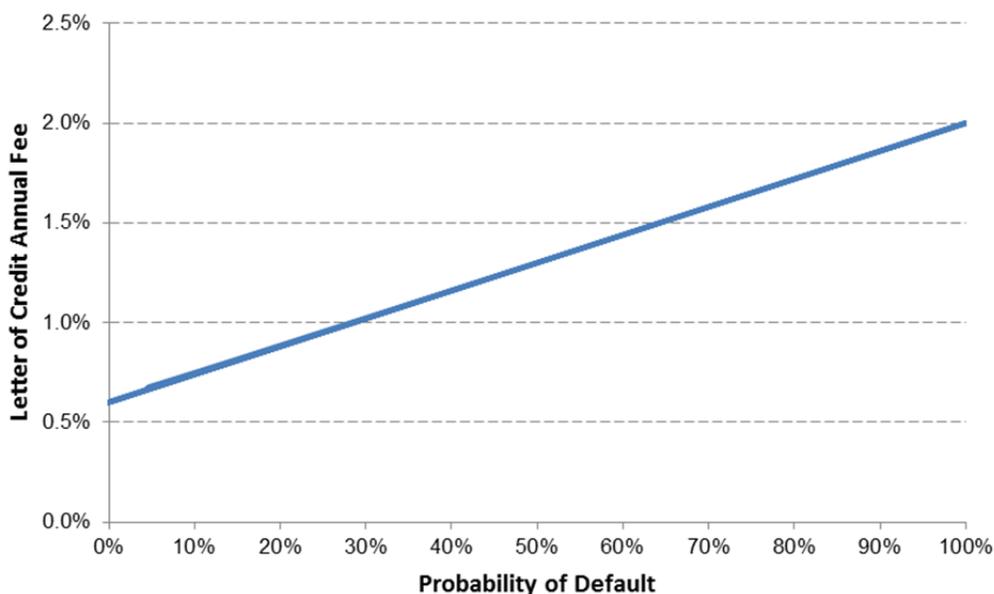
2. **Cash collateral** requirements. Typically, cash collateral is determined as a percentage of the face value of the letter of credit, and is paid at the time the letter of credit is established.

These two components are discussed in more detail in the sections that follow.⁴⁸

4.3.0 ANNUAL COMMISSION FEE CALCULATION

This analysis includes a possible range of commission fees equivalent to 0.6 to 2.0 percent of the face value of the letter of credit.⁴⁹ A default rate of 0 percent was assumed to be equivalent to a commission fee of 0.6 percent, while a 2.0 percent commission fee was assigned to the highest possible default rate (i.e., 100 percent) as seen in Exhibit 20.

Exhibit 20. Graph of Commission Fee Correlated to Probability of Default



[For an applied example of this step, see **Appendix A, Step 5B**, and its application in **Appendix A, Steps 6A through 6D**.]

4.3.1 CASH COLLATERAL CALCULATION

Similar to commission fees, this analysis indexes a range of collateral requirements against the range of default rates. EPA assumed collateral requirements may range from 20 to 100 percent of the face value of the letter of credit.⁵⁰ That is, a default rate of 0 percent was assumed to be equivalent to a collateral requirement of 20 percent, whereas a 100 percent collateral requirement was assigned to the highest observed default rate (i.e., 100 percent) as in Exhibit 21. As shown in Exhibit 21, the analysis applies the

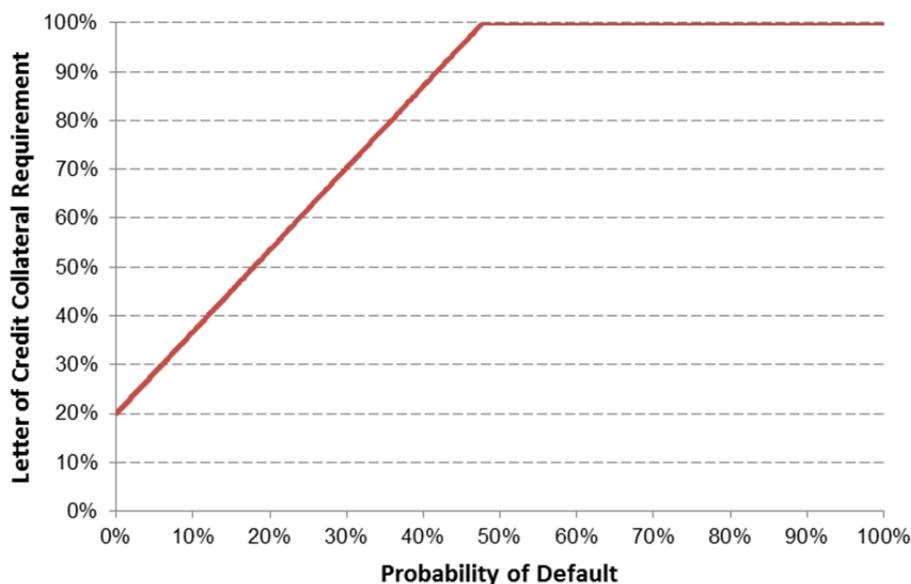
⁴⁸ In addition, see Section 4.3.5 for information on additional administrative costs that accrue to NAICS 212 companies within the financial test analysis, including the cost of preparing audited financial statements for the purposes of being evaluated under the various financial test scenarios.

⁴⁹ See Footnote 47 above.

⁵⁰ See Footnote 47 above.

assumption that firms with sufficiently high probabilities of default (i.e., above 50 percent) would need to provide collateral equal to 100 percent of the face value of the financial assurance instrument in order to secure the instrument. This indicates that third-party financial assurance providers would not be willing to weather the risk associated with these companies unless collateral to cover the entirety of the instrument were provided.

Exhibit 21. Graph of Collateral Requirement Correlated to Probability of Default



[For an applied example of this step, see **Appendix A, Step 5B**, and its application in **Appendix A, Steps 6A through 6D**.]

4.3.2 CASH COLLATERAL OPPORTUNITY COST CALCULATION

In general, a company must pay cash collateral to the financial institution providing the third-party instrument as a hedge against the risk of default. As long as no draws are made on the letter of credit, this collateral plus accrued interest is returned to the company when the letter of credit is released by the regulator. The cost to the company is not the full value of the collateral deposit, but rather the resulting opportunity cost of capital. That is, the collateral deposit represents available funds that a company otherwise would have invested for productive purposes. By investing in its own business activities, a company would have earned the internal rate of return associated with its own business activities.

Although this rate is a common financial statistic, internal rates of return are proprietary and generally not publically available. Financial theory dictates that a company's internal rate of return must be at least as high as the price the company pays to obtain investment capital. The company's weighted average cost of capital (WACC) is a statistic calculable from a company's financial statements and provides a reasonably proxy for the average price the company pays for its investment capital.

This analysis uses company-specific WACCs as a proxy for the respective internal rates of return companies are foregoing by virtue of obtaining a letter of credit. Note that these proxies are applicable only when the option of the company to self-assure its environmental obligations is removed by a failing

financial test result and there is no opportunity for a corporate guarantee from a direct- or higher-tier parent company.

4.3.3 COMPANY WACC CALCULATION

To calculate the opportunity cost of capital associated with obtaining a letter of credit, EPA calculated the actual WACC for 78 firms in the NAICS 212 database using the financial information collected for each company, as summarized in Chapter 3. This exercise was performed during the original data collection wave, prior to updates to the universe of NAICS 212 target companies and corporate parents conducted in 2014 and 2015.

As shown in Exhibit 22, the average calculated WACC based on 2009 data was 9.9 percent, with a standard deviation of 3.3 percent.

Exhibit 22. Descriptive Statistics for Calculated NAICS 212 WACCs – Original Data Collected and Estimated in 2009-2010.

Observations	Mean	Standard Deviation	Minimum	Maximum
78	10.1%	4.0%	4.4%	30.3%

However, as described in Chapter 3, the universe of NAICS 212 companies, as well as the financial data associated with these companies, updated in 2014-2015. Of the 78 companies for which WACCs were calculated based on their 2009 financial data, only 51 remain in the current universe of NAICS 212 companies. Additionally, the industry WACC fell considerably between 2009-2010 and 2014-2015 per the *Ibbotson Cost of Capital Yearbooks* for 2009 and 2013, which compile industry-level financial data, including WACCs, on an annual basis.⁵¹

Specifically, EPA analyzed the reported industry-level WACCs for three SIC codes between 2009 and 2014: SIC 10 – Metal Mining; SIC 14 – Mining & Quarrying of Nonmetallic Minerals; and, SIC 12 – Coal Mining. EPA then derived a weighted average change in WACCs across these three SIC codes, weighted by the number of companies in the sample for each SIC code. The resulting weighted average change in WACCs between 2009 and 2014 was approximately 4.77 percent.⁵²

This 4.77 percent difference was then applied to the previously-calculated WACCs for the 51 companies remaining in the current NAICS 212 universe.⁵³ Descriptive statistics for these companies are shown in Exhibit 23 below.

⁵¹ See Morningstar, Inc., *Ibbotson Cost of Capital 2009 Yearbook*, Chicago, IL: Morningstar Publications, 2010, Morningstar, Inc., *Ibbotson Cost of Capital 2012 Yearbook*, Chicago, IL: Morningstar Publications, 2013, Morningstar, Inc., *Ibbotson Cost of Capital 2013 Yearbook*, Chicago, IL: Morningstar Publications, 2014, and Morningstar, Inc., *Ibbotson Cost of Capital 2014 Yearbook*, Chicago, IL: Morningstar Publications, 2015 for SIC codes 10, 12, and 14.

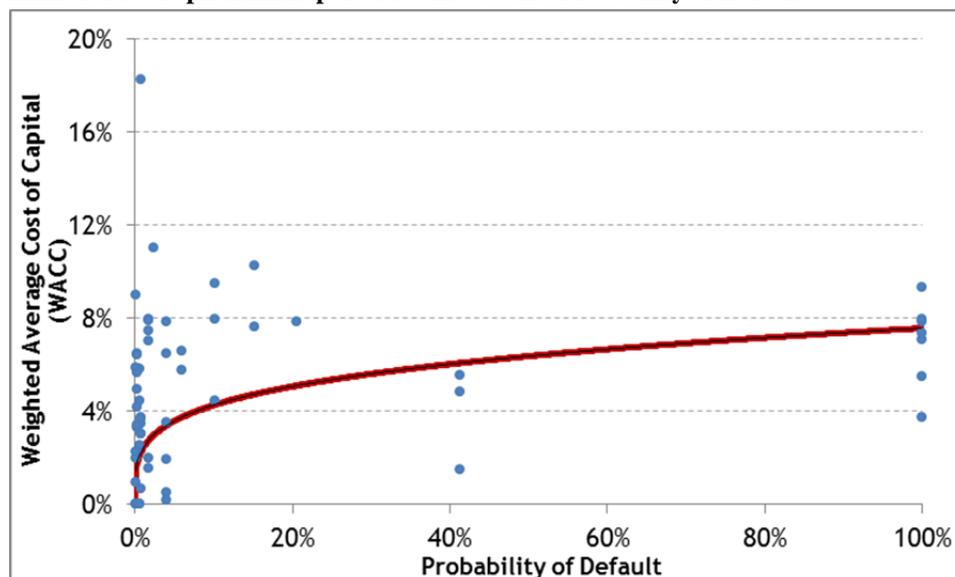
⁵² Specifically, EPA analyzed the 3-Factor Fama-French WACC as reported within the *Cost of Capital Yearbooks*. Note that the 2014 *Yearbook* did not have adequate data to report WACCs for SIC 14 – Mining & Quarrying of Nonmetallic Minerals; the difference between 2013 and 2009 industry WACCs were used for this SIC code in the weighted average calculation instead.

⁵³ For two of the 51 companies, application of this 4.77 percent downward scaling factor resulted in WACCs below zero (i.e., the 2009-2010 estimated WACCs for these companies were below 4.77 percent). Therefore, for these companies, the analysis assigns the lowest downscaled WACC among the remaining 49 companies in the sample.

Exhibit 23. Descriptive Statistics for Calculated NAICS 212 WACCs – Updated Data Estimated in 2014-2015.

Observations	Mean	Standard Deviation	Minimum	Maximum
51	5.1%	3.4%	0.02%	18.3%

The updated sample of companies for which *actual* WACCs were calculated was used to specify a regression model to estimate *implied* WACCs for companies using their probability of default. The distribution of WACC and probability of default values were transformed using the natural log formula to achieve a normal distribution of the values for regression analysis. An ordinary least squares (OLS) regression model was estimated using the WACC as the dependent variable regressed onto the independent variable, probability of default. The coefficients estimated were significant at the 5 percent level and accounted for 10 percent of the variation. The dataset for this regression and the resulting best-fit curve between probability of default and *implied* WACC is shown in Exhibit 24. Companies for which WACCs were not calculated, and therefore no WACC data are available, therefore use an implied WACC based on their probability of default within the analysis.⁵⁴

Exhibit 24. Graph of Extrapolated WACCs and Probability of Default

[For an applied example of this step, see **Appendix A, Step 5A.**]

4.3.4 TOTAL COST TO INDUSTRY OF OBTAINING A THIRD PARTY INSTRUMENT

Based on the calculated and extrapolated WACCs, EPA estimated the potential value of the foregone investment assuming: (1) a discount rate equivalent to the WACC over the default horizon, and (2) that the return on investment accrues at the end of the default horizon. The analysis also assumes that funds deposited for purposes of collateral are invested in bank accounts that accumulate interest over time. The

⁵⁴ Therefore, a company with no available rating from S&P or Moody's without a calculated WACC based on actual data would first receive an estimated probability of default based on its Altman Z''-score (Section 4.2.3), and that estimated probability of default would then be used to imply its WACC.

interest accrued is equivalent to prevailing rates determined by the issuing institution. To approximate this rate, EPA used the yield on five-year Treasury Inflation Protected Securities (TIPS) bonds.⁵⁵

Essentially, a company's total opportunity cost of the collateral deposit is the difference between the returns earned at the WACC and the returns earned on the collateral account – the difference between what industry could have earned as compared to what it did earn over the three-year default time horizon.

In addition to the opportunity cost of collateral, EPA added the full cost of commission fees, which are incurred annually and represent sunk costs that are not recovered. As detailed in Section 4.3.0 above, the commission fee is multiplied first by the estimated face value of the financial instrument, then by the number of years in the default horizon (or, the number of years over which the company likely would incur the fee). Therefore, the total cost to obtain a third party financial instrument is given as:

$$\text{Total Costs} = (\text{FV at WACC} - \text{PV}) - (\text{FV at } r - \text{PV}) + \text{Commission}$$

Where:

FV = future value

WACC = weighted average cost of capital

PV = present value of collateral deposit (i.e., collateral requirement * obligations)

r = risk-free rate

Commission = sunk administrative expenses (i.e., commission fee * obligations * default horizon)

As an example, consider a company with an AA- rating, which translates to an estimated probability of default of **0.2** percent (see Exhibit 17). Based on this probability of default and the model shown in Exhibit 24, this company's implied WACC is approximately **1.6** percent. Similarly, based on its probability of default, its commission fee rate is estimated at approximately **0.6** percent, and its collateral amount is estimated at approximately **20.3** percent of its environmental obligation.

Were this company to fail a given financial test and have to purchase a third-party instrument, its costs would be estimated as follows:

- PV = Obligation times collateral proportion = \$50 million x 20.3% = **\$10.2 million**.
- FV at WACC over Three-Year Period = \$10.2 million x (1 + 1.6%)³ - \$10.2 million = **\$0.50 million**
- FV at *r* over Three-Year Period = \$10.2 million x (1 + 0.15%)³ - \$10.2 million = **\$0.05 million**
- Forgone value of collateral = \$0.50 million - \$0.05 million = **\$0.45 million**
- Commission cost over Three-Year Period = \$50 million x 0.6% x 3 = **\$0.90 million**
- **Total cost** = \$0.45 million + \$0.90 million = **\$1.35 million**.

The total cost of \$1.35 million reflects a three-year cost, and can be annualized using the company's WACC. The industry costs in Exhibits 2 and 3 of the Executive Summary reflect the sum of the

⁵⁵ For consistency with the company-level financial data used in this analysis, the analysis uses the five-year TIPS yield from March 6, 2014. The data and parameters used throughout this analysis are all consistent with a data year of 2013 or 2014 to maintain an apples-to-apples set of comparisons, rather than mixing more recent TIPS yields with WACCs, company-level financial data, and historical default rates from other time horizons.

calculations shown above across all companies purchasing a third-party instrument to cover their obligations, annualized at the median WACC across all companies in the NAICS 212 financial universe subject to the financial test.

[For an applied example of this step across additional companies, see **Appendix A, Step 6A through 6D.**]

4.3.5 OTHER COSTS ACCRUING TO INDUSTRY

In addition to the above costs of procuring a third-party financial instrument, there are administrative costs of preparing audited financial statements for the purposes of being evaluated under the various financial test scenarios. The cost of a financial test for companies that already have audited financial statements as part of their normal business operations and maintain a credit rating is expected to consist of only minor administrative costs, assumed to be under \$3,000 for each such financial test submission.

For public companies without ratings, EPA assumed an estimated cost of \$70,000, while the cost of an audit was modeled at \$500,000 for private, unrated companies.⁵⁶ The estimate of audit costs may overstate these costs as the estimate obtained is for a small firm, and includes the cost of complying with Sarbanes-Oxley. As we understand, Sarbanes-Oxley compliance is not a requirement of the CERCLA 108(b) rule.⁵⁷

⁵⁶ The estimate of audit costs may overstate these costs as the estimate is for a small firm, and includes the cost of complying with Sarbanes–Oxley Act of 2002. Sarbanes-Oxley compliance is not a requirement of the CERCLA 108(b) rule. Source: William R. Kinney, Jr. and Marcy L. Shepardson, *Do control effectiveness disclosures require internal control audits? A natural experiment with small US public companies*, April 26, 2010. These costs were inflated to 2014 dollars for presentation purposes, as shown in Exhibits 2 and 3 of the Executive Summary; however, given the low incidence of unrated and/or private companies being able to pass a given financial test, even in an actual plus implied ratings scenario, audit costs are estimated at approximately \$0.1 million or less on an annual basis.

⁵⁷ William R. Kinney, Jr. and Marcy L. Shepardson, *Do control effectiveness disclosures require internal control audits? A natural experiment with small US public companies*, April 26, 2010.

5. Additional Consideration: The Cyclical Nature of the Hard Rock Mining Industry

5.0 THE CYCLICAL NATURE OF THE HARD ROCK MINING INDUSTRY (NAICS 212)

Under Option 2 as co-proposed, companies able to pass a given financial test are able to self-insure their environmental obligations. The financial tests analyzed in this document, and especially EPA's Co-Proposed test option (the Higher-than-Investment-Grade Ratings test with tangible net worth and U.S. assets thresholds), feature a set of requirements intended to ensure that companies allowed to self-insure have a low probability of entering bankruptcy.

The hard rock mining industry features acute cyclicity based on the nature of its business. Because the industry is reliant on commodity prices, rapid changes in commodity markets may lead to corresponding rapid fluctuations in the financial health of NAICS 212 companies, including those who may have been able to previously pass a given financial test scenario and self-insure their environmental obligations.

For example, a company may evidence financial strength during a period of high mining commodity prices, allowing it to pass a financial test. However, adverse occurrences in mining commodity markets may in turn decrease this company's revenue and cash flow, affecting its ability to maintain sufficient net income, net working capital, and/or tangible net worth to pass a financial test predicated on these or similar metrics. Further, ratings agencies may downgrade the company such that it no longer passes a financial test with a credit rating requirement.

Lastly, adverse market conditions may increase industry-wide bankruptcy rates. The government and taxpayers realize a financial burden when a company that previously self-insured its obligations through passing a financial test defaults and is no longer able to meet its obligations – the expected value of this burden is characterized in the blue bars in Exhibits 2 and 3 of the Executive Summary.

Exhibit 25 on the following page illustrates the interrelationships between commodity metals prices, bankruptcies in NAICS 212, and ratings upgrades and downgrades. Bankruptcies and ratings downgrades appear to occur more frequently during periods of relatively low commodity prices and vice versa.

5.0.1 FINANCIAL TEST CONSIDERATIONS FOR HARD ROCK MINING (NAICS 212) COMPANIES PRIOR TO BANKRUPTCY

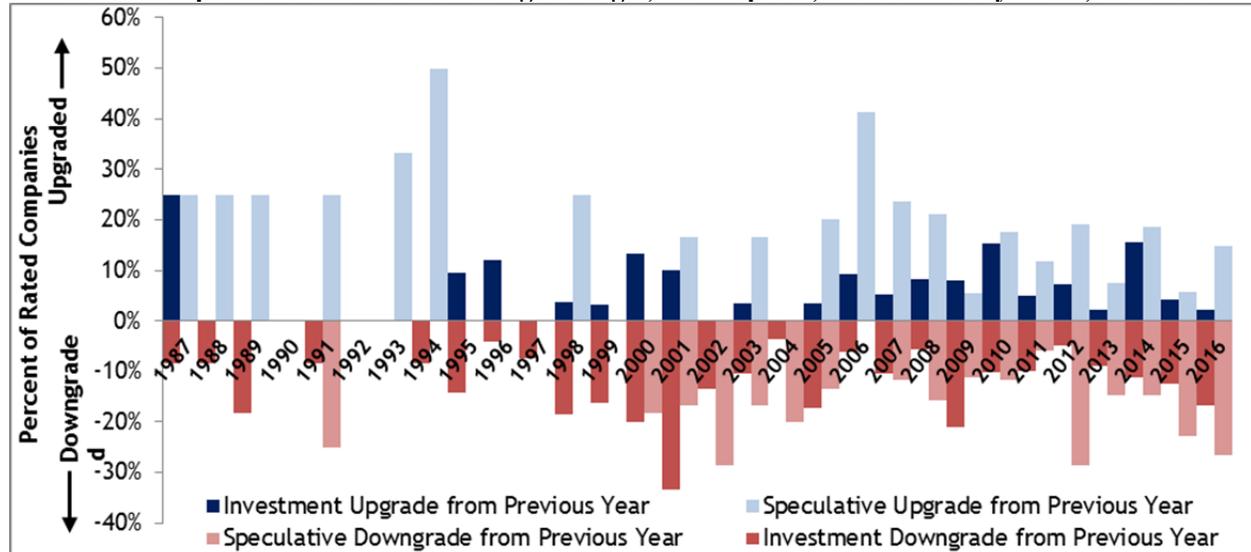
EPA identified 26 total bankruptcies across these 25 companies (one company entered bankruptcy twice in this period). All of the financial tests assessed in this document (see Exhibit 1) disallow the vast majority of these companies from self-insuring their obligations one, two, or three years prior to bankruptcy (see Appendix B, Table B-2).

5.0.2 CREDIT RATING DECLINES AND BANKRUPTCIES OF COMPANIES RECEIVING A BBB RATING

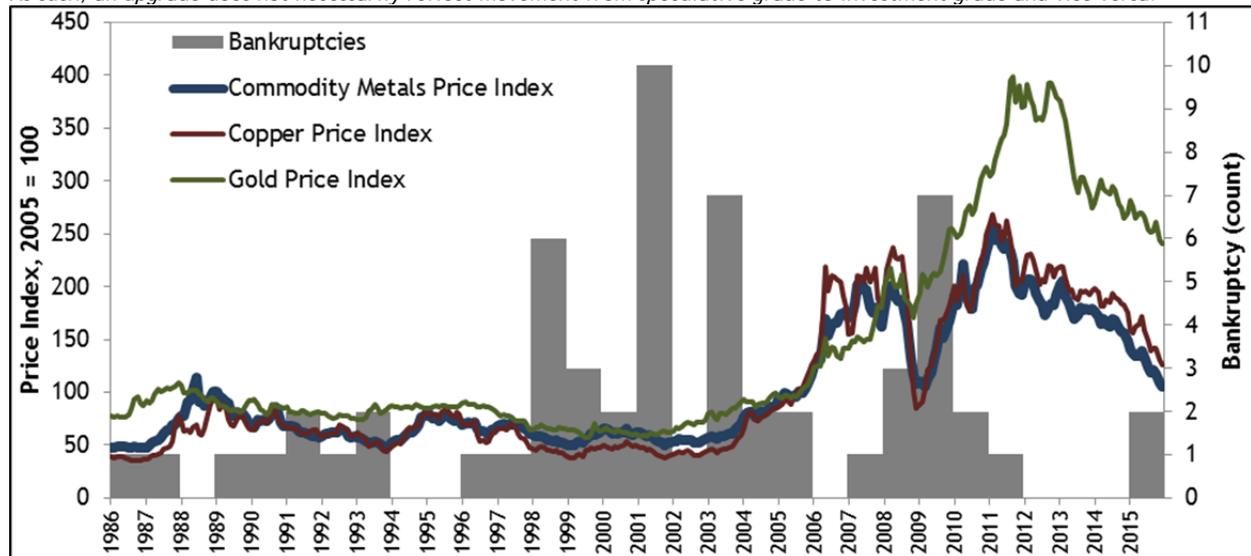
As a companion piece to the above analysis, EPA also examined ratings and bankruptcy trends for companies who received a BBB rating between 1984 and 2010. Because the BBB rating is the minimum rating for passing EPA's Co-Proposed Financial Test Option, the Higher-than-Investment-Grade Rating Test with tangible net worth and U.S. assets thresholds, this analysis, included in Appendix B, Table B-3, characterizes companies with the lowest possible rating that can be maintained to pass this test. Note that

the BBB rating only allows a company to self-insure 50 percent of its obligations; companies must have a rating of A- or higher to self-insure 100 percent of their obligations under EPA’s Co-Proposed Financial Test Option, the Higher-than-Investment-Grade Rating Test with tangible net worth and U.S. assets thresholds.

Exhibit 25. Comparison of S&P Credit Ratings Changes, Bankruptcies, and Commodity Prices, 1986-2015



Note: Upgrades and downgrades reflect movements both within and across the investment and speculative grade ratings classes. As such, an upgrade does not necessarily reflect movement from speculative grade to investment grade and vice versa.



Bankruptcy information based on the following:

- 1986-2010: data collected under prior work assignments from Standard and Poor’s (S&P), Dun & Bradstreet (D&B), Merlin Information Services, New Generation Research Bankruptcy Yearbook, and PACER.
- 2011: based on research from U.S. Securities and Exchange Commission (SEC) listing of available bankruptcies, which indicated one NAICS 212 bankruptcy (this dataset not available post-2011): <https://www.sec.gov/opa/data/opedatasets/html/bankruptcy.html>.
- 2015: two companies identified as filing for bankruptcy based on company-specific research as part of iterative data collection.
- 2011-2015: S&P identified one NAICS 212 company filing for bankruptcy within this period; this company is potentially one of the three bankruptcies identified in this period as described above.

Commodity index data acquired from Index Mundi, available at:

<http://www.indexmundi.com/commodities/?commodity=metals-price-index&months=360>. The composite metals index reflects prices for copper, aluminum, iron ore, tin, nickel, zinc, lead, and uranium.

Appendix A: Applied Example of Analytic Method – Anonymized Data

Appendix A provides the array of calculations referenced in Chapter 4 of this document for 10 example companies. These calculations illustrate how company-level data across the corporate hierarchy are used to assess pass/fail for financial test scenarios and develop estimates of the cost to industry of acquiring a third-party financial assurance instrument (in the case of failing a financial test) and the cost to government of allowing a company to pass a financial test and self-insure its environmental obligations.

*Disclaimer: This step-by-step analytical flow is based on anonymized data.

November 2016

Step 1: Array Company Financial and Ratings Data

Anonymized data (in \$ millions)

Target													
Target Company ID	Current Assets	Current Liabilities	Total Assets	Total Liabilities	Intangible Assets	Retained Earnings	Book Value of Equity	EBIT	Net Income	DDA	Operating Cash Flow	S&P Rating	Moody's Rating
1	\$ 3	\$ 61	\$ 51	\$ 69	\$ -	\$ (141)	\$ (18)	\$ (6)	\$ (10)	\$ 1	\$ (0)	No Rating	No Rating
2	\$ 84	\$ 19	\$ 686	\$ 317	\$ 27	\$ 49	\$ 355	\$ (78)	\$ (55)	\$ 3	\$ 15	No Rating	No Rating
3	\$ 101	\$ 21	\$ 4,390	\$ 1,023	\$ -	\$ 1,465	\$ 3,367	\$ 388	\$ 376	\$ 144	\$ 534	No Rating	No Rating
4	\$ 208	\$ 293	\$ 599	\$ 570	\$ 130	\$ (235)	\$ 29	\$ 29	\$ (59)	\$ 41	\$ 42	No Rating	No Rating
5	\$ 577	\$ 153	\$ 3,007	\$ 1,630	\$ 560	\$ (847)	\$ 1,348	\$ (252)	\$ (368)	\$ 105	\$ (154)	CCC+	Caa2
6	\$ 1,125	\$ 718	\$ 1,732	\$ 924	\$ 121	\$ 204	\$ 798	\$ 80	\$ 81	\$ 45	\$ 78	No Rating	Ba2
7	\$ 11,295	\$ 4,578	\$ 27,934	\$ 10,022	\$ 6,849	\$ 9,934	\$ 17,713	\$ 2,107	\$ 1,096	\$ 1,698	\$ 3,161	A	A2
8	\$ 3,896	\$ 1,674	\$ 10,057	\$ 3,447	\$ 2,332	\$ 3,145	\$ 6,000	\$ 1,274	\$ 736	\$ 303	\$ 869	BBB-	Baa3
9	\$ 3,228	\$ 3,228	\$ 73,461	\$ 25,047	\$ 15,614	\$ 5,494	\$ 48,414	\$ 6,668	\$ 4,271	\$ 1,968	\$ 6,205	BBB+	Aa2
10	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	A	A2
Direct Parent													
Direct Parent ID	Current Assets	Current Liabilities	Total Assets	Total Liabilities	Intangible Assets	Retained Earnings	Book Value of Equity	EBIT	Net Income	DDA	Operating Cash Flow	S&P Rating	Moody's Rating
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
2-P	\$ 949	\$ 395	\$ 2,967	\$ 1,974	\$ 444	\$ (48)	\$ 601	\$ (197)	\$ (98)	\$ 75	\$ 117	No Rating	No Rating
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
4-P	\$ 542	\$ 246	\$ 1,783	\$ 623	\$ 836	\$ 542	\$ 1,160	\$ 51	\$ (72)	\$ 74	\$ 62	No Rating	No Rating
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
6-P	\$ 3,391	\$ 1,839	\$ 8,718	\$ 4,491	\$ 4,265	\$ 1,630	\$ 4,081	\$ 497	\$ 247	\$ 264	\$ 614	No Rating	Ba2
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
9-P	\$ 4,803	\$ 3,851	\$ 75,030	\$ 40,418	\$ 15,640	Data Point Missing	\$ 34,612	\$ 6,667	\$ 3,793	\$ 1,973	\$ 5,762	BBB+	A3
10-P	\$ 96,840	\$ 72,812	\$ 305,690	\$ 175,283	\$ 13,355	\$ 133,378	\$ 129,302	\$ 16,019	\$ 23,451	\$ 13,631	\$ 21,100	A	A2
Ultimate Parent													
Ultimate Parent ID	Current Assets	Current Liabilities	Total Assets	Total Liabilities	Intangible Assets	Retained Earnings	Book Value of Equity	EBIT	Net Income	DDA	Operating Cash Flow	S&P Rating	Moody's Rating
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
2-UP	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No Data	No Data
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
6-UP	\$ 3,434	\$ 2,456	\$ 6,123	\$ 3,851	\$ 2,028	\$ 321	\$ 2,187	\$ 322	\$ 230	\$ 93	\$ 361	No Rating	No Rating
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
9-UP	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	AA	Aa2
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent

*Disclaimer: This step-by-step analytical flow is based on anonymized data.

Step 2: Calculate Revised Altman Z-Score (Z²-Score)

Anonymized data (in \$ millions)

Target Company ID	Target																	Revised Altman Z Q = D+G+J+P+3.25
	Current Assets A [Step 1]	Current Liabilities B [Step 1]	Total Assets C [Step 1]	6.56*(A-B)/C D	Retained Earnings E [Step 1]	Total Assets F [Step 1]	3.26*E/F G	EBIT H [Step 1]	Total Assets I [Step 1]	6.72*H/I J	Market Value of Equity K [Step 1]	Total Assets L [Step 1]	Total Liabilities M [Step 1]	1.05*K/M N	1.05*(L-M)/M O	N>0 then N, else 0 P		
1	\$ 3	\$ 61	\$ 51	(7.46)	\$ (141)	\$ 51	(9.04)	\$ (6)	\$ 51	(0.83)	\$ (18)	\$ 51	\$ 69	(0.27)	(0.27)	(0.27)	(14.35)	
2	\$ 84	\$ 19	\$ 686	0.62	\$ 49	\$ 686	0.23	\$ (78)	\$ 686	(0.76)	\$ 355	\$ 686	\$ 317	1.18	1.22	1.18	4.52	
3	\$ 101	\$ 21	\$ 4,390	0.12	\$ 1,465	\$ 4,390	1.09	\$ 388	\$ 4,390	0.59	\$ 3,367	\$ 4,390	\$ 1,023	3.45	3.45	3.45	8.51	
4	\$ 208	\$ 293	\$ 599	(0.93)	\$ (235)	\$ 599	(1.28)	\$ 29	\$ 599	0.32	\$ 29	\$ 599	\$ 570	0.05	0.05	0.05	1.42	
5	\$ 577	\$ 153	\$ 3,007	0.92	\$ (847)	\$ 3,007	(0.92)	\$ (252)	\$ 3,007	(0.56)	\$ 1,348	\$ 3,007	\$ 1,630	0.87	0.89	0.87	3.56	
6	\$ 1,125	\$ 718	\$ 1,732	1.54	\$ 204	\$ 1,732	0.38	\$ 80	\$ 1,732	0.31	\$ 798	\$ 1,732	\$ 924	0.91	0.92	0.91	6.39	
7	\$ 11,295	\$ 4,578	\$ 27,934	1.58	\$ 9,934	\$ 27,934	1.16	\$ 2,107	\$ 27,934	0.51	\$ 17,713	\$ 27,934	\$ 10,022	1.86	1.88	1.86	8.35	
8	\$ 3,896	\$ 1,674	\$ 10,057	1.45	\$ 3,145	\$ 10,057	1.02	\$ 1,274	\$ 10,057	0.85	\$ 6,000	\$ 10,057	\$ 3,447	1.83	2.01	1.83	8.40	
9	\$ 3,228	\$ 3,228	\$ 73,461	0.00	\$ 5,494	\$ 73,461	0.24	\$ 6,668	\$ 73,461	0.61	\$ 48,414	\$ 73,461	\$ 25,047	2.03	2.03	2.03	6.13	
10	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	
Direct Parent ID	Direct Parent																	Revised Altman Z Q = D+G+J+P+3.25
	Current Assets A [Step 1]	Current Liabilities B [Step 1]	Total Assets C [Step 1]	6.56*(A-B)/C D	Retained Earnings E [Step 1]	Total Assets F [Step 1]	3.26*E/F G	EBIT H [Step 1]	Total Assets I [Step 1]	6.72*H/I J	Market Value of Equity K [Step 1]	Total Assets L [Step 1]	Total Liabilities M [Step 1]	1.05*K/M N	1.05*(L-M)/M O	N>0 then N, else 0 P		
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	
2-P	\$ 949	\$ 395	\$ 2,967	1.23	\$ (48)	\$ 2,967	(0.05)	\$ (197)	\$ 2,967	(0.45)	\$ 601	\$ 2,967	\$ 1,974	0.32	0.53	0.32	4.30	
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	
4-P	\$ 542	\$ 246	\$ 1,783	1.09	\$ 542	\$ 1,783	0.99	\$ 51	\$ 1,783	0.19	\$ 1,160	\$ 1,783	\$ 623	1.95	1.95	1.95	7.48	
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	
6-P	\$ 3,391	\$ 1,839	\$ 8,718	1.17	\$ 1,630	\$ 8,718	0.61	\$ 497	\$ 8,718	0.38	\$ 4,081	\$ 8,718	\$ 4,491	0.95	0.99	0.95	6.37	
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	
9-P	\$ 4,803	\$ 3,851	\$ 75,030	0.08	Data Point Missing	\$ 75,030	No data	\$ 6,667	\$ 75,030	0.60	\$ 34,612	\$ 75,030	\$ 40,418	0.90	0.90	0.90	No data	
10-P	\$ 96,840	\$ 72,812	\$ 305,690	0.52	\$ 133,378	\$ 305,690	1.42	\$ 16,019	\$ 305,690	0.35	\$ 129,302	\$ 305,690	\$ 175,283	0.77	0.78	0.77	6.31	
Ultimate Parent ID	Ultimate Parent																	Revised Altman Z Q = D+G+J+P+3.25
	Current Assets A [Step 1]	Current Liabilities B [Step 1]	Total Assets C [Step 1]	6.56*(A-B)/C D	Retained Earnings E [Step 1]	Total Assets F [Step 1]	3.26*E/F G	EBIT H [Step 1]	Total Assets I [Step 1]	6.72*H/I J	Market Value of Equity K [Step 1]	Total Assets L [Step 1]	Total Liabilities M [Step 1]	1.05*K/M N	1.05*(L-M)/M O	N>0 then N, else 0 P		
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	
2-UP	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	
6-UP	\$ 3,434	\$ 2,456	\$ 6,123	1.05	\$ 321	\$ 6,123	0.17	\$ 322	\$ 6,123	0.35	\$ 2,187	\$ 6,123	\$ 3,851	0.60	0.62	0.60	5.42	
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	
9-UP	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	

*Disclaimer: This step-by-step analytical flow is based on anonymized data.

Step 3: Estimate Probabilities of Default and Implied Ratings

Each company's credit rating [A, B] is used to estimate a probability of default [D]. For unrated companies, the Altman Z'-score [F] is used to imply a rating [G]. The probability of default for this implied rating [I] is used for unrated companies, while the probability of default associated with the actual rating [D] is used for rated companies.

Anonymized data (in \$ millions)

Target										
Target Company ID	S&P Rating A [Step 1]	Moody's Rating B [Step 1]	Final Rating C = Max (A,B)	P(default) D [Ex. 17]	Revised Altman-Z E [Step 2]	Rounded Altman-Z F	Predicted S&P Rating G [Ex. 18]	Predicted Moody's Rating H [Ex. 18]	Predicted S&P P(default) I [Ex. 17]	Final P(default) J = D or I
1	No Rating	No Rating	No Rating	No Rating	-14.35	-14.35	D	C	100.00%	100.00%
2	No Rating	No Rating	No Rating	No Rating	4.52	4.52	B+	B1	10.15%	10.15%
3	No Rating	No Rating	No Rating	No Rating	8.51	8.51	AA-	Aa3	0.20%	0.20%
4	No Rating	No Rating	No Rating	No Rating	1.42	1.42	D	C	100.00%	100.00%
5	CCC+	Caa2	CCC+	41.23%	3.56	3.56	CCC+	Caa1	41.23%	41.23%
6	No Rating	Ba2	BB	4.07%	6.39	6.39	BBB+	Baa1	0.66%	4.07%
7	A	A2	A	0.27%	8.35	8.35	AA-	Aa3	0.20%	0.27%
8	BBB-	Baa3	BBB-	1.73%	8.40	8.4	AA-	Aa3	0.20%	1.73%
9	BBB+	Aa2	BBB+	0.66%	6.13	6.13	BBB	Baa2	0.80%	0.66%
10	A	A2	A	0.27%	No data	No data	No data	No data	No data	0.27%
Direct Parent										
Direct Parent ID	S&P Rating A [Step 1]	Moody's Rating B [Step 1]	Final Rating C = Max (A,B)	P(default) D [Ex. 17]	Revised Altman-Z E [Step 2]	Rounded Altman-Z F	Predicted S&P Rating G [Ex. 18]	Predicted Moody's Rating H [Ex. 18]	Predicted S&P P(default) I [Ex. 17]	Final P(default) J = D or I
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	AA-	Aa3	No Parent	No parent
2-P	No Rating	No Rating	No Rating	No Rating	4.30	4.3	B	B2	15.19%	15.19%
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	AA-	Aa3	No Parent	No parent
4-P	No Rating	No Rating	No Rating	No Rating	7.48	7.48	AA	Aa2	0.09%	0.09%
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	AA-	Aa3	No Parent	No parent
6-P	No Rating	Ba2	BB	4.07%	6.37	6.37	BBB+	Baa1	0.66%	4.07%
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	AA-	Aa3	No Parent	No parent
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	AA-	Aa3	No Parent	No parent
9-P	BBB+	A3	BBB+	0.66%	No data	No data	No data	No data	No data	0.66%
10-P	A	A2	A	0.27%	6.31	6.31	BBB+	Baa1	0.66%	0.27%
Ultimate Parent										
Ultimate Parent ID	S&P Rating A [Step 1]	Moody's Rating B [Step 1]	Final Rating C = Max (A,B)	P(default) D [Ex. 17]	Revised Altman-Z E [Step 2]	Rounded Altman-Z F	Predicted S&P Rating G [Ex. 18]	Predicted Moody's Rating H [Ex. 18]	Predicted S&P P(default) I [Ex. 17]	Final P(default) J = D or I
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	AA-	Aa3	No Parent	No parent
2-UP	No Data	No Data	No Data	No Data	No Data	No Data	No data	No data	No data	No data
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	AA-	Aa3	No Parent	No parent
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	AA-	Aa3	No Parent	No parent
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	AA-	Aa3	No Parent	No parent
6-UP	No Rating	No Rating	No Rating	No Rating	5.42	5.42	BB	Ba2	4.07%	4.07%
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	AA-	Aa3	No Parent	No parent
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	AA-	Aa3	No Parent	No parent
9-UP	AA	Aa2	AA	0.09%	No data	No data	No data	No data	No data	0.09%
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	AA-	Aa3	No Parent	No parent

*Disclaimer: This step-by-step analytical flow is based on anonymized data.

Step 4.A1: RCRA Subtitle C Financial Test, Alternative 1

Anonymized data (in \$ millions)

Target																					
Target Company ID	Total Liabilities A [Step 1]	Total Assets B [Step 1]	Net Income C [Step 1]	DDA D [Step 1]	Current Assets E [Step 1]	Current Liabilities F [Step 1]	Part 1a A/(B-A)<2	Part 2a (C+D)/A>0.1	Part 3a E/F>1.5	Part A 2 of 3	Intangible Assets G	Cost Estimate H	Part 1b E-F>6*H	Part 2b B-A-G>6*H	Part B 1b&2b	Part C B-A-G>10	Part 1d Has US Assets	Part 2d 1d > 0.9*B	Part3d 1d > 6*H	Part D 2d or 3d	Overall Parts A&B&C&D
1	\$ 69	\$ 51	\$ (10)	\$ 1	\$ 3	\$ 61	1	0	0	FAIL	\$ -	\$ 50	0	0	FAIL	FAIL	No data	No data	No data	PASS	FAIL
2	\$ 317	\$ 686	\$ (55)	\$ 3	\$ 84	\$ 19	1	0	1	PASS	\$ 27	\$ 50	0	1	FAIL	PASS	No data	No data	No data	PASS	FAIL
3	\$ 1,023	\$ 4,390	\$ 376	\$ 144	\$ 101	\$ 21	1	1	1	PASS	\$ -	\$ 50	0	1	FAIL	PASS	No data	No data	No data	PASS	FAIL
4	\$ 570	\$ 599	\$ (59)	\$ 41	\$ 208	\$ 293	0	0	0	FAIL	\$ 130	\$ 50	0	0	FAIL	FAIL	\$ 599	PASS	PASS	PASS	FAIL
5	\$ 1,630	\$ 3,007	\$ (368)	\$ 105	\$ 577	\$ 153	1	0	1	PASS	\$ 560	\$ 50	1	1	PASS	PASS	No data	No data	No data	PASS	PASS
6	\$ 924	\$ 1,732	\$ 81	\$ 45	\$ 1,125	\$ 718	1	1	1	PASS	\$ 121	\$ 50	1	1	PASS	PASS	No data	No data	No data	PASS	PASS
7	\$ 10,022	\$ 27,934	\$ 1,096	\$ 1,698	\$ 11,295	\$ 4,578	1	1	1	PASS	\$ 6,849	\$ 50	1	1	PASS	PASS	No data	No data	No data	PASS	PASS
8	\$ 3,447	\$ 10,057	\$ 736	\$ 303	\$ 3,896	\$ 1,674	1	1	1	PASS	\$ 2,332	\$ 50	1	1	PASS	PASS	\$ 10,057	PASS	PASS	PASS	PASS
9	\$ 25,047	\$ 73,461	\$ 4,271	\$ 1,968	\$ 3,228	\$ 3,228	1	1	0	PASS	\$ 15,614	\$ 50	0	1	FAIL	PASS	\$ 73,461	PASS	PASS	PASS	FAIL
10	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	\$ 50	No data	No data	No data	No data	No data	No data	No data	PASS	FAIL
Parent																					
Direct Parent Company ID	Total Liabilities A	Total Assets B	Net Income C	DDA D	Current Assets E	Current Liabilities F	Part 1a A/(B-A)<2	Part 2a (C+D)/A>0.1	Part 3a E/F>1.5	Part A 2 of 3	Intangible Assets G	Cost Estimate H	Part 1b E-F>6*H	Part 2b B-A-G>6*H	Part B 1b&2b	Part C B-A-G>10	Part 1d Has US Assets	Part 2d 1d > 0.9*B	Part3d 1d > 6*H	Part D 2d or 3d	Overall Parts A&B&C&D
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No parent	No Parent	No Parent	No Parent	\$ 50	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
2-P	\$ 1,974	\$ 2,967	\$ (98)	\$ 75	\$ 949	\$ 395	1	0	1	PASS	\$ 444	\$ 50	1	1	PASS	PASS	No data	No data	No data	PASS	PASS
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No parent	No Parent	No Parent	No Parent	\$ 50	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
4-P	\$ 623	\$ 1,783	\$ (72)	\$ 74	\$ 542	\$ 246	1	0	1	PASS	\$ 836	\$ 50	0	1	FAIL	PASS	No data	No data	No data	PASS	FAIL
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No parent	No Parent	No Parent	No Parent	\$ 50	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
6-P	\$ 4,491	\$ 8,718	\$ 247	\$ 264	\$ 3,391	\$ 1,839	1	1	1	PASS	\$ 4,265	\$ 50	1	0	FAIL	FAIL	No data	No data	No data	PASS	FAIL
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No parent	No Parent	No Parent	No Parent	\$ 50	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No parent	No Parent	No Parent	No Parent	\$ 50	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
9-P	\$ 40,418	\$ 75,030	\$ 3,793	\$ 1,973	\$ 4,803	\$ 3,851	1	1	0	PASS	\$ 15,640	\$ 50	1	1	PASS	PASS	\$ 75,030	PASS	PASS	PASS	PASS
10-P	\$ 175,283	\$ 305,690	\$ 23,451	\$ 13,631	\$ 96,840	\$ 72,812	1	1	0	PASS	\$ 13,355	\$ 50	1	1	PASS	PASS	No data	No data	No data	PASS	PASS
Ultimate																					
Ultimate Parent Company ID	Total Liabilities A	Total Assets B	Net Income C	DDA D	Current Assets E	Current Liabilities F	Part 1a A/(B-A)<2	Part 2a (C+D)/A>0.1	Part 3a E/F>1.5	Part A 2 of 3	Intangible Assets G	Cost Estimate H	Part 1b E-F>6*H	Part 2b B-A-G>6*H	Part B 1b&2b	Part C B-A-G>10	Part 1d Has US Assets	Part 2d 1d > 0.9*B	Part3d 1d > 6*H	Part D 2d or 3d	Overall Parts A&B&C&D
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No parent	No Parent	No Parent	No Parent	\$ 50	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
2-UP	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	\$ 50	No data	No data	No data	No data	No data	No data	No data	PASS	FAIL
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No parent	No Parent	No Parent	No Parent	\$ 50	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No parent	No Parent	No Parent	No Parent	\$ 50	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No parent	No Parent	No Parent	No Parent	\$ 50	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
6-UP	\$ 3,851	\$ 6,123	\$ 230	\$ 93	\$ 3,434	\$ 2,456	1	0	0	FAIL	\$ 2,028	\$ 50	1	0	FAIL	PASS	No data	No data	No data	PASS	FAIL
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No parent	No Parent	No Parent	No Parent	\$ 50	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No parent	No Parent	No Parent	No Parent	\$ 50	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
9-UP	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	\$ 50	No data	No data	No data	No data	No data	No data	No data	PASS	FAIL
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No parent	No Parent	No Parent	No Parent	\$ 50	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent

*Disclaimer: This step-by-step analytical flow is based on anonymized data.

Step 4.A2: RCRA Subtitle C Financial Test, Alternative 2**Actual Ratings**

Anonymized data (in \$ millions)

Target							
Target Company ID	S&P Rating [Step 3]	Moody's Rating [Step 3]	Investment Grade A [BBB- or above]	2b of Alt 1 B [Step 4.A1]	C of Alt 1 C [Step 4.A1]	D of Alt 1 D [Step 4.A1]	Overall Parts A&B&C&D
1	No Rating	No Rating	FAIL	FAIL	FAIL	PASS	FAIL
2	No Rating	No Rating	FAIL	PASS	PASS	PASS	FAIL
3	No Rating	No Rating	FAIL	PASS	PASS	PASS	FAIL
4	No Rating	No Rating	FAIL	FAIL	FAIL	PASS	FAIL
5	CCC+	Caa2	FAIL	PASS	PASS	PASS	FAIL
6	No Rating	Ba2	FAIL	PASS	PASS	PASS	FAIL
7	A	A2	PASS	PASS	PASS	PASS	PASS
8	BBB-	Baa3	PASS	PASS	PASS	PASS	PASS
9	BBB+	Aa2	PASS	PASS	PASS	PASS	PASS
10	A	A2	PASS	No data	No data	PASS	FAIL
Direct Parent							
Direct Parent Company ID	S&P Rating [Step 3]	Moody's Rating [Step 3]	Investment Grade BBB- or above	2b of Alt 1 [Step 4.A1]	C of Alt 1 C [Step 4.A1]	C of Alt 1 D [Step 4.A1]	C of Alt 1 D [Step 4.A1]
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
2-P	No Rating	No Rating	FAIL	PASS	PASS	PASS	FAIL
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
4-P	No Rating	No Rating	FAIL	PASS	PASS	PASS	FAIL
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
6-P	No Rating	Ba2	FAIL	FAIL	FAIL	PASS	FAIL
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
9-P	BBB+	A3	PASS	PASS	PASS	PASS	PASS
10-P	A	A2	PASS	PASS	PASS	PASS	PASS
Ultimate Parent							
Ultimate Parent Company ID	S&P Rating [Step 3]	Moody's Rating [Step 3]	Investment Grade BBB- or above	2b of Alt 1 [Step 4.A1]	C of Alt 1 C [Step 4.A1]	C of Alt 1 D [Step 4.A1]	C of Alt 1 D [Step 4.A1]
None	No Parent	No Parent	No parent	No Parent	No Parent	No Parent	No Parent
2-UP	No Data	No Data	No data	No data	No data	PASS	FAIL
None	No Parent	No Parent	No parent	No Parent	No Parent	No Parent	No Parent
None	No Parent	No Parent	No parent	No Parent	No Parent	No Parent	No Parent
None	No Parent	No Parent	No parent	No Parent	No Parent	No Parent	No Parent
6-UP	No Rating	No Rating	FAIL	FAIL	PASS	PASS	FAIL
None	No Parent	No Parent	No parent	No Parent	No Parent	No Parent	No Parent
None	No Parent	No Parent	No parent	No Parent	No Parent	No Parent	No Parent
9-UP	AA	Aa2	PASS	No data	No data	PASS	FAIL
None	No Parent	No Parent	No parent	No Parent	No Parent	No Parent	No Parent

*Disclaimer: This step-by-step analytical flow is based on anonymized data.

Step 4.A2: RCRA Subtitle C Financial Test, Alternative 2**Actual and Implied Ratings**

Anonymized data (in \$ millions)

Target							
Target Company ID	S&P Rating [Step 3]	Moody's Rating [Step 3]	Investment Grade A [BBB- or above]	2b of Alt 1 B [Step 4.A1]	C of Alt 1 C [Step 4.A1]	D of Alt 1 D [Step 4.A1]	Overall Parts A&B&CD
1	D	C	FAIL	FAIL	FAIL	PASS	FAIL
2	B+	B1	FAIL	PASS	PASS	PASS	FAIL
3	AA-	Aa3	PASS	PASS	PASS	PASS	PASS
4	D	C	FAIL	FAIL	FAIL	PASS	FAIL
5	CCC+	Caa2	FAIL	PASS	PASS	PASS	FAIL
6	N/A	Ba2	FAIL	PASS	PASS	PASS	FAIL
7	A	A2	PASS	PASS	PASS	PASS	PASS
8	BBB-	Baa3	PASS	PASS	PASS	PASS	PASS
9	BBB+	Aa2	PASS	PASS	PASS	PASS	PASS
10	A	A2	PASS	No data	No data	PASS	FAIL
Direct Parent							
Direct Parent Company ID	S&P Rating [Step 3]	Moody's Rating [Step 3]	Investment Grade BBB- or above	2b of Alt 1 [Step 4.A1]	C of Alt 1 C [Step 4.A1]	C of Alt 1 D [Step 4.A1]	C of Alt 1 D [Step 4.A1]
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
2-P	B	B2	FAIL	PASS	PASS	PASS	FAIL
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
4-P	AA	Aa2	PASS	PASS	PASS	PASS	PASS
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
6-P	N/A	Ba2	FAIL	FAIL	FAIL	PASS	FAIL
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
9-P	BBB+	A3	PASS	PASS	PASS	PASS	PASS
10-P	A	A2	PASS	PASS	PASS	PASS	PASS
Ultimate Parent							
Ultimate Parent Company ID	S&P Rating [Step 3]	Moody's Rating [Step 3]	Investment Grade BBB- or above	2b of Alt 1 [Step 4.A1]	C of Alt 1 C [Step 4.A1]	C of Alt 1 D [Step 4.A1]	C of Alt 1 D [Step 4.A1]
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
2-UP	No data	No data	No data	No data	No data	PASS	FAIL
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
6-UP	BB	Ba2	FAIL	FAIL	PASS	PASS	FAIL
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
9-UP	AA	Aa2	PASS	No data	No data	PASS	FAIL
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent

*Disclaimer: This step-by-step analytical flow is based on anonymized data.

Step 4.A3: RCRA Subtitle C Financial Test, Alternatives 1 & 2 Combined

Step 4.A3: RCRA Subtitle C Financial Test, Alternatives 1 & 2 Combined

Actual Ratings

Actual and Implied Ratings

Anonymized data (in \$ millions)

Anonymized data (in \$ millions)

Target			
Target Company ID	Alt 1 Result A [Step 4.A1]	Alt 2 Result B [Step 4.A2]	Overall Result PASS if A or B
1	FAIL	FAIL	FAIL
2	FAIL	FAIL	FAIL
3	FAIL	FAIL	FAIL
4	FAIL	FAIL	FAIL
5	PASS	FAIL	PASS
6	PASS	FAIL	PASS
7	PASS	PASS	PASS
8	PASS	PASS	PASS
9	FAIL	PASS	PASS
10	FAIL	FAIL	FAIL

Target			
Target Company ID	Alt 1 Result A [Step 4.A1]	Alt 2 Result B [Step 4.A2]	Overall Result PASS if A or B
1	FAIL	FAIL	FAIL
2	FAIL	FAIL	FAIL
3	FAIL	PASS	PASS
4	FAIL	FAIL	FAIL
5	PASS	FAIL	PASS
6	PASS	FAIL	PASS
7	PASS	PASS	PASS
8	PASS	PASS	PASS
9	FAIL	PASS	PASS
10	FAIL	FAIL	FAIL

Direct Parent			
Direct Parent Company ID	Alt 1 Result A [Step 4.A1]	Alt 2 Result B [Step 4.A2]	Overall Result PASS if A or B
None	No Parent	No Parent	No Parent
2-P	PASS	FAIL	PASS
None	No Parent	No Parent	No Parent
4-P	FAIL	FAIL	FAIL
None	No Parent	No Parent	No Parent
6-P	FAIL	FAIL	FAIL
None	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent
9-P	PASS	PASS	PASS
10-P	PASS	PASS	PASS

Direct Parent			
Direct Parent Company ID	Alt 1 Result A [Step 4.A1]	Alt 2 Result B [Step 4.A2]	Overall Result PASS if A or B
None	No Parent	No Parent	No Parent
2-P	PASS	FAIL	PASS
None	No Parent	No Parent	No Parent
4-P	FAIL	PASS	PASS
None	No Parent	No Parent	No Parent
6-P	FAIL	FAIL	FAIL
None	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent
9-P	PASS	PASS	PASS
10-P	PASS	PASS	PASS

Ultimate Parent			
Ultimate Parent Company ID	Alt 1 Result A [Step 4.A1]	Alt 2 Result B [Step 4.A2]	Overall Result PASS if A or B
None	No Parent	No Parent	No parent
2-UP	FAIL	FAIL	FAIL
None	No Parent	No Parent	No parent
None	No Parent	No Parent	No parent
None	No Parent	No Parent	No parent
6-UP	FAIL	FAIL	FAIL
None	No Parent	No Parent	No parent
None	No Parent	No Parent	No parent
9-UP	FAIL	FAIL	FAIL
None	No Parent	No Parent	No parent

Ultimate Parent			
Ultimate Parent Company ID	Alt 1 Result A [Step 4.A1]	Alt 2 Result B [Step 4.A2]	Overall Result PASS if A or B
None	No Parent	No Parent	No Parent
2-UP	FAIL	FAIL	FAIL
None	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent
6-UP	FAIL	FAIL	FAIL
None	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent
9-UP	FAIL	FAIL	FAIL
None	No Parent	No Parent	No Parent

Target ID	Overall Result
1	FAIL
2	PASS - CG
3	FAIL
4	FAIL
5	PASS
6	PASS
7	PASS
8	PASS
9	PASS
10	PASS - CG

Target ID	Overall Result
1	FAIL
2	PASS - CG
3	PASS
4	PASS - CG
5	PASS
6	PASS
7	PASS
8	PASS
9	PASS
10	PASS - CG

*Disclaimer: This step-by-step analytical flow is based on anonymized data.

Step 4.B: Investment Grade Test

Actual Ratings

Anonymized data (in \$ millions)

Target			
Target Company ID	S&P Rating [Step 3]	Moody's Rating [Step 3]	Investment Grade [BBB- or above]
1	No Rating	No Rating	FAIL
2	No Rating	No Rating	FAIL
3	No Rating	No Rating	FAIL
4	No Rating	No Rating	FAIL
5	CCC+	Caa2	FAIL
6	No Rating	Ba2	FAIL
7	A	A2	PASS
8	BBB-	Baa3	PASS
9	BBB+	Aa2	PASS
10	A	A2	PASS

Direct Parent			
Direct Parent Company ID	S&P Rating [Step 3]	Moody's Rating [Step 3]	Investment Grade [BBB- or above]
None	No Parent	No Parent	No Parent
2-P	No Rating	No Rating	FAIL
None	No Parent	No Parent	No Parent
4-P	No Rating	No Rating	FAIL
None	No Parent	No Parent	No Parent
6-P	No Rating	Ba2	FAIL
None	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent
9-P	BBB+	A3	PASS
10-P	A	A2	PASS

Ultimate Parent			
Ultimate Parent Company ID	S&P Rating [Step 3]	Moody's Rating [Step 3]	Investment Grade [BBB- or above]
None	No Parent	No Parent	No parent
2-UP	No Data	No Data	No data
None	No Parent	No Parent	No parent
None	No Parent	No Parent	No parent
None	No Parent	No Parent	No parent
6-UP	No Rating	No Rating	FAIL
None	No Parent	No Parent	No parent
None	No Parent	No Parent	No parent
9-UP	AA	Aa2	PASS
None	No Parent	No Parent	No parent

Target ID	Overall Result
1	FAIL
2	FAIL
3	FAIL
4	FAIL
5	FAIL
6	FAIL
7	PASS
8	PASS
9	PASS
10	PASS

Step 4.B: Investment Grade Test

Actual and Implied Ratings

Anonymized data (in \$ millions)

Target			
Target Company ID	S&P Rating [Step 3]	Moody's Rating [Step 3]	Investment Grade [BBB- or above]
1	D	C	FAIL
2	B+	B1	FAIL
3	AA-	Aa3	PASS
4	D	C	FAIL
5	CCC+	Caa2	FAIL
6	N/A	Ba2	FAIL
7	A	A2	PASS
8	BBB-	Baa3	PASS
9	BBB+	Aa2	PASS
10	A	A2	PASS

Direct Parent			
Direct Parent Company ID	S&P Rating [Step 3]	Moody's Rating [Step 3]	Investment Grade [BBB- or above]
None	No Parent	No Parent	No Parent
2-P	B	B2	FAIL
None	No Parent	No Parent	No Parent
4-P	AA	Aa2	PASS
None	No Parent	No Parent	No Parent
6-P	N/A	Ba2	FAIL
None	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent
9-P	BBB+	A3	PASS
10-P	A	A2	PASS

Ultimate Parent			
Ultimate Parent Company ID	S&P Rating [Step 3]	Moody's Rating [Step 3]	Investment Grade [BBB- or above]
None	No Parent	No Parent	No Parent
2-UP	No data	No data	No data
None	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent
6-UP	BB	Ba2	FAIL
None	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent
9-UP	AA	Aa2	PASS
None	No Parent	No Parent	No Parent

Target ID	Overall Result
1	FAIL
2	FAIL
3	PASS
4	PASS - CG
5	FAIL
6	FAIL
7	PASS
8	PASS
9	PASS
10	PASS

*Disclaimer: This step-by-step analytical flow is based on anonymized data.

Step 4.C: Higher-than-Investment-Grade Test, Base Version

Actual Ratings

A rating of A- or above allows a company to self-insure 100 percent of obligations; a rating of BBB+ or BBB allows a company to self-insure 50 percent of obligations.

Anonymized data (in \$ millions)

Target			
Target Company ID	S&P Rating [Step 3]	Moody's Rating [Step 3]	Higher-than-Investment Grade [A- or above = pass; BBB+ or BBB = hybrid]
1	No Rating	No Rating	FAIL
2	No Rating	No Rating	FAIL
3	No Rating	No Rating	FAIL
4	No Rating	No Rating	FAIL
5	CCC+	Caa2	FAIL
6	No Rating	Ba2	FAIL
7	A	A2	PASS
8	BBB-	Baa3	FAIL
9	BBB+	Aa2	PASS
10	A	A2	PASS

Direct Parent			
Direct Parent Company ID	S&P Rating [Step 3]	Moody's Rating [Step 3]	Higher-than-Investment Grade [A- or above = pass; BBB+ or BBB = hybrid]
None	No Parent	No Parent	No Parent
2-P	No Rating	No Rating	FAIL
None	No Parent	No Parent	No Parent
4-P	No Rating	No Rating	FAIL
None	No Parent	No Parent	No Parent
6-P	No Rating	Ba2	FAIL
None	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent
9-P	BBB+	A3	PASS
10-P	A	A2	PASS

Ultimate Parent			
Ultimate Parent Company ID	S&P Rating [Step 3]	Moody's Rating [Step 3]	Higher-than-Investment Grade [A- or above = pass; BBB+ or BBB = hybrid]
None	No Parent	No Parent	No parent
2-UP	No Data	No Data	No data
None	No Parent	No Parent	No parent
None	No Parent	No Parent	No parent
None	No Parent	No Parent	No parent
6-UP	No Rating	No Rating	FAIL
None	No Parent	No Parent	No parent
None	No Parent	No Parent	No parent
9-UP	AA	Aa2	PASS
None	No Parent	No Parent	No parent

Target ID	Overall Result
1	FAIL
2	FAIL
3	FAIL
4	FAIL
5	FAIL
6	FAIL
7	PASS
8	FAIL
9	PASS
10	PASS

Step 4.C: Higher-than-Investment-Grade Test, Base Version

Actual and Implied Ratings

A rating of A- or above allows a company to self-insure 100 percent of obligations; a rating of BBB+ or BBB allows a company to self-insure 50 percent of obligations.

Anonymized data (in \$ millions)

Target			
Target Company ID	S&P Rating [Step 3]	Moody's Rating [Step 3]	Higher-than-Investment Grade [A- or above = pass; BBB+ or BBB = hybrid]
1	D	C	FAIL
2	B+	B1	FAIL
3	AA-	Aa3	PASS
4	D	C	FAIL
5	CCC+	Caa2	FAIL
6	N/A	Ba2	FAIL
7	A	A2	PASS
8	BBB-	Baa3	FAIL
9	BBB+	Aa2	PASS
10	A	A2	PASS

Direct Parent			
Direct Parent Company ID	S&P Rating [Step 3]	Moody's Rating [Step 3]	Higher-than-Investment Grade [A- or above = pass; BBB+ or BBB = hybrid]
None	No Parent	No Parent	No Parent
2-P	B	B2	FAIL
None	No Parent	No Parent	No Parent
4-P	AA	Aa2	PASS
None	No Parent	No Parent	No Parent
6-P	N/A	Ba2	FAIL
None	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent
9-P	BBB+	A3	PASS
10-P	A	A2	PASS

Ultimate Parent			
Ultimate Parent Company ID	S&P Rating [Step 3]	Moody's Rating [Step 3]	Higher-than-Investment Grade [A- or above = pass; BBB+ or BBB = hybrid]
None	No Parent	No Parent	No Parent
2-UP	No data	No data	No data
None	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent
6-UP	BB	Ba2	FAIL
None	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent
9-UP	AA	Aa2	PASS
None	No Parent	No Parent	No Parent

Target ID	Overall Result
1	FAIL
2	FAIL
3	PASS
4	PASS - CG
5	FAIL
6	FAIL
7	PASS
8	FAIL
9	PASS
10	PASS

*Disclaimer: This step-by-step analytical flow is based on anonymized data.

Step 4.D: Higher-than-Investment-Grade Test with TNW and U.S. Assets Thresholds
Final Version, Co-Proposed as Option 2 for Financial Test
Actual Ratings

A rating of A- or above allows a company to self-insure 100 percent of obligations; a rating of BBB+ or BBB allows a company to self-insure 50 percent of obligations.

Anonymized data (in \$ millions)

Target						
Target Company ID	S&P Rating [Step 3]	Moody's Rating [Step 3]	Higher-than-Investment Grade A [Step 4C]	TNW Threshold B [Part 2b of 4A.1]	US Assets Threshold C [Part D of 4A.1]	Overall Result A & B & C
1	No Rating	No Rating	FAIL	FAIL	PASS	FAIL
2	No Rating	No Rating	FAIL	PASS	PASS	FAIL
3	No Rating	No Rating	FAIL	PASS	PASS	FAIL
4	No Rating	No Rating	FAIL	FAIL	PASS	FAIL
5	CCC+	Caa2	FAIL	PASS	PASS	FAIL
6	No Rating	Ba2	FAIL	PASS	PASS	FAIL
7	A	A2	PASS	PASS	PASS	PASS
8	BBB-	Baa3	FAIL	PASS	PASS	FAIL
9	BBB+	Aa2	PASS	PASS	PASS	PASS
10	A	A2	PASS	No data	PASS	FAIL

Direct Parent						
Direct Parent Company ID	S&P Rating [Step 3]	Moody's Rating [Step 3]	Higher-than-Investment Grade [Step 4C]	TNW Threshold B [Part 2b of 4A.1]	US Assets Threshold C [Part D of 4A.1]	Overall Result A & B & C
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
2-P	No Rating	No Rating	FAIL	PASS	PASS	FAIL
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
4-P	No Rating	No Rating	FAIL	PASS	PASS	FAIL
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
6-P	No Rating	Ba2	FAIL	FAIL	PASS	FAIL
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
9-P	BBB+	A3	PASS	PASS	PASS	PASS
10-P	A	A2	PASS	PASS	PASS	PASS

Ultimate Parent						
Ultimate Parent Company ID	S&P Rating [Step 3]	Moody's Rating [Step 3]	Higher-than-Investment Grade [Step 4C]	TNW Threshold B [Part 2b of 4A.1]	US Assets Threshold C [Part D of 4A.1]	Overall Result A & B & C
None	No Parent	No Parent	No parent	No Parent	No Parent	No Parent
2-UP	No Data	No Data	No data	No data	PASS	FAIL
None	No Parent	No Parent	No parent	No Parent	No Parent	No Parent
None	No Parent	No Parent	No parent	No Parent	No Parent	No Parent
None	No Parent	No Parent	No parent	No Parent	No Parent	No Parent
6-UP	No Rating	No Rating	FAIL	FAIL	PASS	FAIL
None	No Parent	No Parent	No parent	No Parent	No Parent	No Parent
None	No Parent	No Parent	No parent	No Parent	No Parent	No Parent
9-UP	AA	Aa2	PASS	No data	PASS	FAIL
None	No Parent	No Parent	No parent	No Parent	No Parent	No Parent

Target ID	Overall Result
1	FAIL
2	FAIL
3	FAIL
4	FAIL
5	FAIL
6	FAIL
7	PASS
8	FAIL
9	PASS
10	PASS - CG

Step 4.D: Higher-than-Investment-Grade Test with TNW and U.S. Assets Thresholds
Final Version, Co-Proposed as Option 2 for Financial Test
Actual and Implied Ratings

A rating of A- or above allows a company to self-insure 100 percent of obligations; a rating of BBB+ or BBB allows a company to self-insure 50 percent of obligations.

Anonymized data (in \$ millions)

Target						
Target Company ID	S&P Rating [Step 3]	Moody's Rating [Step 3]	Higher-than-Investment Grade [Step 4C]	TNW Threshold B [Part 2b of 4A.1]	US Assets Threshold C [Part D of 4A.1]	Overall Result A & B & C
1	D	C	FAIL	FAIL	PASS	FAIL
2	B+	B1	FAIL	PASS	PASS	FAIL
3	AA-	Aa3	PASS	PASS	PASS	PASS
4	D	C	FAIL	FAIL	PASS	FAIL
5	CCC+	Caa2	FAIL	PASS	PASS	FAIL
6	N/A	Ba2	FAIL	PASS	PASS	FAIL
7	A	A2	PASS	PASS	PASS	PASS
8	BBB-	Baa3	FAIL	PASS	PASS	FAIL
9	BBB+	Aa2	PASS	PASS	PASS	PASS
10	A	A2	PASS	No data	PASS	FAIL

Direct Parent						
Direct Parent Company ID	S&P Rating [Step 3]	Moody's Rating [Step 3]	Higher-than-Investment Grade [Step 4C]	TNW Threshold B [Part 2b of 4A.1]	US Assets Threshold C [Part D of 4A.1]	Overall Result A & B & C
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
2-P	B	B2	FAIL	PASS	PASS	FAIL
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
4-P	AA	Aa2	PASS	PASS	PASS	PASS
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
6-P	N/A	Ba2	FAIL	FAIL	PASS	FAIL
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
9-P	BBB+	A3	PASS	PASS	PASS	PASS
10-P	A	A2	PASS	PASS	PASS	PASS

Ultimate Parent						
Ultimate Parent Company ID	S&P Rating [Step 3]	Moody's Rating [Step 3]	Higher-than-Investment Grade [Step 4C]	TNW Threshold B [Part 2b of 4A.1]	US Assets Threshold C [Part D of 4A.1]	Overall Result A & B & C
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
2-UP	No data	No data	No data	No data	PASS	FAIL
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
6-UP	BB	Ba2	FAIL	FAIL	PASS	FAIL
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
9-UP	AA	Aa2	PASS	No data	PASS	FAIL
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent

Target ID	Overall Result
1	FAIL
2	FAIL
3	PASS
4	PASS - CG
5	FAIL
6	FAIL
7	PASS
8	FAIL
9	PASS
10	PASS - CG

*Disclaimer: This step-by-step analytical flow is based on anonymized data.

Step 4.E: Summary of Tests Results

Actual Ratings

Anonymized data (in \$ millions)

Target				
Target Company ID	RCRA Subtitle C	Investment Grade	Higher-than-Investment Grade, Base Version	Higher-than-Investment Grade with TNW and U.S. Assets Thresholds, Final Version Co-Proposed as Option 2 for Financial Test
	[Step 4.A3]	[Step 4.B]	[Step 4.C]	[Step 4.D]
1	FAIL	FAIL	FAIL	FAIL
2	FAIL	FAIL	FAIL	FAIL
3	FAIL	FAIL	FAIL	FAIL
4	FAIL	FAIL	FAIL	FAIL
5	PASS	FAIL	FAIL	FAIL
6	PASS	FAIL	FAIL	FAIL
7	PASS	PASS	PASS	PASS
8	PASS	PASS	FAIL	FAIL
9	PASS	PASS	PASS	PASS
10	FAIL	PASS	PASS	FAIL

Direct Parent				
Direct Parent Company ID	RCRA Subtitle C	Investment Grade	Higher-than-Investment Grade, Base Version	Higher-than-Investment Grade with TNW and U.S. Assets Thresholds, Final Version Co-Proposed as Option 2 for Financial Test
	[Step 4.A3]	[Step 4.B]	[Step 4.C]	[Step 4.D]
None	No Parent	No Parent	No Parent	No Parent
2-P	PASS	FAIL	FAIL	FAIL
None	No Parent	No Parent	No Parent	No Parent
4-P	FAIL	FAIL	FAIL	FAIL
None	No Parent	No Parent	No Parent	No Parent
6-P	FAIL	FAIL	FAIL	FAIL
None	No Parent	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent	No Parent
9-P	PASS	PASS	PASS	PASS
10-P	PASS	PASS	PASS	PASS

Ultimate Parent				
Ultimate Parent Company ID	RCRA Subtitle C	Investment Grade	Higher-than-Investment Grade, Base Version	Higher-than-Investment Grade with TNW and U.S. Assets Thresholds, Final Version Co-Proposed as Option 2 for Financial Test
	[Step 4.A3]	[Step 4.B]	[Step 4.C]	[Step 4.D]
None	No parent	No parent	No parent	No Parent
2-UP	FAIL	No data	No data	FAIL
None	No parent	No parent	No parent	No Parent
None	No parent	No parent	No parent	No Parent
None	No parent	No parent	No parent	No Parent
6-UP	FAIL	FAIL	FAIL	FAIL
None	No parent	No parent	No parent	No Parent
None	No parent	No parent	No parent	No Parent
9-UP	FAIL	PASS	PASS	FAIL
None	No parent	No parent	No parent	No Parent

Overall Results for Corporate Hierarchy

Target ID	RCRA Subtitle C	Investment Grade	Higher-than-Investment Grade, Base Version	Higher-than-Investment Grade with TNW and U.S. Assets Thresholds, Final Version Co-Proposed as Option 2 for Financial Test
1	FAIL	FAIL	FAIL	FAIL
2	PASS - CG	FAIL	FAIL	FAIL
3	FAIL	FAIL	FAIL	FAIL
4	FAIL	FAIL	FAIL	FAIL
5	PASS	FAIL	FAIL	FAIL
6	PASS	FAIL	FAIL	FAIL
7	PASS	PASS	PASS	PASS
8	PASS	PASS	FAIL	FAIL
9	PASS	PASS	PASS	PASS
10	PASS - CG	PASS	PASS	PASS - CG

Step 4.E: Summary of Tests Results

Actual and Implied Ratings

Anonymized data (in \$ millions)

Target				
Target Company ID	RCRA Subtitle C	Investment Grade	Higher-than-Investment Grade, Base Version	Higher-than-Investment Grade with TNW and U.S. Assets Thresholds, Final Version Co-Proposed as Option 2 for Financial Test
	[Step 4.A3]	[Step 4.B]	[Step 4.C]	[Step 4.D]
1	FAIL	FAIL	FAIL	FAIL
2	FAIL	FAIL	FAIL	FAIL
3	PASS	PASS	PASS	PASS
4	FAIL	FAIL	FAIL	FAIL
5	PASS	FAIL	FAIL	FAIL
6	PASS	FAIL	FAIL	FAIL
7	PASS	PASS	PASS	PASS
8	PASS	PASS	FAIL	FAIL
9	PASS	PASS	PASS	PASS
10	FAIL	PASS	PASS	FAIL

Direct Parent				
Direct Parent Company ID	RCRA Subtitle C	Investment Grade	Higher-than-Investment Grade, Base Version	Higher-than-Investment Grade with TNW and U.S. Assets Thresholds, Final Version Co-Proposed as Option 2 for Financial Test
	[Step 4.A3]	[Step 4.B]	[Step 4.C]	[Step 4.D]
None	No Parent	No Parent	No Parent	No Parent
2-P	PASS	FAIL	FAIL	FAIL
None	No Parent	No Parent	No Parent	No Parent
4-P	PASS	PASS	PASS	PASS
None	No Parent	No Parent	No Parent	No Parent
6-P	FAIL	FAIL	FAIL	FAIL
None	No Parent	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent	No Parent
9-P	PASS	PASS	PASS	PASS
10-P	PASS	PASS	PASS	PASS

Ultimate Parent				
Ultimate Parent Company ID	RCRA Subtitle C	Investment Grade	Higher-than-Investment Grade, Base Version	Higher-than-Investment Grade with TNW and U.S. Assets Thresholds, Final Version Co-Proposed as Option 2 for Financial Test
	[Step 4.A3]	[Step 4.B]	[Step 4.C]	[Step 4.D]
None	No Parent	No Parent	No Parent	No Parent
2-UP	FAIL	No data	No data	FAIL
None	No Parent	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent	No Parent
6-UP	FAIL	FAIL	FAIL	FAIL
None	No Parent	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent	No Parent
9-UP	FAIL	PASS	PASS	FAIL
None	No Parent	No Parent	No Parent	No Parent

Overall Results for Corporate Hierarchy

Target ID	RCRA Subtitle C	Investment Grade	Higher-than-Investment Grade, Base Version	Higher-than-Investment Grade with TNW and U.S. Assets Thresholds, Final Version Co-Proposed as Option 2 for Financial Test
1	FAIL	FAIL	FAIL	FAIL
2	PASS - CG	FAIL	FAIL	FAIL
3	FAIL	FAIL	PASS	PASS
4	PASS - CG	PASS - CG	PASS - CG	PASS - CG
5	PASS	FAIL	FAIL	FAIL
6	PASS	FAIL	FAIL	FAIL
7	PASS	PASS	PASS	PASS
8	PASS	PASS	FAIL	FAIL
9	PASS	PASS	PASS	PASS
10	PASS - CG	PASS	PASS	PASS - CG

*Disclaimer: This step-by-step analytical flow is based on anonymized data.

Step 5.A: Company-Level WACCs

If a company has available WACC data, its WACC is directly used [A]. Otherwise, this step extrapolates the company's WACC [J] based on its probability of default [B]. See Exhibit 24 for additional information. The curve in Exhibit 24 yields the inputs used in [E] and [F] that inform the extrapolation of the WACC.

Target Company ID	WACC A	P(Default) B [Step 3]	ln(WACC) C = ln(B)	ln(P(Default)) D = ln(B)	Coeff E [Ex. 24]	Constant F [Ex. 24]	Estimated ln(WACC) I=D*E+F	Estimated WACC J=exp(I)	WACC K = A or J
1	7.85%	100.00%	-2.54	0.00	0.25	-2.58	-2.58	7.58%	7.85%
2	0.18%	10.15%	-6.31	-2.29	0.25	-2.58	-3.15	4.29%	0.18%
3	Not available	0.20%	Not available	-6.21	0.25	-2.58	-4.13	1.61%	1.61%
4	7.97%	100.00%	-2.53	0.00	0.25	-2.58	-2.58	7.58%	7.97%
5	1.53%	41.23%	-4.18	-0.89	0.25	-2.58	-2.80	6.08%	1.53%
6	Not available	4.07%	Not available	-3.20	0.25	-2.58	-3.38	3.42%	3.42%
7	6.51%	0.27%	-2.73	-5.91	0.25	-2.58	-4.05	1.74%	6.51%
8	Not available	1.73%	Not available	-4.06	0.25	-2.58	-3.59	2.76%	2.76%
9	0.02%	0.66%	-8.76	-5.02	0.25	-2.58	-3.83	2.17%	0.02%
10	2.26%	0.27%	-3.79	-5.91	0.25	-2.58	-4.05	1.74%	2.26%

Direct Parent ID	WACC A	P(Default) B [Step 3]	ln(WACC) C = ln(B)	ln(P(Default)) D = ln(B)	Coeff E [Ex. 24]	Constant F [Ex. 24]	Estimated ln(WACC) I=D*E+F	Estimated WACC J=exp(I)	WACC K = A or J
None	No parent	No parent	No parent	No parent	No parent	No parent	No parent	No parent	No parent
2-P	Not available	15.19%	Not available	-1.88	0.25	-2.58	-3.05	4.74%	4.74%
None	No parent	No parent	No parent	No parent	No parent	No parent	No parent	No parent	No parent
4-P	Not available	0.09%	Not available	-7.01	0.25	-2.58	-4.33	1.32%	1.32%
None	No parent	No parent	No parent	No parent	No parent	No parent	No parent	No parent	No parent
6-P	4.47%	4.07%	-310.87%	-3.20	0.25	-2.58	-3.38	3.42%	4.47%
None	No parent	No parent	No parent	No parent	No parent	No parent	No parent	No parent	No parent
None	No parent	No parent	No parent	No parent	No parent	No parent	No parent	No parent	No parent
9-P	0.02%	0.66%	-8.76	-5.02	0.25	-2.58	-3.83	2.17%	0.02%
10-P	Not available	0.27%	Not available	-5.91	0.25	-2.58	-4.05	1.74%	1.74%

Ultimate Parent ID	WACC A	P(Default) B [Step 3]	ln(WACC) C = ln(B)	ln(P(Default)) D = ln(B)	Coeff E [Ex. 24]	Constant F [Ex. 24]	Estimated ln(WACC) I=D*E+F	Estimated WACC J=exp(I)	WACC K = A or J
None	No parent	No parent	No parent	No parent	No parent	No parent	No parent	No parent	No parent
2-UP	Not available	Not available	Not available	Not available	Not available	Not available	Not available	Not available	Not available
None	No parent	No parent	No parent	No parent	No parent	No parent	No parent	No parent	No parent
None	No parent	No parent	No parent	No parent	No parent	No parent	No parent	No parent	No parent
None	No parent	No parent	No parent	No parent	No parent	No parent	No parent	No parent	No parent
6-UP	Not available	4.07%	Not available	-320.15%	24.90%	-257.97%	-337.69%	3.42%	3.42%
None	No parent	No parent	No parent	No parent	No parent	No parent	No parent	No parent	No parent
None	No parent	No parent	No parent	No parent	No parent	No parent	No parent	No parent	No parent
9-UP	Not available	0.09%	Not available	-701.31%	24.90%	-257.97%	-432.60%	1.32%	1.32%
None	No parent	No parent	No parent	No parent	No parent	No parent	No parent	No parent	No parent

*Disclaimer: This step-by-step analytical flow is based on anonymized data.

Step 5.B: Third-Party Instrument Cost Elements (Letter of Credit)

See Section 4.3.4. The cost of a letter credit is estimated based on the company's probability of default [A]. The commission rate [F] scales linearly between 0.6% and 2.0% with the probability of default. The collateral amount (as a proportion of total obligation amount) [G] scales linearly based on probability of default from 20% to 100%. Companies with a probability of default of 48% or higher must set aside 100% of the obligation in a collateral account.

Target Company ID	P(default) A [Step 3]	Max Commission B = 2% [Ex. 20]	Min Commission C = 0.6% [Ex. 20]	Max Collateral D = 100% [Ex. 21]	Min Collateral E = 20% [Ex. 21]	Estimated Commission Fee F = A * (B - C) + C	Estimated Collateral Amount G = A * (0.8 / 0.48) + E
1	100.00%	2.00%	0.60%	100.00%	20.00%	2.00%	100.00%
2	10.15%	2.00%	0.60%	100.00%	20.00%	0.74%	36.92%
3	0.20%	2.00%	0.60%	100.00%	20.00%	0.60%	20.33%
4	100.00%	2.00%	0.60%	100.00%	20.00%	2.00%	100.00%
5	41.23%	2.00%	0.60%	100.00%	20.00%	1.18%	88.72%
6	4.07%	2.00%	0.60%	100.00%	20.00%	0.66%	26.78%
7	0.27%	2.00%	0.60%	100.00%	20.00%	0.60%	20.45%
8	1.73%	2.00%	0.60%	100.00%	20.00%	0.62%	22.88%
9	0.66%	2.00%	0.60%	100.00%	20.00%	0.61%	21.10%
10	0.27%	2.00%	0.60%	100.00%	20.00%	0.60%	20.45%

Direct Parent ID	P(default) A [Step 3]	Max Commission B = 2% [Ex. 20]	Min Commission C = 0.6% [Ex. 20]	Max Collateral D = 100% [Ex. 21]	Min Collateral E = 20% [Ex. 21]	Estimated Commission Fee F = A * (B - C) + C	Estimated Collateral Amount G = A * (0.8 / 0.48) + E
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
2-P	15.19%	2.00%	0.60%	100.00%	20.00%	0.81%	45.32%
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
4-P	0.09%	2.00%	0.60%	100.00%	20.00%	0.60%	20.15%
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
6-P	4.07%	2.00%	0.60%	100.00%	20.00%	0.66%	26.78%
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
9-P	0.66%	2.00%	0.60%	100.00%	20.00%	0.61%	21.10%
10-P	0.27%	2.00%	0.60%	100.00%	20.00%	0.60%	20.45%

Ultimate Parent ID	P(default) A [Step 3]	Max Commission B = 2% [Ex. 20]	Min Commission C = 0.6% [Ex. 20]	Max Collateral D = 100% [Ex. 21]	Min Collateral E = 20% [Ex. 21]	Estimated Commission Fee F = A * (B - C) + C	Estimated Collateral Amount G = A * (0.8 / 0.48) + E
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
2-UP	Not Available	2.00%	0.60%	100.00%	20.00%	Not Available	Not Available
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
6-UP	4.07%	2.00%	0.60%	100.00%	20.00%	0.66%	26.78%
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent
9-UP	0.09%	2.00%	0.60%	100.00%	20.00%	0.60%	20.15%
None	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent	No Parent

*Disclaimer: This step-by-step analytical flow is based on anonymized data.

Step 6.A: Industry and Government Costs, RCRA Subtitle C Financial Test

Actual Ratings

Industry Cost - Anonymized data (in \$ millions)

Target Company ID	Financial Test Result [Step 4.A3]	Responsible Company [Step 4.A3]	Obligation Amount A = \$50M if FAIL	Commission Rate B [Step 5.B]	Three-Year Commission Fee Cost C = A * B * 3	Collateral Proportion D [Step 5.B]	Collateral Deposit E = D * A	WACC F [Step 5.A]	Three-Year Future Value at WACC G = E * (1 + F)^3	Three-Year Future Value at Risk-Free Rate H = E * (1 + 0.15%) ^ 3	Incremental Collateral Cost I = G - H	Three-Year Industry Cost J = C + I
1	FAIL	1	\$50	2.00%	\$3.00	100.00%	\$50.00	7.85%	\$62.72	\$50.23	\$12.50	\$15.50
2	PASS - CG	2-P	\$0	0.81%	\$0.00	45.32%	\$0.00	4.74%	\$0.00	\$0.00	\$0.00	\$0.00
3	FAIL	3	\$50	0.60%	\$0.90	20.33%	\$10.17	1.61%	\$10.67	\$10.21	\$0.45	\$1.36
4	FAIL	4	\$50	2.00%	\$3.00	100.00%	\$50.00	7.97%	\$62.93	\$50.23	\$12.71	\$15.71
5	PASS	5	\$0	1.18%	\$0.00	88.72%	\$0.00	1.53%	\$0.00	\$0.00	\$0.00	\$0.00
6	PASS	6	\$0	0.66%	\$0.00	26.78%	\$0.00	3.42%	\$0.00	\$0.00	\$0.00	\$0.00
7	PASS	7	\$0	0.60%	\$0.00	20.45%	\$0.00	6.51%	\$0.00	\$0.00	\$0.00	\$0.00
8	PASS	8	\$0	0.62%	\$0.00	22.88%	\$0.00	2.76%	\$0.00	\$0.00	\$0.00	\$0.00
9	PASS	9	\$0	0.61%	\$0.00	21.10%	\$0.00	0.02%	\$0.00	\$0.00	\$0.00	\$0.00
10	PASS - CG	10-P	\$0	0.60%	\$0.00	20.45%	\$0.00	1.74%	\$0.00	\$0.00	\$0.00	\$0.00

Target Company ID	Financial Test Result [Step 4.A3]	Responsible Company [Step 4.A3]	Probability of Default (Three-Year) K [Step 3]	Self-Insured Obligation Amount L = \$50M if PASS	Three-Year Government Expected Default Risk M = K * L
1	FAIL	1	100.00%	\$0	\$0.00
2	PASS - CG	2-P	15.19%	\$50	\$7.60
3	FAIL	3	0.20%	\$0	\$0.00
4	FAIL	4	100.00%	\$0	\$0.00
5	PASS	5	41.23%	\$50	\$20.62
6	PASS	6	4.07%	\$50	\$2.04
7	PASS	7	0.27%	\$50	\$0.14
8	PASS	8	1.73%	\$50	\$0.87
9	PASS	9	0.66%	\$50	\$0.33
10	PASS - CG	10-P	0.27%	\$50	\$0.14

Step 6.A: Industry and Government Costs, RCRA Subtitle C Financial Test

Actual and Implied Ratings

Industry Cost - Anonymized data (in \$ millions)

Target Company ID	Financial Test Result [Step 4.A3]	Responsible Company [Step 4.A3]	Obligation Amount A = \$50M if FAIL	Commission Rate B [Step 5.B]	Three-Year Commission Fee Cost C = A * B * 3	Collateral Proportion D [Step 5.B]	Collateral Deposit E = D * A	WACC F [Step 5.A]	Three-Year Future Value at WACC G = E * (1 + F)^3	Three-Year Future Value at Risk-Free Rate H = E * (1 + 0.15%) ^ 3	Incremental Collateral Cost I = G - H	Three-Year Industry Cost J = C + I
1	FAIL	1	\$50	2.00%	\$3.00	100.00%	\$50.00	7.85%	\$62.72	\$50.23	\$12.50	\$15.50
2	PASS - CG	2-P	\$0	0.81%	\$0.00	45.32%	\$0.00	4.74%	\$0.00	\$0.00	\$0.00	\$0.00
3	PASS	3	\$0	0.60%	\$0.00	20.33%	\$0.00	1.61%	\$0.00	\$0.00	\$0.00	\$0.00
4	PASS - CG	4-P	\$0	0.60%	\$0.00	20.15%	\$0.00	1.32%	\$0.00	\$0.00	\$0.00	\$0.00
5	PASS	5	\$0	1.18%	\$0.00	88.72%	\$0.00	1.53%	\$0.00	\$0.00	\$0.00	\$0.00
6	PASS	6	\$0	0.66%	\$0.00	26.78%	\$0.00	3.42%	\$0.00	\$0.00	\$0.00	\$0.00
7	PASS	7	\$0	0.60%	\$0.00	20.45%	\$0.00	6.51%	\$0.00	\$0.00	\$0.00	\$0.00
8	PASS	8	\$0	0.62%	\$0.00	22.88%	\$0.00	2.76%	\$0.00	\$0.00	\$0.00	\$0.00
9	PASS	9	\$0	0.61%	\$0.00	21.10%	\$0.00	0.02%	\$0.00	\$0.00	\$0.00	\$0.00
10	PASS - CG	10-P	\$0	0.60%	\$0.00	20.45%	\$0.00	1.74%	\$0.00	\$0.00	\$0.00	\$0.00

Target Company ID	Financial Test Result [Step 4.A3]	Responsible Company [Step 4.A3]	Probability of Default (Three-Year) K [Step 3]	Self-Insured Obligation Amount L = \$50M if PASS	Three-Year Government Expected Default Risk M = K * L
1	FAIL	1	100.00%	\$0	\$0.00
2	PASS - CG	2-P	15.19%	\$50	\$7.60
3	PASS	3	0.20%	\$50	\$0.10
4	PASS - CG	4-P	0.09%	\$50	\$0.05
5	PASS	5	41.23%	\$50	\$20.62
6	PASS	6	4.07%	\$50	\$2.04
7	PASS	7	0.27%	\$50	\$0.14
8	PASS	8	1.73%	\$50	\$0.87
9	PASS	9	0.66%	\$50	\$0.33
10	PASS - CG	10-P	0.27%	\$50	\$0.14

*Disclaimer: This step-by-step analytical flow is based on anonymized data.

Step 6.B: Industry and Government Costs, Investment Grade Test

Actual Ratings

Industry Cost - Anonymized data (in \$ millions)

Target Company ID	Financial Test Result [Step 4.A3]	Responsible Company [Step 4.A3]	Obligation Amount A = \$50M if FAIL	Commission Rate B [Step 5.B]	Three-Year Commission Fee Cost C = A * B * 3	Collateral Proportion D [Step 5.B]	Collateral Deposit E = D * A	WACC F [Step 5.A]	Three-Year Future Value at WACC G = E * (1 + F)^3	Three-Year Future Value at Risk-Free Rate H = E * (1 + 0.15%) ^ 3	Incremental Collateral Cost I = G - H	Three-Year Industry Cost J = C + I
1	FAIL	1	\$50	2.00%	\$3.00	100.00%	\$50.00	7.85%	\$62.72	\$50.23	\$12.50	\$15.50
2	FAIL	2	\$50	0.74%	\$1.11	36.92%	\$18.46	0.18%	\$18.56	\$18.54	\$0.02	\$1.13
3	FAIL	3	\$50	0.60%	\$0.90	20.33%	\$10.17	1.61%	\$10.67	\$10.21	\$0.45	\$1.36
4	FAIL	4	\$50	2.00%	\$3.00	100.00%	\$50.00	7.97%	\$62.93	\$50.23	\$12.71	\$15.71
5	FAIL	5	\$50	1.18%	\$1.77	88.72%	\$44.36	1.53%	\$46.42	\$44.56	\$1.86	\$3.63
6	FAIL	6	\$50	0.66%	\$0.99	26.78%	\$13.39	3.42%	\$14.81	\$13.45	\$1.36	\$2.34
7	PASS	7	\$0	0.60%	\$0.00	20.45%	\$0.00	6.51%	\$0.00	\$0.00	\$0.00	\$0.00
8	PASS	8	\$0	0.62%	\$0.00	22.88%	\$0.00	2.76%	\$0.00	\$0.00	\$0.00	\$0.00
9	PASS	9	\$0	0.61%	\$0.00	21.10%	\$0.00	0.02%	\$0.00	\$0.00	\$0.00	\$0.00
10	PASS	10	\$0	0.60%	\$0.00	20.45%	\$0.00	2.26%	\$0.00	\$0.00	\$0.00	\$0.00

Target Company ID	Financial Test Result [Step 4.A3]	Responsible Company [Step 4.A3]	Probability of Default (Three-Year) K [Step 3]	Self-Insured Obligation Amount L = \$50M if PASS	Three-Year Government Expected Default Risk M = K * L
1	FAIL	1	100.00%	\$0	\$0.00
2	FAIL	2	10.15%	\$0	\$0.00
3	FAIL	3	0.20%	\$0	\$0.00
4	FAIL	4	100.00%	\$0	\$0.00
5	FAIL	5	41.23%	\$0	\$0.00
6	FAIL	6	4.07%	\$0	\$0.00
7	PASS	7	0.27%	\$50	\$0.14
8	PASS	8	1.73%	\$50	\$0.87
9	PASS	9	0.66%	\$50	\$0.33
10	PASS	10	0.27%	\$50	\$0.14

Step 6.B: Industry and Government Costs, Investment Grade Test

Actual and Implied Ratings

Industry Cost - Anonymized data (in \$ millions)

Target Company ID	Financial Test Result [Step 4.A3]	Responsible Company [Step 4.A3]	Obligation Amount A = \$50M if FAIL	Commission Rate B [Step 5.B]	Three-Year Commission Fee Cost C = A * B * 3	Collateral Proportion D [Step 5.B]	Collateral Deposit E = D * A	WACC F [Step 5.A]	Three-Year Future Value at WACC G = E * (1 + F)^3	Three-Year Future Value at Risk-Free Rate H = E * (1 + 0.15%) ^ 3	Incremental Collateral Cost I = G - H	Three-Year Industry Cost J = C + I
1	FAIL	1	\$50	2.00%	\$3.00	100.00%	\$50.00	7.85%	\$62.72	\$50.23	\$12.50	\$15.50
2	FAIL	2	\$50	0.74%	\$1.11	36.92%	\$18.46	0.18%	\$18.56	\$18.54	\$0.02	\$1.13
3	PASS	3	\$0	0.60%	\$0.00	20.33%	\$0.00	1.61%	\$0.00	\$0.00	\$0.00	\$0.00
4	PASS - CG	4-P	\$0	0.60%	\$0.00	20.15%	\$0.00	1.32%	\$0.00	\$0.00	\$0.00	\$0.00
5	FAIL	5	\$50	1.18%	\$1.77	88.72%	\$44.36	1.53%	\$46.42	\$44.56	\$1.86	\$3.63
6	FAIL	6	\$50	0.66%	\$0.99	26.78%	\$13.39	3.42%	\$14.81	\$13.45	\$1.36	\$2.34
7	PASS	7	\$0	0.60%	\$0.00	20.45%	\$0.00	6.51%	\$0.00	\$0.00	\$0.00	\$0.00
8	PASS	8	\$0	0.62%	\$0.00	22.88%	\$0.00	2.76%	\$0.00	\$0.00	\$0.00	\$0.00
9	PASS	9	\$0	0.61%	\$0.00	21.10%	\$0.00	0.02%	\$0.00	\$0.00	\$0.00	\$0.00
10	PASS	10	\$0	0.60%	\$0.00	20.45%	\$0.00	2.26%	\$0.00	\$0.00	\$0.00	\$0.00

Target Company ID	Financial Test Result [Step 4.A3]	Responsible Company [Step 4.A3]	Probability of Default (Three-Year) K [Step 3]	Self-Insured Obligation Amount L = \$50M if PASS	Three-Year Government Expected Default Risk M = K * L
1	FAIL	1	100.00%	\$0	\$0.00
2	FAIL	2	10.15%	\$0	\$0.00
3	PASS	3	0.20%	\$50	\$0.10
4	PASS - CG	4-P	0.09%	\$50	\$0.05
5	FAIL	5	41.23%	\$0	\$0.00
6	FAIL	6	4.07%	\$0	\$0.00
7	PASS	7	0.27%	\$50	\$0.14
8	PASS	8	1.73%	\$50	\$0.87
9	PASS	9	0.66%	\$50	\$0.33
10	PASS	10	0.27%	\$50	\$0.14

*Disclaimer: This step-by-step analytical flow is based on anonymized data.

Step 6.C: Industry and Government Costs, Higher-than-Investment Grade Test, Base Version

Actual Ratings

Industry Cost - Anonymized data (in \$ millions)

Target Company ID	Financial Test Result [Step 4.A3]	Responsible Company [Step 4.A3]	Obligation Amount A = \$50M if FAIL	Commission Rate B [Step 5.B]	Three-Year Commission Fee Cost C = A * B * 3	Collateral Proportion D [Step 5.B]	Collateral Deposit E = D * A	WACC F [Step 5.A]	Three-Year Future Value at WACC G = E * (1 + F)^3	Three-Year Future Value at Risk-Free Rate H = E * (1 + 0.15%) ^ 3	Incremental Collateral Cost I = G - H	Three-Year Industry Cost J = C + I
1	FAIL	1	\$50	2.00%	\$3.00	100.00%	\$50.00	7.85%	\$62.72	\$50.23	\$12.50	\$15.50
2	FAIL	2	\$50	0.74%	\$1.11	36.92%	\$18.46	0.18%	\$18.56	\$18.54	\$0.02	\$1.13
3	FAIL	3	\$50	0.60%	\$0.90	20.33%	\$10.17	1.61%	\$10.67	\$10.21	\$0.45	\$1.36
4	FAIL	4	\$50	2.00%	\$3.00	100.00%	\$50.00	7.97%	\$62.93	\$50.23	\$12.71	\$15.71
5	FAIL	5	\$50	1.18%	\$1.77	88.72%	\$44.36	1.53%	\$46.42	\$44.56	\$1.86	\$3.63
6	FAIL	6	\$50	0.66%	\$0.99	26.78%	\$13.39	3.42%	\$14.81	\$13.45	\$1.36	\$2.34
7	PASS	7	\$0	0.60%	\$0.00	20.45%	\$0.00	6.51%	\$0.00	\$0.00	\$0.00	\$0.00
8	FAIL	8	\$50	0.62%	\$0.94	22.88%	\$11.44	2.76%	\$12.42	\$11.49	\$0.92	\$1.86
9	PASS	9	\$0	0.61%	\$0.00	21.10%	\$0.00	0.02%	\$0.00	\$0.00	\$0.00	\$0.00
10	PASS	10	\$0	0.60%	\$0.00	20.45%	\$0.00	2.26%	\$0.00	\$0.00	\$0.00	\$0.00

Target Company ID	Financial Test Result [Step 4.A3]	Responsible Company [Step 4.A3]	Probability of Default (Three-Year) K [Step 3]	Self-Insured Obligation Amount L = \$50M if PASS	Three-Year Government Expected Default Risk M = K * L
1	FAIL	1	100.00%	\$0	\$0.00
2	FAIL	2	10.15%	\$0	\$0.00
3	FAIL	3	0.20%	\$0	\$0.00
4	FAIL	4	100.00%	\$0	\$0.00
5	FAIL	5	41.23%	\$0	\$0.00
6	FAIL	6	4.07%	\$0	\$0.00
7	PASS	7	0.27%	\$50	\$0.14
8	FAIL	8	1.73%	\$0	\$0.00
9	PASS	9	0.66%	\$50	\$0.33
10	PASS	10	0.27%	\$50	\$0.14

Step 6.C: Industry and Government Costs, Higher-than-Investment Grade Test

Actual and Implied Ratings

Industry Cost - Anonymized data (in \$ millions)

Target Company ID	Financial Test Result [Step 4.A3]	Responsible Company [Step 4.A3]	Obligation Amount A = \$50M if FAIL	Commission Rate B [Step 5.B]	Three-Year Commission Fee Cost C = A * B * 3	Collateral Proportion D [Step 5.B]	Collateral Deposit E = D * A	WACC F [Step 5.A]	Three-Year Future Value at WACC G = E * (1 + F)^3	Three-Year Future Value at Risk-Free Rate H = E * (1 + 0.15%) ^ 3	Incremental Collateral Cost I = G - H	Three-Year Industry Cost J = C + I
1	FAIL	1	\$50	2.00%	\$3.00	100.00%	\$50.00	7.85%	\$62.72	\$50.23	\$12.50	\$15.50
2	FAIL	2	\$50	0.74%	\$1.11	36.92%	\$18.46	0.18%	\$18.56	\$18.54	\$0.02	\$1.13
3	PASS	3	\$0	0.60%	\$0.00	20.33%	\$0.00	1.61%	\$0.00	\$0.00	\$0.00	\$0.00
4	PASS - CG	4-P	\$0	0.60%	\$0.00	20.15%	\$0.00	1.32%	\$0.00	\$0.00	\$0.00	\$0.00
5	FAIL	5	\$50	1.18%	\$1.77	88.72%	\$44.36	1.53%	\$46.42	\$44.56	\$1.86	\$3.63
6	FAIL	6	\$50	0.66%	\$0.99	26.78%	\$13.39	3.42%	\$14.81	\$13.45	\$1.36	\$2.34
7	PASS	7	\$0	0.60%	\$0.00	20.45%	\$0.00	6.51%	\$0.00	\$0.00	\$0.00	\$0.00
8	FAIL	8	\$50	0.62%	\$0.94	22.88%	\$11.44	2.76%	\$12.42	\$11.49	\$0.92	\$1.86
9	PASS	9	\$0	0.61%	\$0.00	21.10%	\$0.00	0.02%	\$0.00	\$0.00	\$0.00	\$0.00
10	PASS	10	\$0	0.60%	\$0.00	20.45%	\$0.00	2.26%	\$0.00	\$0.00	\$0.00	\$0.00

Target Company ID	Financial Test Result [Step 4.A3]	Responsible Company [Step 4.A3]	Probability of Default (Three-Year) K [Step 3]	Self-Insured Obligation Amount L = \$50M if PASS	Three-Year Government Expected Default Risk M = K * L
1	FAIL	1	100.00%	\$0	\$0.00
2	FAIL	2	10.15%	\$0	\$0.00
3	PASS	3	0.20%	\$50	\$0.10
4	PASS - CG	4-P	0.09%	\$50	\$0.05
5	FAIL	5	41.23%	\$0	\$0.00
6	FAIL	6	4.07%	\$0	\$0.00
7	PASS	7	0.27%	\$50	\$0.14
8	FAIL	8	1.73%	\$0	\$0.00
9	PASS	9	0.66%	\$50	\$0.33
10	PASS	10	0.27%	\$50	\$0.14

*Disclaimer: This step-by-step analytical flow is based on anonymized data.

Step 6.D: Industry and Government Costs, Higher-than-Investment Grade Test with Tangible Net Worth and U.S. Assets Thresholds, Final Version, Co-Proposed as Option 2 for Financial Test

Actual Ratings

Industry Cost - Anonymized data (in \$ millions)

Target Company ID	Financial Test Result [Step 4.A3]	Responsible Company [Step 4.A3]	Obligation Amount A = \$50M if FAIL	Commission Rate B [Step 5.B]	Three-Year Commission Fee Cost C = A * B * 3	Collateral Proportion D [Step 5.B]	Collateral Deposit E = D * A	WACC F [Step 5.A]	Three-Year Future Value at WACC G = E * (1 + F)^3	Three-Year Future Value at Risk-Free Rate H = E * (1 + 0.15%) ^ 3	Incremental Collateral Cost I = G - H	Three-Year Industry Cost J = C + I
1	FAIL	1	\$50	2.00%	\$3.00	100.00%	\$50.00	7.85%	\$62.72	\$50.23	\$12.50	\$15.50
2	FAIL	2	\$50	0.74%	\$1.11	36.92%	\$18.46	0.18%	\$18.56	\$18.54	\$0.02	\$1.13
3	FAIL	3	\$50	0.60%	\$0.90	20.33%	\$10.17	1.61%	\$10.67	\$10.21	\$0.45	\$1.36
4	FAIL	4	\$50	2.00%	\$3.00	100.00%	\$50.00	7.97%	\$62.93	\$50.23	\$12.71	\$15.71
5	FAIL	5	\$50	1.18%	\$1.77	88.72%	\$44.36	1.53%	\$46.42	\$44.56	\$1.86	\$3.63
6	FAIL	6	\$50	0.66%	\$0.99	26.78%	\$13.39	3.42%	\$14.81	\$13.45	\$1.36	\$2.34
7	PASS	7	\$0	0.60%	\$0.00	20.45%	\$0.00	6.51%	\$0.00	\$0.00	\$0.00	\$0.00
8	FAIL	8	\$50	0.62%	\$0.94	22.88%	\$11.44	2.76%	\$12.42	\$11.49	\$0.92	\$1.86
9	PASS	9	\$0	0.61%	\$0.00	21.10%	\$0.00	0.02%	\$0.00	\$0.00	\$0.00	\$0.00
10	PASS - CG	10-P	\$0	0.60%	\$0.00	20.45%	\$0.00	1.74%	\$0.00	\$0.00	\$0.00	\$0.00

Target Company ID	Financial Test Result [Step 4.A3]	Responsible Company [Step 4.A3]	Probability of Default (Three-Year) K [Step 3]	Self-Insured Obligation Amount L = \$50M if PASS	Three-Year Government Expected Default Risk M = K * L
1	FAIL	1	100.00%	\$0	\$0.00
2	FAIL	2	10.15%	\$0	\$0.00
3	FAIL	3	0.20%	\$0	\$0.00
4	FAIL	4	100.00%	\$0	\$0.00
5	FAIL	5	41.23%	\$0	\$0.00
6	FAIL	6	4.07%	\$0	\$0.00
7	PASS	7	0.27%	\$50	\$0.14
8	FAIL	8	1.73%	\$0	\$0.00
9	PASS	9	0.66%	\$50	\$0.33
10	PASS - CG	10-P	0.27%	\$50	\$0.14

Step 6.D: Industry and Government Costs, Higher-than-Investment Grade Test with Tangible Net Worth and U.S. Assets Thresholds

Actual and Implied Ratings

Industry Cost - Anonymized data (in \$ millions)

Target Company ID	Financial Test Result [Step 4.A3]	Responsible Company [Step 4.A3]	Obligation Amount A = \$50M if FAIL	Commission Rate B [Step 5.B]	Three-Year Commission Fee Cost C = A * B * 3	Collateral Proportion D [Step 5.B]	Collateral Deposit E = D * A	WACC F [Step 5.A]	Three-Year Future Value at WACC G = E * (1 + F)^3	Three-Year Future Value at Risk-Free Rate H = E * (1 + 0.15%) ^ 3	Incremental Collateral Cost I = G - H	Three-Year Industry Cost J = C + I
1	FAIL	1	\$50	2.00%	\$3.00	100.00%	\$50.00	7.85%	\$62.72	\$50.23	\$12.50	\$15.50
2	FAIL	2	\$50	0.74%	\$1.11	36.92%	\$18.46	0.18%	\$18.56	\$18.54	\$0.02	\$1.13
3	PASS	3	\$0	0.60%	\$0.00	20.33%	\$0.00	1.61%	\$0.00	\$0.00	\$0.00	\$0.00
4	PASS - CG	4-P	\$0	0.60%	\$0.00	20.15%	\$0.00	1.32%	\$0.00	\$0.00	\$0.00	\$0.00
5	FAIL	5	\$50	1.18%	\$1.77	88.72%	\$44.36	1.53%	\$46.42	\$44.56	\$1.86	\$3.63
6	FAIL	6	\$50	0.66%	\$0.99	26.78%	\$13.39	3.42%	\$14.81	\$13.45	\$1.36	\$2.34
7	PASS	7	\$0	0.60%	\$0.00	20.45%	\$0.00	6.51%	\$0.00	\$0.00	\$0.00	\$0.00
8	FAIL	8	\$50	0.62%	\$0.94	22.88%	\$11.44	2.76%	\$12.42	\$11.49	\$0.92	\$1.86
9	PASS	9	\$0	0.61%	\$0.00	21.10%	\$0.00	0.02%	\$0.00	\$0.00	\$0.00	\$0.00
10	PASS - CG	10-P	\$0	0.60%	\$0.00	20.45%	\$0.00	1.74%	\$0.00	\$0.00	\$0.00	\$0.00

Target Company ID	Financial Test Result [Step 4.A3]	Responsible Company [Step 4.A3]	Probability of Default (Three-Year) K [Step 3]	Self-Insured Obligation Amount L = \$50M if PASS	Three-Year Government Expected Default Risk M = K * L
1	FAIL	1	100.00%	\$0	\$0.00
2	FAIL	2	10.15%	\$0	\$0.00
3	PASS	3	0.20%	\$50	\$0.10
4	PASS - CG	4-P	0.09%	\$50	\$0.05
5	FAIL	5	41.23%	\$0	\$0.00
6	FAIL	6	4.07%	\$0	\$0.00
7	PASS	7	0.27%	\$50	\$0.14
8	FAIL	8	1.73%	\$0	\$0.00
9	PASS	9	0.66%	\$50	\$0.33
10	PASS - CG	10-P	0.27%	\$50	\$0.14

*Disclaimer: This step-by-step analytical flow is based on anonymized data.

Step 6.E: Industry Costs - Assuming No Financial Test (All Companies Must Purchase Third-Party Financial Assurance Instruments) - Preferred as Option 1 for No Financial Test

Government's expected risk of default is \$0 in this scenario, because all companies purchase financial assurance regardless of their financial strength.

Industry Cost - Anonymized data (in \$ millions)

Target Company ID	Responsible Company	Obligation Amount	Commission Rate	Three-Year Commission Fee Cost	Collateral Proportion	Collateral Deposit	WACC	Three-Year Future Value at WACC	Three-Year Future Value at Risk-Free Rate	Incremental Collateral Cost	Three-Year Industry Cost
	[Step 4.A3]	A = \$50M	B [Step 5.B]	C = A * B * 3	D [Step 5.B]	E = D * A	F [Step 5.A]	G = E * (1 + F)^3	H = E * (1 + 0.15%) ^ 3	I = G - H	J = C + I
1	1	\$50	2.00%	\$3.00	100.00%	\$50.00	7.85%	\$62.72	\$50.23	\$12.50	\$15.50
2	2	\$50	0.74%	\$1.11	36.92%	\$18.46	0.18%	\$18.56	\$18.54	\$0.02	\$1.13
3	3	\$50	0.60%	\$0.90	20.33%	\$10.17	1.61%	\$10.67	\$10.21	\$0.45	\$1.36
4	4	\$50	2.00%	\$3.00	100.00%	\$50.00	7.97%	\$62.93	\$50.23	\$12.71	\$15.71
5	5	\$50	1.18%	\$1.77	88.72%	\$44.36	1.53%	\$46.42	\$44.56	\$1.86	\$3.63
6	6	\$50	0.66%	\$0.99	26.78%	\$13.39	3.42%	\$14.81	\$13.45	\$1.36	\$2.34
7	7	\$50	0.60%	\$0.91	20.45%	\$10.23	6.51%	\$12.35	\$10.27	\$2.08	\$2.99
8	8	\$50	0.62%	\$0.94	22.88%	\$11.44	2.76%	\$12.42	\$11.49	\$0.92	\$1.86
9	9	\$50	0.61%	\$0.91	21.10%	\$10.55	0.02%	\$10.55	\$10.60	(\$0.04)	\$0.87
10	10	\$50	0.60%	\$0.91	20.45%	\$10.23	2.26%	\$10.94	\$10.27	\$0.66	\$1.57

Step 6.E: Government Expected Risk of Default - Assuming No Regulation (All Companies May Self-Insure their Obligations and do not Purchase Financial Assurance)

Industry financial assurance costs are \$0 in this scenario, because all companies self-insure their environmental obligations rather than purchasing financial assurance.

Industry Cost - Anonymized data (in \$ millions)

Target Company ID	Responsible Company	Probability of Default (Three-Year)	Self-Insured Obligation Amount	Three-Year Government Expected Default Risk
	[Step 4.A3]	K [Step 3]	L = \$50M	M = K * L
1	1	100.00%	\$50	\$50.00
2	2	10.15%	\$50	\$5.08
3	3	0.20%	\$50	\$0.10
4	4	100.00%	\$50	\$50.00
5	5	41.23%	\$50	\$20.62
6	6	4.07%	\$50	\$2.04
7	7	0.27%	\$50	\$0.14
8	8	1.73%	\$50	\$0.87
9	9	0.66%	\$50	\$0.33
10	10	0.27%	\$50	\$0.14

Appendix B: Bankruptcy and Ratings Considerations for Hard Rock Mining (NAICS 212) Companies

This appendix consists of three tables.

- Table B-1 summarizes ratings data for companies within NAICS 212 rated at least once by S&P between 1984 and 2010.
- Table B-2 summarizes financial test results for companies within NAICS 212 with bankruptcies in the 1984 to 2015 period for one, two, and three years prior to bankruptcy.
- Table B-3 summarizes credit rating declines and bankruptcies for companies within NAICS 212 for companies that received a BBB rating in the 1984 to 2010 period.

Table B-1. Historical Ratings for Companies Rated by Standard and Poor's (S&P), 1984 – 2010

Company ID	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	
1	AA-	AAA																										
2	BBB+	AAA	AA+	AA+																								
3	BBB	AAA	AA	AA	AA	AA	AA																					
4	A+	AA	AA-	AA-	AA-	AA-	AA	AA	AA	AA+	AA	AA	A															
5	A	AA	AA-	AA																								
6	BBB	AA	AA-	A	A	A	A	A	A	A																		
7	BBB	A+	A+	A+	A+	A+	AA-	A+	A-	BBB+	BBB	BBB-																
8	A-	AA	AA-	A	A	A	A	A+	AA-	AA-	A+	A-	BBB-	BBB-	BBB-	BBB-	BBB+	A	A	A	A	A						
9	BBB	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
10	BBB	BBB+	BBB+	BBB+	A-	A	A	A	A+	A	A-	A-	A-	A-	BBB+	BBB+	BBB-	BBB-										
11	BBB	A-	A-	A-	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A-	A-	A-	A-	A-	BBB	BBB-	BBB-
12	BBB	A	B+	A-	A	A	A	A	A	A	A-	A-	A-	A-	A	A	A	A	A									
13	BBB	A	A+	A	A	A	A	A	A	BBB	BBB	BBB-																
14	BBB	AA	A+	A+	A+	A	A	A	A	A	A	A-	BBB	BBB	BBB-	BBB-	BBB-	BBB-	BBB-	BBB	BBB+							
15	A	AA	AA	AA	A	A	A	A	A-	A-	BBB+	BBB+	BBB	BBB-	BBB-													
16		A-	BBB+	BBB-	BBB-	BBB-	BBB-																					
17	BBB	A	A-	A-	BBB	BBB+																						
18	BBB+	BBB+	BBB	BBB	BBB	BBB	BBB-	BBB																				
19	BBB	BB-	BB-	BB+	BB+	BBB	A	A	BBB-																			
20	BBB	A	BB	BB	BB	BB	BB	BB+	BBB-	BBB-	BBB	BBB	BBB	BBB	BBB-	BBB	BBB	BBB+	BBB+									
21	BBB	BBB	A	A	A	A	A	A	A	A	A	A	A	A-	BBB+	BBB+	BBB+	BBB										
22	BBB	BBB	BB-	BB-	B-	CCC+	CCC+	CCC+	CCC+	B-	B	B	B+	BB-	BB-	BB	BB	BB	BB	BB+	BBB-							
23	BBB+	AA-	A	A	BB-	B+	CCC+	CC	B+	B+	BB-	BB	BB	BBB	BBB	BBB+	BBB	D	BBB	BBB	BBB	BB+	BB+	BB-	BB-	B+	B+	
24			BBB-	BBB-	B+	BB-	BB-	BB-	BB																			
25	BBB-	BBB	BBB	BB+	BBB	A-	A-	A-	A-	A	A	A	A	A	A	A-	BBB	BBB-	BBB-	BBB-	BBB-	BBB-	BBB	BBB	BBB	BBB	BBB	BBB
26	BB	BB-	B+	B+	BBB	BBB+	BBB+	BBB+	BB+	BB+	BB+	BB+	BB+	BB+	BB-	BB-	BB-	BB-	BB-	BB-	B+	B						
27	BBB+	A	A-	BBB																								
28					BBB+	BBB	BBB-	BB+	BB+	BB+	BB+	BBB-	BBB-	BBB-	B-	CCC+	B-	CCC+	B	B	BB-	BB-	BB-	BB-	BBB	BBB-	BBB-	BBB-
29	BBB	AA	AA	AA	BBB+	BBB+	BBB+	BBB+	BBB+	BBB+	BBB	BBB	BBB	BBB	BBB	BBB+												
30	BB+	BB+	BBB-	BB	BB-	BB	BBB	BBB	BBB-	BBB+	BBB+	BBB+	BBB+	BBB+	BBB													
31	A-	BB+	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	B	B	B	B+	B+	B	B	B	B-	SD	CCC	CCC	B-							
32					A-	BBB	BBB	BBB	BBB-	BB	BB	BB	BB	BB	BB-	B+	BB-	BB-										
33	BBB+	BBB+	BBB+	BBB+	BBB+	BBB+	BBB	BBB	BBB+	A-	BBB-	BBB	BBB	BBB+	BBB+	A-												
34	BBB	A	B+	BB-	BB-	BBB																						
35											BBB+	BBB-	A	A	A	A	A	A	A	A-	A-	A-	BBB+	BBB+	BBB+	BBB+	BBB+	BBB+
36											BBB+	BBB-	BBB-	BBB														
37	A-	A+	A-	BBB+	BBB	BB	B+	B-	CCC+	CCC+	B-	B-	BB	BBB	BBB	BBB	BBB	BBB	BBB-									
38										BBB+	BBB-	BBB-	AA-	A+														
39	A+	AA-	A	A+	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A						
40					AA-	BBB	BBB	BBB+	A-	A	AA	BBB	BBB-	BBB	BBB	BBB	BBB	BBB	BBB+	A-	A-	A-						
41	BBB-	B+	B+	BB	BBB-	BBB+	BBB																					
42																												
43	BBB	BBB	BB+	BB+	BB+	BBB-	BBB																					
44	BBB	BBB	BBB-	BBB	BBB-	BBB-	BB+	BBB-	BBB																			
45	A	AA-	AA-	AA-	AA																							
46	BB	BB	BB+	BBB-	BB+	BBB-	BBB	BBB+	BBB+	AA	BBB+	AA-	A-	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A

Company ID	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	
47			BBB-	BBB-	BBB-	BBB-	A	A	A	BBB+	BBB+	BBB	BBB	BBB-	BBB-	A-	A-	A+	A+	A+								
48	AA	A+	AA	AA-	AA-	A+	A+	A-	A-	A-	BBB+	BBB+	BBB+	BBB+	BBB	BBB	BBB	BBB	BBB	BBB	BBB+	BBB+	A	AA-	BBB+	BBB	A-	
49	BBB-	BBB-	BB	BB+	BBB-	BBB	BBB-																					
50	BBB-	B	CCC	B	B	B-	B	BBB	BBB-	BBB-	BBB+	BBB	A-	BB	BB-	BB-	B+	B+	B+	B-	B							
51	BBB-	BB+	BB+	BBB-	B-	B+	B	B	B	B	B	B	BB+	B+														
52															A	A	A-	A-	A-	A-	A-	BBB+	BBB+	BBB+	BBB+	BBB+	BBB+	
53					BB+	BB+	BB+	BBB-	BBB-	BBB	BBB	BBB-	BBB+	BBB-	A-	A-	A-	A-	A-	BBB+								
54												BBB+	BBB+	A-	BBB+	A-	A-	A-										
55												BBB	BBB	BB	BB	BB-	B+	B-	B-	BBB	BBB+	BBB	BBB+	BBB+	BBB+	BBB+	BBB-	
56				BB+	BB+	BB+	BB+	BB+	BB	BB	BB+	BB+	BB+	BB	BB+	BB+	BB	BB+	BB+	BB+	BB	BB-						
57	BBB	BB-	BB-	BB-	BB-	BB-	BB	BB	BB	B+	B+	BB-	BB-	B+														
58	BB+	BBB-	BBB	A-	BBB+	BBB+	BBB	BBB-	BBB	BBB+	BBB+	BBB+	BBB+															
59														BB	BB-	BBB+	BBB+	BBB+	BBB+	BB-	BB-	BB-	BB	BB	BB+	BB+	BB	
60	BBB-	BBB	BBB	BB+	BB	B+	BBB-	BBB+	BBB+	BBB+	BBB+	BBB	BBB	BBB	BBB	BB	BB	BB	BB-	BB-	BB	BB	BB+	BB+	BB	BB	BB+	
61											B+	B+	B+	B+	B+	BB	BB	BB	BB	BB	BB	BB+						
62	AA	BB-	BB-	BB	BB	B	B+	BB	BB	BB	BB	BB	BB															
63															BBB+	BBB+	AA-	A+	A									
64		BB	BB	BB+	BBB-	BBB	BBB	BBB	BBB	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-													
65												BBB	BBB-	B+	BB-	B+	B+											
66									BBB-	BBB	BBB-	BB	BB-															
67												BBB-	BBB-	BBB	BBB	BBB	BBB	BBB	BBB	BB	D	BB	BB	BB	D	B+	B+	BB-
68													BB+	BB+	BB+	BBB-	BBB	BBB-	BBB-	B	B	B	B+	BB-	BB	BB-	BB	
69											BBB-	A+	A-	BBB-	BBB-	A-	BBB	BB	BB-	BB-	BB-	BB-	B+	BB-	BB	B	B	
70																BB	BB+	BB+	BB+									
71						BBB-	BBB-	BB+	BB+	BB+	BBB-	BB+	BB+	BBB-	BBB-	BBB-	BBB-	BB	BB+	BB+	BB	BB						
72													BBB	BBB	BBB-	BBB-	BBB-	BB-	C	CCC+	B-	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	
73															BBB-	BBB	BBB	BBB	BBB	A	A	A-	A-	A-	A	A+	A+	A+
74	BBB	BBB+	A-	A-	A	A	A	A	A	A	A																	
75	A-	AA	AA	AA-	BBB-	BBB-	BB+	B+	BB+	AA-	B+	B+	B+	B+	B	B	B	B	B	A-	BBB-	BBB	AA	A-	BBB	BBB-	BBB	
76																			BBB-	A	A	A	A	A	A	A	A	
77	BBB+	BBB+	BBB+	A-	BBB	BBB	BBB+	BBB	BB	BBB	BBB	BBB	BBB	BBB	BB	BB	BB											
78																	BB	BB	B+	B+	B+	B+	BB-	BB	BB	BB	BB+	
79																			BB	BB	B+	B+	B+	BB-	BB-	BB-	BB-	
80	BB+	B+																										
81																				BBB-	BBB-	BB	BB	BB	BB	BBB-	BBB-	
82							BBB-	BBB-	B+	B+	B+	B+	B	B	BB+	BB+	BB+	BB	BB-	B	B	B-	A-	AA	BBB-	A-	BBB	
83																				BB-	BB+	B	CCC+	CCC	B-	B-	B-	
84																					BBB	BBB-	BBB	BBB	BBB	BBB	BBB+	
85	A-	A	A+	A	AA-	AA	A	AA	AA	AA	A	A+	AA-	AA-	A-	A-	BBB+	BBB+	BBB	BBB	BBB	BBB	BB-	BB-	BB-	BB-	BB-	
86																				BB-	BB	BB+	B+	B+	B+	B+	BB	BBB-
87	BB+	BB+	BB+	BB	BB+	BB+	BB+	BB+	BB-	B	B	B	B+	BB-	BB-	BB-	BB-	BB	BB	BB	BB	BB	BB	BB-	BB-	BB-	BB-	
88		BB	A-	AA	AA-	AA	AA	AA	AA	AA	BBB-	BBB+	BBB+	BBB+														
89	BB+	BB	BB+	BB+	BB-	BB-	BB	BB	BB+	A-	AA	AA	BBB+	BBB-	BB	BB	BB-	BB-	BB+	BBB	BB+	BB+	BBB	BBB-	BBB-	BBB-	BBB	
90																					BBB-	BB-	BB-	B+				
91																					CCC	BB+	BB	BBB-	B+	B+	B+	
92																					BB+	BBB-	B	B-	B-	B-	B-	
93																					CCC	BBB-	CCC+	CCC	CCC	BB-	CCC	
94							BB-	BB	BB	BB+	BBB-	BBB+	A	BBB-	A-	AA-	BBB	AA-	AA	AA	AA	AA	BBB	BBB-	BBB-	BBB-	BBB+	BBB+
95	BBB	BBB	BBB	BBB	BBB-	BBB-	BBB-	BBB-	BBB-	BBB	BBB	BBB																
96	AA	AA	BBB+	BBB-	BBB-	BBB	BBB+	BBB+	BBB	BBB-	BBB-	AA-	AA	AA	AA	AA	AA	AA	A+	AA	BB-	BB-	AA	AA	A	A-	A+	
97	BB+	BBB-	BB+	BBB-	BBB-	BBB-	BBB-	BBB	BBB-	BB+	BB	BB+	BBB-															
98	BBB	BB+	BBB-	BBB	BBB	BBB	BBB	BBB	BBB	A-	A-	BBB+	A-	BBB-	BBB	BBB	BBB	BBB	BBB-	BBB-	BBB							

Company ID	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
99																	B+	B+	B+								
100																							BB-	BB	BB-	BB	B+
101																									B+	B+	B+
102																BB	BB	BB	D	BB-	BB-	BB-					

Company IDs 103 through 299 not rated between 1984 and 2010 by S&P.

Table B-2.A. Financial Test Results within Three Years Prior to Bankruptcy, Count of NAICS 212 Companies by Financial Test Type*n = 26 (25 unique companies, one company with two bankruptcy dates)*

Financial Test Result	Years Prior to Bankruptcy	RCRA Subtitle C 40 CFR 264		Investment Grade Rating Test	Higher-Than-Investment-Grade Rating Test	
		Alternative 1	Alternative 2		Base Version	Final Version (Co-Proposed as an Alternative 2 nd Option for the Rule)
PASS	3	1	1	3	0	0
	2	2	1	3	0	0
	1	0	1	1	0	0
	Total Companies	2	1	3	0	0
Hybrid Coverage	3	N/A	N/A	N/A	2	1
	2	N/A	N/A	N/A	2	1
	1	N/A	N/A	N/A	1	1
	Total Companies	N/A	N/A	N/A	2	1
FAIL	3	24	24	22	23	24
	2	18	19	17	18	19
	1	13	12	12	12	12
	Total Companies	24	25	23	24	25

Note: See Exhibit 1 of the Executive Summary for a summary of criteria evaluated for the array of financial test scenarios.

Table B-2.B. Financial Test Results for NAICS 212 Companies with Prior Bankruptcy*Includes NAICS 212 Company Bankruptcies 1984-2010, and two Bankruptcies Reported 2010-2015*

Company ID	Associated Commodity	Bankruptcy Year	Years Prior to Bankruptcy	RCRA Subtitle C 40 CFR 264		Investment Grade Rating Test	Higher-Than-Investment-Grade Rating Test	
				Alternative 1	Alternative 2		Base Version	Final Version (Co-Proposed as an Alternative 2 nd Option for the Rule)
23	Gypsum	2001	3	PASS	PASS	PASS	Hybrid	Hybrid
			2	PASS	PASS	PASS	Hybrid	Hybrid
			1	FAIL	PASS	PASS	Hybrid	Hybrid
32	Petrochemicals	2009	3	FAIL	FAIL	FAIL	FAIL	FAIL
			2	-	-	-	-	-
			1	-	-	-	-	-
44	Asbestos	2001	3	FAIL	FAIL	PASS	FAIL	FAIL
			2	FAIL	FAIL	PASS	FAIL	FAIL
			1	FAIL	FAIL	FAIL	FAIL	FAIL
65	Inorganics	2009	3	FAIL	FAIL	FAIL	FAIL	FAIL
			2	FAIL	FAIL	FAIL	FAIL	FAIL
			1	-	-	-	-	-
67	Phosphates	2003	3	FAIL	FAIL	PASS	Hybrid	FAIL
			2	FAIL	FAIL	PASS	Hybrid	FAIL
			1	FAIL	FAIL	FAIL	FAIL	FAIL
76	Steel	1998	3	-	-	-	-	-
			2	-	-	-	-	-
			1	-	-	-	-	-
80	-	1993	3	FAIL	FAIL	FAIL	FAIL	FAIL
			2	FAIL	FAIL	FAIL	FAIL	FAIL
			1	FAIL	FAIL	FAIL	FAIL	FAIL
82	Aluminum	2002	3	FAIL	FAIL	FAIL	FAIL	FAIL
			2	FAIL	FAIL	FAIL	FAIL	FAIL
			1	FAIL	FAIL	FAIL	FAIL	FAIL
90	-	2009	3	FAIL	FAIL	FAIL	FAIL	FAIL
			2	FAIL	FAIL	FAIL	FAIL	FAIL
			1	-	-	-	-	-

Hyphen = Insufficient data

Company ID	Associated Commodity	Bankruptcy Year	Years Prior to Bankruptcy	RCRA Subtitle C 40 CFR 264		Investment Grade Rating Test	Higher-Than-Investment-Grade Rating Test	
				Alternative 1	Alternative 2		Base Version	Final Version (Co-Proposed as an Alternative 2 nd Option for the Rule)
98	-	2001	3	FAIL	FAIL	FAIL	FAIL	FAIL
			2	FAIL	FAIL	FAIL	FAIL	FAIL
			1	FAIL	FAIL	FAIL	FAIL	FAIL
110	Coal	1999	3	FAIL	FAIL	FAIL	FAIL	FAIL
			2	-	-	-	-	-
			1	-	-	-	-	-
113	-	1986	3	FAIL	FAIL	FAIL	FAIL	FAIL
			2	-	-	-	-	-
			1	-	-	-	-	-
148	Coal	2007	3	FAIL	FAIL	FAIL	FAIL	FAIL
			2	FAIL	FAIL	FAIL	FAIL	FAIL
			1	-	-	-	-	-
159	Gold	2003	3	FAIL	FAIL	FAIL	FAIL	FAIL
			2	FAIL	FAIL	FAIL	FAIL	FAIL
			1	FAIL	FAIL	FAIL	FAIL	FAIL
161	-	1991	3	FAIL	FAIL	FAIL	FAIL	FAIL
			2	FAIL	FAIL	FAIL	FAIL	FAIL
			1	FAIL	FAIL	FAIL	FAIL	FAIL
169	Gold	2010	3	FAIL	FAIL	FAIL	FAIL	FAIL
			2	FAIL	FAIL	FAIL	FAIL	FAIL
			1	-	-	-	-	-
185	Silver	2009	3	FAIL	FAIL	FAIL	FAIL	FAIL
			2	FAIL	FAIL	FAIL	FAIL	FAIL
			1	FAIL	FAIL	FAIL	FAIL	FAIL
229	Rare Earths	2015	3	FAIL	FAIL	FAIL	FAIL	FAIL
			2	PASS	FAIL	FAIL	FAIL	FAIL
			1	FAIL	FAIL	FAIL	FAIL	FAIL

Hyphen = Insufficient data

Company ID	Associated Commodity	Bankruptcy Year	Years Prior to Bankruptcy	RCRA Subtitle C 40 CFR 264		Investment Grade Rating Test	Higher-Than-Investment-Grade Rating Test	
				Alternative 1	Alternative 2		Base Version	Final Version (Co-Proposed as an Alternative 2 nd Option for the Rule)
236a	Copper, Nickel	2001	3	FAIL	FAIL	FAIL	FAIL	FAIL
			2	FAIL	FAIL	FAIL	FAIL	FAIL
			1	-	-	-	-	-
236b	Copper, Nickel	2015	3	FAIL	FAIL	FAIL	FAIL	FAIL
			2	-	-	-	-	-
			1	-	-	-	-	-
239	Gold, Copper	2001	3	FAIL	FAIL	FAIL	FAIL	FAIL
			2	FAIL	FAIL	FAIL	FAIL	FAIL
			1	-	-	-	-	-
279	-	1984	3	FAIL	FAIL	FAIL	FAIL	FAIL
			2	FAIL	FAIL	FAIL	FAIL	FAIL
			1	FAIL	FAIL	FAIL	FAIL	FAIL
281	Silver	2009	3	FAIL	FAIL	FAIL	FAIL	FAIL
			2	FAIL	FAIL	FAIL	FAIL	FAIL
			1	-	-	-	-	-
282	Silver	1992	3	FAIL	FAIL	FAIL	FAIL	FAIL
			2	FAIL	FAIL	FAIL	FAIL	FAIL
			1	FAIL	FAIL	FAIL	FAIL	FAIL
297	Silver	2003	3	FAIL	FAIL	FAIL	FAIL	FAIL
			2	-	-	-	-	-
			1	-	-	-	-	-

Hyphen = Insufficient data

Table B-3.A. Summary Statistics for NAICS 212 Companies Rated BBB by S&P at Least Once Between 1984 and 2010

Note: Company counts in table below are not additive because a company can satisfy multiple criteria.

Criteria	Company Count	% of Companies Rated BBB
Rated BBB at least once	36	100%
Rated BBB for 3 Consecutive Years	23	64%
Upgraded after rated BBB	16	44%
Downgraded after rated BBB	25	69%
Received speculative grade rating (less than BBB-) after rated BBB	10	28%
Entered bankruptcy after rated BBB	5	14%

Table B-3.B. Summary of NAICS 212 Companies Downgraded by S&P from BBB to Speculative Grade with no Rating Rebound Between 1984 and 2010

Company ID	Downgrade Year	Bankruptcy	Notes
23	2001	Yes - 2001	Downgraded from BBB to default in 2001
27	2005	No	Downgraded from BBB to BB+ in 2005
32	1992	Yes - 2009	Downgraded from BBB to BBB- in 1992
43	1986	No	Downgraded from BBB to BB+ in 1986
44	1998	Yes - 2001	Downgraded from BBB to BBB- in 1998
67	2002	Yes - 2003	Downgraded from BBB to BB in 2002
68	2001	No	Downgraded from BBB to BB- in 2001
77	1998	No	Downgraded from BBB to BB in 1998
59	2003	No	Never rated BBB, but downgraded from BBB+ to BB- in 2003