UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, D.C. 20549

FORM 10-K

(Mark One)

☒ **ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

For the fiscal year ended December 31, 2021

OR

☐ **TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

For the transition period from _____ to _____

Commission File Number 1-37816

ALCOA CORPORATION

(Exact name of registrant as specified in its charter)

Delaware	**81-1789115**
(State or other jurisdiction of incorporation or organization)	**(I.R.S. Employer Identification No.)**
201 Isabella Street, Suite 500, Pittsburgh, Pennsylvania	**15212-5858**
(Address of principal executive offices)	**(Zip Code)**

(Registrant's telephone number, including area code): 412-315-2900

Securities registered pursuant to Section 12(b) of the Act:

Title of each class	**Trading Symbol(s)**	**Name of each exchange on which registered**
Common Stock, par value $0.01 per share	AA	New York Stock Exchange

Securities registered pursuant to Section 12(g) of the Act: **None**

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes ☑ No ☐

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Act. Yes ☐ No ☑

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes ☑ No ☐

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§ 232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files). Yes ☑ No ☐

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company," and "emerging growth company" in Rule 12b-2 of the Exchange Act.

Large accelerated filer	☒	Accelerated filer	☐
Non-accelerated filer	☐	Smaller reporting company	☐
Emerging growth company	☐		

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☐

Indicate by check mark whether the registrant has filed a report on and attestation to its management's assessment of the effectiveness of its internal control over financial reporting under Section 404(b) of the Sarbanes-Oxley Act (15 U.S.C. 7262(b)) by the registered public accounting firm that prepared or issued its audit report. ☑

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Act). Yes ☐ No ☑

The aggregate market value of the registrant's voting stock held by non-affiliates at June 30, 2021 was approximately $6.9 billion, based on the closing price per share of Common Stock on June 30, 2021 of $36.84 as reported on the New York Stock Exchange.

As of February 18, 2022, there were 185,403,032 shares of the registrant's common stock, par value $0.01 per share, outstanding.

DOCUMENTS INCORPORATED BY REFERENCE

Part III of this Form 10-K incorporates by reference certain information from the registrant's Definitive Proxy Statement for its 2022 Annual Meeting of Stockholders to be filed pursuant to Regulation 14A.

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Note on Incorporation by Reference

In this Form 10-K, selected items of information and data are incorporated by reference to portions of Alcoa Corporation's Definitive Proxy Statement for its 2022 Annual Meeting of Stockholders (Proxy Statement), which will be filed with the Securities and Exchange Commission within 120 days after the end of Alcoa Corporation's fiscal year ended December 31, 2021. Unless otherwise provided herein, any reference in this Form 10-K to disclosures in the Proxy Statement shall constitute incorporation by reference of only that specific disclosure into this Form 10-K.

PART I

Item 1. Business.

(dollars in millions, except per-share amounts, average realized prices, and average cost amounts)

The Company

Alcoa Corporation, a Delaware corporation, became an independent, publicly traded company on November 1, 2016, following its separation (the Separation Transaction) from its former parent company, Alcoa Inc. "Regular-way" trading of Alcoa Corporation's common stock began with the opening of the New York Stock Exchange (NYSE) on November 1, 2016 under the ticker symbol "AA." Alcoa Corporation's common stock has a par value of $0.01 per share. Alcoa Corporation's principal executive office is located in Pittsburgh, Pennsylvania. In this report, unless the context otherwise requires, the terms "Alcoa," the "Company," "we," "us," and "our" refer to Alcoa Corporation and all subsidiaries consolidated for the purposes of its financial statements.

References herein to "ParentCo" refer to Alcoa Inc., a Pennsylvania corporation, and its consolidated subsidiaries through October 31, 2016, at which time it was renamed Arconic Inc. (Arconic) and since has been subsequently renamed Howmet Aerospace Inc.

Alcoa Upstream Corporation was formed in Delaware in March 2016 and was renamed Alcoa Corporation in connection with the Separation Transaction. Alcoa Corporation entered into certain agreements with ParentCo to implement the legal and structural separation between the two companies to govern the relationship and allocation of various assets, liabilities, and obligations between Alcoa Corporation and ParentCo after the completion of the Separation Transaction.

Alcoa is a global industry leader in bauxite, alumina, and aluminum products. Alcoa has direct and indirect ownership of 28 operating locations across nine countries. The Company's operations comprise three reportable business segments: Bauxite, Alumina, and Aluminum. The Bauxite and Alumina segments primarily consist of a series of affiliated operating entities held in Alcoa World Alumina and Chemicals, a global, unincorporated joint venture between Alcoa and Alumina Limited (described below). The Aluminum segment consists of the Company's aluminum smelting and casting along with the majority of the energy production business.

Aluminum, as an element, is abundant in the earth's crust, but a multi-step process is required to make aluminum metal. Aluminum metal is produced by refining alumina oxide from bauxite into alumina, which is then smelted into aluminum and can be cast and rolled into many shapes and forms. Aluminum is a commodity traded on the London Metal Exchange (LME) and priced daily. Alumina, an intermediary product, is subject to market pricing through alumina price indices published by third-party price reporting firms such as CRU Metallurgical Grade Alumina Price, Platts Metals Daily Alumina PAX Price, and FastMarkets Metal Bulletin Non-Ferrous Metals Alumina Index (collectively, the Alumina Price Index (API)). As a result, the prices of both aluminum and alumina are subject to significant volatility and, therefore, influence the operating results of Alcoa.

Business Strategy

The Company has a goal to innovate and create low-carbon solutions. The Company has a comprehensive portfolio of products manufactured through low-carbon emitting processes (Sustana™ brand) and future-oriented research and development projects focused on reducing carbon output.

The Company offers a comprehensive portfolio of products manufactured through low-carbon emitting processes in its Sustana™ family of products, including EcoDura™ aluminum, EcoLum™ aluminum, and EcoSource™ alumina.

Further, Alcoa has established a technology roadmap of research and development projects that have the potential to drive value by reducing costs, improving efficiency, and reducing carbon emissions in both alumina refining and aluminum smelting. The roadmap includes:

- Our Refinery of the Future project, which aims to achieve zero-carbon alumina refining through the use of various processes and new technologies that we are undertaking to adapt to alumina refining, such as mechanical vapor recompression (MVR) and electric calcination.
- Our ELYSIS™ joint venture, which uses carbon-free aluminum smelting technology to eliminate all greenhouse gases in smelting production and produce pure oxygen as a byproduct.
- Our ASTRAEA™ process, which is a proprietary technology that can purify post-consumer aluminum scrap, regardless of alloy combination, and beneficiate it up to high purity levels that could permit its use in high tolerance applications, such as aerospace.

Alcoa earned the Aluminium Stewardship Initiative (ASI) certification for 15 operating sites and continues to pursue additional certifications from ASI, the aluminum industry's most comprehensive third-party program to validate responsible production practices. The Company has also earned ASI's Chain of Custody certification, which allows Alcoa to market globally ASI-certified bauxite, alumina, and aluminum.

In 2021, the Company made significant progress on its strategic objectives, announced in October 2019, to drive lower costs and sustainable profitability. The announced objectives included the sale of non-core assets over the following twelve to eighteen month period with the goal of generating cash proceeds of $500 to $1,000 and realignment of the operating portfolio over the following five years through a review of 1.5 million metric tons of smelting capacity and 4 million metric tons of refining capacity.

In the first quarter 2021, the Company reached its target to generate between $500 and $1,000 from non-core asset sales by completing the divestiture of the rolling mill business at the Company's Warrick operations in a transaction valued at $670. Additionally in 2021, the Company completed two other significant non-core asset sales of the former Eastalco and Rockdale smelter sites in Maryland and Texas, respectively. Net cash proceeds from asset sales totaled $966 million in 2021.

In 2021, Alcoa made significant progress on its smelting portfolio review reaching approximately 75 percent of its target to improve, curtail, close, or divest 1.5 million metric tons of smelting capacity within the five-year program ending in 2024. After the portfolio transformation, the Company has the goal of being the lowest emitter of carbon dioxide among all global aluminum companies, per ton of emissions in both smelting and refining, and aims to move its aluminum portfolio to a first quartile cost position. In addition, Alcoa anticipates that up to 85 percent of its smelting portfolio will be powered by renewable energy, building upon the Company's existing sustainability profile and in support of its strategic priority to "advance sustainably."

The Company continues to review the 4 million metric tons of alumina refining capacity which is also part of the five-year program. Although no actions were announced in 2021, the Company has completed approximately 58% of the alumina refining capacity review.

See Part II Item 7 of this Form 10-K in Management's Discussion and Analysis of Financial Condition and Results of Operations under caption Business Update.

Joint Ventures

Alcoa World Alumina and Chemicals (AWAC)

AWAC is an unincorporated global joint venture between Alcoa Corporation and Alumina Limited, a company incorporated under the laws of the Commonwealth of Australia and listed on the Australian Securities Exchange. AWAC consists of a number of affiliated entities that own, operate, or have an interest in bauxite mines and alumina refineries, as well as an aluminum smelter, in seven countries. Alcoa Corporation owns 60% and Alumina Limited owns 40% of these entities, directly or indirectly, with such entities being consolidated by Alcoa Corporation for financial reporting purposes. The scope of AWAC generally includes the mining of bauxite and other aluminous ores; the refining, production, and sale of smelter grade and non-metallurgical alumina; and the production of certain primary aluminum products.

Alcoa provides the operating management for AWAC, which is subject to direction provided by the Strategic Council of AWAC. The Strategic Council consists of five members, three of whom are appointed by Alcoa (of which one is the Chair) and two of whom are appointed by Alumina Limited (of which one is the Deputy Chair). Matters are decided by a majority vote with certain matters requiring approval by at least 80% of the members, including: changes to the scope of AWAC; changes in the dividend policy; equity calls in aggregate greater than $1,000 in any year; sales of all or a majority of the AWAC assets; loans from AWAC companies to Alcoa or Alumina Limited; certain acquisitions, divestitures, expansions, curtailments or closures; certain related-party transactions; financial derivatives, hedges or swap transactions; a decision by AWAC entities to file for insolvency; and changes to pricing formula in certain offtake agreements which may be entered into between AWAC entities and Alcoa or Alumina Limited.

AWAC Operations

AWAC entities' assets include the following interests:

- 100% of the bauxite mining, alumina refining, and aluminum smelting operations of Alcoa's affiliate, Alcoa of Australia Limited (AofA);
- 100% of the Juruti bauxite deposit and mine in Brazil;
- 45% interest in Halco (Mining) Inc., a bauxite consortium that owns a 51% interest in Compagnie des Bauxites de Guinée (CBG), a bauxite mine in Guinea;
- 9.62% interest in the bauxite mining operations in Brazil of Mineração Rio Do Norte (MRN), a Brazilian company;
- 39.96% interest in the São Luís refinery in Brazil;
- 55% interest in the Portland, Australia smelter that AWAC manages on behalf of the joint venture partners;
- 25.1% interest in the mine and refinery in Ras Al Khair, Saudi Arabia;
- 100% of the refinery and alumina-based chemicals assets at San Ciprián, Spain;
- 100% of Alcoa Steamship Company LLC, a company that procures ocean freight and commercial shipping services for Alcoa in the ordinary course of business;
- 100% of the refinery assets at the closed facility in Point Comfort, Texas, United States; and,
- 100% interest in various assets formerly used for mining and refining in the Republic of Suriname (Suriname).

Exclusivity

Under the terms of their joint venture agreements, Alcoa and Alumina Limited have agreed that, subject to certain exceptions, AWAC is their exclusive vehicle for their investments, operations or participation in the bauxite and alumina business, and they will not compete with AWAC in those businesses. In the event of a change of control of either Alcoa or Alumina Limited, this exclusivity and non-compete restriction will terminate, and the partners will then have opportunities to unilaterally pursue bauxite or alumina projects outside of or within AWAC, subject to certain conditions provided in the Amended and Restated Charter of the Strategic Council.

Equity Calls

The cash flow of AWAC and borrowings are the preferred sources of funding for the needs of AWAC. An equity call can be made on 30 days' notice, subject to certain limitations, in the event the aggregate annual capital budget of AWAC requires an equity contribution from Alcoa and Alumina Limited.

Dividend Policy

AWAC will generally be required to distribute at least 50% of the prior calendar quarter's net income of each AWAC entity, and certain AWAC entities will also be required to pay a distribution every three months equal to the amount of available cash above specified thresholds and subject to the forecast cash needs of the AWAC entity.

Leveraging Policy

Debt of AWAC is subject to a limit of 30% of total capital (defined as the sum of debt (net of cash) plus any minority interest plus shareholder equity). The AWAC joint venture has raised a limited amount of debt to fund growth projects as permitted under Alcoa's revolving credit line and in accordance with the joint venture partnership agreements.

Saudi Arabia Joint Venture

In December 2009, Alcoa entered into a joint venture with the Saudi Arabian Mining Company (Ma'aden), which was formed by the government of Saudi Arabia to develop its mineral resources and create a fully integrated aluminum complex in Saudi Arabia. Ma'aden is listed on the Saudi Stock Exchange (Tadawul). The complex includes a bauxite mine with estimated capacity of 4 million dry metric tons per year; an alumina refinery with a capacity of 1.8 million metric tons per year (mtpy); an aluminum smelter with a capacity of ingot, slab and billet of 804,000 mtpy; and a rolling mill with a capacity of 460,000 mtpy.

The joint venture is currently comprised of two entities: the Ma'aden Bauxite and Alumina Company (MBAC) and the Ma'aden Aluminium Company (MAC). Ma'aden owns a 74.9% interest in the MBAC and MAC joint venture. Alcoa owns a 25.1% interest in MAC, which holds the smelter; AWAC holds a 25.1% interest in MBAC, which holds the mine and refinery. See Part II Item 8 of this Form 10-K in Note C to the Consolidated Financial Statements. The refinery and smelter are located within the Ras Al Khair industrial zone on the east coast of Saudi Arabia.

Ma'aden and Alcoa Corporation have put and call options, respectively, whereby Ma'aden can require Alcoa Corporation to purchase from Ma'aden, or Alcoa Corporation can require Ma'aden to sell to Alcoa Corporation, a 14.9% interest in MBAC and MAC at the then fair market value. These options, if exercised, must be exercised for the full 14.9% interest in both entities. The amended joint venture agreement defines October 1, 2021 as the date after which Ma'aden and Alcoa Corporation can exercise their put and call options, respectively, for a period of six months. To date, neither party has exercised their respective put or call options.

The amended joint venture agreement also defines October 1, 2021 as the date after which Alcoa is permitted to sell all of its shares in both MBAC and MAC collectively, for which Ma'aden has a right of first refusal. Prior to this date, Ma'aden and Alcoa Corporation could not sell, transfer, or otherwise dispose of, pledge, or encumber any interests in the joint venture. Under the amended joint venture agreement, upon the occurrence of an unremedied event of default by Alcoa, Ma'aden may purchase, or, upon the occurrence of an unremedied event of default by Ma'aden, Alcoa may sell, its interest in the joint venture for consideration that varies depending on the time of the default.

ELYSIS™

ELYSIS™ Limited Partnership (ELYSIS™) is a joint venture between the wholly-owned subsidiaries of Alcoa (48.235%) and Rio Tinto Alcan Inc. (Rio Tinto) (48.235%), respectively, and Investissement Québec (3.53%), a company wholly-owned by the Government of Québec, Canada. The purpose of the ELYSIS™ joint venture is to advance larger scale development and commercialization of its patent-protected technology that produces oxygen and eliminates all direct greenhouse gas emissions from the traditional aluminum smelting process. Alcoa invented the inert anode technology for aluminum smelting that serves as the basis for the ELYSIS™ joint venture. Batches of carbon-free aluminum produced by ELYSIS™ have been sold for use by such companies as Apple Inc. and Audi AG, as the joint venture continues working toward an industrial scale with a technology package planned for sale from 2024.

Others

The Company is party to several other joint ventures and consortia. See additional details within each business segment discussion below.

The Aluminerie de Bécancour Inc. (ABI) smelter is a joint venture between Alcoa and Rio Tinto located in Bécancour, Québec. Alcoa owns 74.95% of the joint venture through the equity investment in Pechiney Reynolds Quebec, Inc., which owns a 50.1% share of the smelter, and two wholly-owned Canadian subsidiaries, which own 49.9% of the smelter. Rio Tinto owns the remaining 25.05% interest in the joint venture.

CBG is a joint venture between Boké Investment Company (51%) and the Government of Guinea (49%) for the operation of a bauxite mine in the Boké region of Guinea. Boké Investment Company is owned 100% by Halco (Mining) Inc.; AWA LLC holds a 45% interest in Halco. AWA LLC is part of the AWAC group of companies and is ultimately owned 60% by Alcoa and 40% by Alumina Limited.

MRN is a joint venture between Alcoa Alumínio (8.58%), AWA Brasil (4.62%), and AWA LLC (5%), each a subsidiary of Alcoa, and affiliates of Rio Tinto (12%), Companhia Brasileira de Alumínio (10%), Vale S.A. (Vale) (40%), South32 Limited (South32) (14.8%), and Norsk Hydro ASA (5%) for the operation of a bauxite mine in Porto Trombetas in the state of Pará in Brazil. AWA Brasil and AWA LLC are part of the AWAC group of companies and are ultimately owned 60% by Alcoa and 40% by Alumina Limited.

Alumar is an unincorporated joint venture for the operation of a refinery, smelter, and casthouse in Brazil. The refinery is owned by AWA Brasil (39.96%), Rio Tinto (10%), Alcoa Alumínio (14.04%), and South32 (36%). AWA Brasil is part of the AWAC group of companies and is ultimately owned 60% by Alcoa and 40% by Alumina Limited. With respect to Rio Tinto and South32, the named company or an affiliate thereof holds the interest. The smelter and casthouse are owned by Alcoa Alumínio (60%) and South32 (40%).

Strathcona calciner is a joint venture between affiliates of Alcoa and Rio Tinto. Calcined coke is used as a raw material in aluminum smelting. The calciner is owned by Alcoa (39%) and Rio Tinto (61%); Alcoa's capacity is currently idled in connection with the curtailment of the Intalco aluminum smelter.

Hydropower

Machadinho Hydro Power Plant (HPP) is a consortium located on the Pelotas River in southern Brazil in which the Company has a 25.7% ownership interest through Alcoa Alumínio. The remaining ownership interests are held by unrelated third parties.

Barra Grande HPP is a joint venture located on the Pelotas River in southern Brazil in which the Company has a 42.2% ownership interest through Alcoa Alumínio. The remaining ownership interests are held by unrelated third parties.

Estreito HPP is a consortium between Alcoa Alumínio, through Estreito Energia S.A. (25.5%) and unrelated third parties located on the Tocantins River, northern Brazil.

Serra do Facão HPP is a joint venture between Alcoa Alumínio (35%) and unrelated third parties located on the Sao Marcos River, central Brazil.

Manicouagan Power Limited Partnership (Manicouagan) is a joint venture between affiliates of Alcoa and Hydro-Québec. Manicouagan owns and operates the 335 megawatt McCormick hydroelectric project, which is located on the Manicouagan River in the Province of Québec, Canada. Alcoa owns 40% of the joint venture.

Bauxite

This segment consists of the Company's global bauxite mining operations. Bauxite is the principal raw material used to produce alumina and contains various aluminum hydroxide minerals, the most important of which are gibbsite and boehmite. Bauxite is refined using the Bayer process, the principal industrial chemical process for refining bauxite to produce alumina, a compound of aluminum and oxygen that is the raw material used by smelters to produce aluminum metal. Bauxite is Alcoa's basic raw material input for its alumina refining process. The Company obtains bauxite from its own resources. including those belonging to AWAC, as well as pursuant to both long-term and short-term contracts and mining leases. Tons of bauxite are reported on a zero-moisture basis in millions of dry metric tons (mdmt) unless otherwise stated.

Alcoa processes most of the bauxite that it mines into alumina and sells the remainder to third parties. In 2021, Alcoa-operated mines produced 40.9 mdmt of bauxite and mines operated by partnerships in which Alcoa, including AWAC, has equity interests produced 6.7 mdmt of bauxite on a proportional equity basis, for a total Company bauxite production of 47.6 mdmt.

Based on the terms of its bauxite supply contracts, the amount of bauxite AWAC purchases from its minority-owned joint ventures MRN and CBG differ from its proportional equity in those mines. Therefore, in 2021, Alcoa had access to 48.1 million dmt of

production from its portfolio of bauxite interests and sold 5.7 million dmt of bauxite to third parties; 42.4 million dmt of bauxite was delivered to Alcoa refineries.

Information regarding the Company's bauxite mining properties and bauxite mineral resources and reserves is included in Part 1 Item 2 of this Form 10-K.

Alumina

This segment consists of the Company's worldwide refining system, which processes bauxite into alumina. Alcoa's alumina sales are made to customers globally and are typically priced by reference to published spot market prices. The Company's largest customer for smelter grade alumina is its own aluminum smelters, which in 2021 accounted for approximately 33% of its total alumina shipments. A small portion of the alumina is sold to third-party customers who process it into industrial chemical products. This segment also includes AWAC's 25.1% share of MBAC.

The Company primarily sells alumina through fixed price spot sales and contracts containing two pricing components: (1) the API price basis, and (2) a negotiated adjustment basis that takes into account various factors, including freight, quality, customer location, and market conditions. In 2021, approximately 95% of the Company's smelter grade alumina shipments to third parties were sold on a fixed price spot basis or adjusted API price basis.

Alcoa's alumina refining facilities and its worldwide alumina capacity stated in metric tons per year (mtpy) are shown in the following table:

Country	Facility	Nameplate Capacity[1] (000 mtpy)	Alcoa Corporation Consolidated Capacity[1] (000 mtpy)
Australia (AofA)	Kwinana	2,190	2,190
	Pinjarra	4,700	4,700
	Wagerup	2,879	2,879
Brazil	Poços de Caldas	390	390
	São Luís (Alumar)	3,860	2,084
Spain	San Ciprián	1,600	1,600
TOTAL		15,619	13,843

Equity Interests:

Country	Facility	Nameplate Capacity[1] (000 mtpy)	Alcoa Corporation Consolidated Capacity[1] (000 mtpy)
Saudi Arabia	Ras Al Khair (MBAC)	1,800	452

1 Nameplate Capacity is an estimate based on design capacity and normal operating efficiencies and does not necessarily represent maximum possible production. Alcoa Corporation Consolidated Capacity represents our share of production from these facilities. For facilities wholly-owned by AWAC, Alcoa takes 100% of the production.

As of December 31, 2021, Alcoa had approximately 214,000 mtpy of idle capacity relative to total Alcoa consolidated capacity of 13,843,000 mtpy. The 214,000 mtpy of idle capacity is at the Poços de Caldas facility as a result of the full curtailment of the Poços de Caldas smelter.

In October 2019, the Company announced a five-year review of our production assets that includes a range of potential outcomes for these facilities, including significantly improved competitive positioning, curtailment, closure, or divestiture. The review includes 4 million metric tons of global refining capacity, of which 2,305,000 mtpy of capacity has been permanently closed since the announced review.

Aluminum

This segment currently consists of (i) the Company's worldwide smelting and casthouse system and (ii) a portfolio of energy assets in Brazil, Canada, and the United States. The smelting operations produce molten primary aluminum, which is then formed by the casting operations into either common alloy ingot (e.g., t-bar, sow, standard ingot) or into value-add ingot products (e.g., foundry, billet, rod, and slab). The energy assets supply power to external customers in Brazil and the United States, as well as internal customers in the Aluminum segment (Baie-Comeau (Canada) smelter and Warrick (Indiana) smelter) and, to a lesser extent, the

Alumina segment (Brazilian refineries). This segment also includes Alcoa's 25.1% share of MAC, the smelting joint venture company in Saudi Arabia.

Smelting and Casting Operations

Contracts for primary aluminum vary widely in duration, from multi-year supply contracts to spot purchases. Pricing for primary aluminum products is typically comprised of three components: (i) the published LME aluminum price for commodity grade P1020 aluminum, (ii) the published regional premium applicable to the delivery locale, and (iii) a negotiated product premium that accounts for factors such as shape and alloy.

Alcoa's primary aluminum facilities and its global smelting capacity stated in metric tons per year (mtpy) are shown in the following table:

Country	Facility	Nameplate Capacity[1] (000 mtpy)	Alcoa Corporation Consolidated Capacity[1] (000 mtpy)
Australia	Portland	358	197
Brazil	Poços de Caldas[2]	N/A	N/A
	São Luís (Alumar)	447	268
Canada	Baie-Comeau, Québec	312	312
	Bécancour, Québec	462	347
	Deschambault, Québec	287	287
Iceland	Fjarðaál	351	351
Norway	Lista	94	94
	Mosjøen	200	200
Spain	San Ciprián	228	228
United States	Massena West, NY	130	130
	Ferndale, WA (Intalco)	279	279
	Evansville, IN (Warrick)	269	269
TOTAL		3,417	2,962

Equity Interests:

Country	Facility	Nameplate Capacity[1] (000 mtpy)	Alcoa Corporation Consolidated Capacity[1] (000 mtpy)
Saudi Arabia	Ras Al Khair (MAC)	804	202

1 Nameplate Capacity is an estimate based on design capacity and normal operating efficiencies and does not necessarily represent maximum possible production. Alcoa Corporation's consolidated capacity is its share of Nameplate Capacity based on its ownership interest in the respective smelter.

2 The Poços de Caldas facility is a casthouse and does not include a smelter.

The Company's five-year review of our production assets first announced in October 2019 includes 1.5 million metric tons of smelting capacity. The portfolio review includes evaluations for significant improvements, curtailments, closures, or divestitures. As of December 31, 2021, the Company had approximately 685,000 mtpy of idle smelting capacity relative to total Alcoa consolidated capacity of 2,962,000 mtpy. The idle capacity includes the capacity at the fully curtailed Intalco smelter, 108,000 mtpy of idle smelting capacity at the Warrick smelter, 30,000 mtpy of idle capacity at the Portland smelter, and 268,000 mtpy of idle smelting capacity at the Alumar smelter. In December 2021, the Company closed 146,000 mtpy of smelting capacity at the Wenatchee smelter in the State of Washington, all of which had been previously idled.

On December 29, 2021, the Company and the workers' representatives at the San Ciprián, Spain aluminum plant reached an agreement that calls for the two-year curtailment of the smelter's 228,000 mtpy, which was completed in January 2022, and a commitment by the Company to initiate the restart of capacity at the smelter in January 2024.

In 2021, the Company announced the restart of its 268,000 mtpy of idle smelting capacity at the Alumar smelter in Brazil, which is expected to be operational by the fourth quarter 2022. The Company also announced that the Portland Aluminium joint venture in

Australia plans to restart 35,000 mtpy of curtailed capacity at the Portland aluminum smelter (19,000 mtpy Alcoa share). Once the restart is complete in 2022, the Company will have approximately 186,000 mtpy of its consolidated capacity at Portland operating.

Including the actions described above, the Company has reviewed approximately 75 percent of the 1.5 million metric tons of smelting capacity in its portfolio review.

The Aluminum segment previously held the Company's rolling mill operations in Warrick, Indiana. On March 31, 2021, the Company completed the sale of the rolling mill operations to Kaiser Aluminum Corporation for total consideration of approximately $670, which included the assumption of $69 in OPEB liabilities (as adjusted post-closing). With the sale, the Company no longer maintains a rolled products business.

See Part II Item 8 of this Form 10-K in Note C and D to the Consolidated Financial Statements for additional information.

Energy Facilities and Sources

Energy comprises approximately 27% of the Company's total alumina refining production costs. Electric power comprises approximately 31% of the Company's primary aluminum production costs.

Electricity markets are regional and are limited in size by physical and regulatory constraints, including the physical inability to transport electricity efficiently over long distances, the design of the electric grid, including interconnections, and the regulatory structure imposed by various federal and state entities.

Electricity contracts may be short-term (real-time or day ahead) or years in duration, and contracts can be executed for immediate delivery or years in advance. Pricing may be fixed, indexed to an underlying fuel source or other index such as LME, cost-based or based on regional market pricing. In 2021, Alcoa generated approximately 10% of the power used at its smelters worldwide and generally purchased the remainder under long-term arrangements.

The following table sets forth the electricity generation capacity and 2021 generation of facilities in which Alcoa Corporation has an ownership interest. See also the Joint Ventures section above.

Country	Facility	Alcoa Corporation Consolidated Capacity (MW)	2021 Generation (MWh)
Brazil	Barra Grande	152	903,664
	Estreito	157	1,158,451
	Machadinho	119	855,289
	Serra do Facão	60	169,898
Canada	Manicouagan	133	1,160,441
United States	Warrick	657	3,859,571
TOTAL		**1,278**	**8,107,314**

The figures in this table are presented in megawatts (MW) and megawatt hours (MWh), respectively.

Each facility listed above generates hydroelectric power except the Warrick facility, which generates substantially all of the power used by the Warrick smelting facility from the co-located Warrick power plant using coal purchased from third parties at nearby coal reserves. During 2021, approximately 32% of the capacity from the Warrick power plant was sold into the market under its current operating permits. Alcoa Power Generating Inc., a subsidiary of the Company, also owns certain Federal Energy Regulatory Commission (FERC)-regulated transmission assets in Indiana, Tennessee, New York, and Washington.

The consolidated capacity of the Brazilian energy facilities shown above in megawatts (MW) is the assured energy, representing approximately 52% of hydropower plant nominal capacity. Since May 2015 (after curtailment of the Poços de Caldas and São Luís smelters in Brazil), the excess generation capacity from the Brazilian hydroelectric facilities has been sold into the market.

Below is an overview of our external energy for our smelters and refineries.

	External Energy Source	
Region	**Electricity**	**Natural Gas**
North America	*Québec, Canada* Alcoa's smelter located in Baie-Comeau, Quebec, purchases approximately one-quarter of its electricity needs from Manicouagan Power Limited Partnership. Otherwise, all electricity consumed by the three smelters in Québec is purchased under contracts with Hydro-Québec that expire on December 31, 2029. *Massena, New York (Massena West)* The Massena West smelter in New York receives power from the New York Power Authority (NYPA) pursuant to a contract between Alcoa and NYPA that expires in March 2026.	Alcoa generally procures natural gas on a competitive bid basis from a variety of sources, including producers in the gas production areas and independent gas marketers. Contract pricing for gas is typically based on a published industry index such as the New York Mercantile Exchange (NYMEX).
Australia	*Portland* This smelter purchases power from the National Electricity Market (NEM) variable spot market in the state of Victoria. During 2021, the smelter entered into fixed-for-floating swap contracts with AGL Hydro Partnership, Origin Energy Electricity Limited and Alinta Energy CEA Trading Pty Ltd, at a combined level of 515 MW. In addition, in November 2021 the Portland Aluminium joint venture announced the planned restart of 35,000 mtpy of idle capacity (19,000 mtpy Alcoa share) which was underpinned by an additional fixed-for-floating swap contract with AGL Hydro Partnership for 72 MW. These swap contracts manage exposure to the variable energy rates from the NEM spot market. The swap contracts will expire on June 30, 2026.	*Western Australia* AofA uses gas to co-generate steam and electricity for its alumina refining processes at the Kwinana, Pinjarra and Wagerup refineries. In 2015, AofA secured a significant portion of gas supplies to 2032, covering more than 95% of the refineries' gas requirements through 2023 and decreasing percentages thereafter. In 2020, AofA contracted for additional gas supplies starting in 2024. On a combined basis, these gas supply arrangements are expected to cover more than 80% of the refineries' gas requirements through 2027.
Europe	*San Ciprián, Spain* The Company completed the temporary curtailment of its 228,000 mtpy smelting capacity at the San Ciprián smelter in January 2022 pursuant to the agreement reached with the workers' representatives on December 29, 2021. The smelter purchases its reduced electricity requirements under a bilateral spot power contract that expires June 30, 2022. *Lista and Mosjøen, Norway* Beginning in 2017, Alcoa entered into several long-term power purchase agreements, which secured approximately 50% of the necessary power for the Norwegian smelters for the period of 2020 to 2035. The remaining 50% is currently purchased under short-term contracts. Financial compensation of the indirect carbon emissions costs passed through in the electricity bill is received in accordance with EU Commission Guidelines and the Norwegian compensation regime. *Iceland* Landsvirkjun, the Icelandic national power company, supplies competitively priced electricity from a hydroelectric facility to Alcoa's Fjarðaál smelter under a 40-year power contract, which will expire in 2047 with price renegotiation effective from 2027.	*Spain* In 2021, natural gas was supplied to the San Ciprián, Spain, alumina refinery pursuant to supply contracts with Naturgy and UFG. In January 2022, Naturgy terminated its contract supplying 50 percent of the refinery's natural gas demand until June 2022 and 25 percent from July to December 2022. The Company is currently negotiating new contracts but has access to adequate supply at spot rates from February 2022 until such new contract arrangements are in place.
South America	*Alumar* Further to the announced restart of its 268,000 mtpy of idle smelting capacity at the Alumar smelter in Brazil, which is expected to be operational by the fourth quarter 2022, Alcoa entered into several short-term power purchase agreements which secured substantially all of the necessary power for its share of the Alumar smelter for the restart period in 2022 through the end of 2023. Alcoa also entered into multiple long-term power purchase agreements which collectively secured all of the necessary power for its share of the Alumar smelter for the period of 2024 to 2038. All power secured for short and long term is from renewable sources.	

Sources and Availability of Raw Materials

The Company believes that the raw materials necessary to its business are and will continue to be available and that the sources and availability of such raw materials are currently adequate. Generally, materials are purchased from third-party suppliers under competitively priced supply contracts or bidding arrangements. Substantially all of the raw materials required to manufacture our products are available from more than one supplier. Some sources of these raw materials are located in countries that may be subject to unstable political and economic conditions, which could disrupt supply or affect the price of these materials.

Certain raw materials, such as caustic soda and calcined petroleum coke, may be subject to significant price volatility which could impact our financial results.

Alcoa sources bauxite from its own resources, including AWAC entities, and believes its present sources of bauxite on a global basis are sufficient to meet the forecasted requirements of its alumina refining operations for the foreseeable future.

For each metric ton (mt) of alumina produced, Alcoa consumes the following amounts of the identified raw material inputs (approximate range across relevant facilities):

Raw Material	Units	Consumption per mt of Alumina
Bauxite	mt	2.2 – 3.7
Caustic soda	kg	60 – 100
Electricity	kWh	200 to 260 total consumed (0 to 230 imported)
Fuel oil and natural gas	GJ	6 – 12
Lime (CaO)	kg	6 – 60

For each metric ton of aluminum produced, Alcoa consumes the following amounts of the identified raw material inputs (approximate range across relevant facilities):

Raw Material	Units	Consumption per mt of Primary Aluminum
Alumina	mt	1.92 ± 0.02
Aluminum fluoride	kg	16.3 ± 2.6
Calcined petroleum coke	mt	0.38 ± 0.03
Cathode blocks	mt	0.005 ± 0.002
Electricity	kWh	13.14 – 16.57
Liquid pitch	mt	0.09 ± 0.02
Natural gas	mcf	3.0 ± 1.0

Certain aluminum we produce includes alloying materials. Because of the number of different types of elements that can be used to produce various alloys, providing a range of such elements would not be meaningful. With the exception of a very small number of internally used products, Alcoa produces its aluminum alloys in adherence to an Aluminum Association (of which Alcoa is an active member) standard, which uses a specific designation system to identify alloy types. In general, each alloy type has a major alloying element other than aluminum but will also include lesser amounts of other constituents.

Competition

Alcoa is subject to highly competitive conditions in all aspects of the aluminum supply chain in which it competes. Our business segments operate in close proximity to our broad, worldwide customer base to enable us to meet customer demand in key markets in North America, South America, Europe, the Middle East, Australia, and China.

We compete with a variety of both U.S. and non-U.S. companies in all major markets across the aluminum supply chain. Competitors include bauxite miners who supply to the third-party bauxite market, active alumina suppliers, refiners and producers, commodity traders, aluminum producers, and producers of alternative materials such as steel, titanium, copper, carbon fiber, composites, plastic, and glass.

By having an integrated aluminum value chain, we are able to deliver our SustanaTM line of products manufactured through low-carbon emitting processes, which includes: EcoSource™ alumina, Ecolum™ aluminum, and EcoDura™ aluminum.

Bauxite:

We are among the world's largest bauxite miners. The majority of bauxite mined globally is converted to alumina for the production of aluminum. In 2021, approximately 12% of Alcoa's bauxite shipments were sold to third-party customers and Alcoa-operated mines supply approximately 95% of their volume to Alcoa refineries.

Alcoa's share of mines operated by partnerships in which Alcoa, including AWAC, has equity interests, supply approximately 55% of their volume to Alcoa refineries. Our principal competitors in the third-party bauxite market include Rio Tinto and multiple suppliers from Guinea, Australia, Indonesia, and Brazil, among other countries. We compete largely based on bauxite quality, price, and proximity to customers, as well as strategically located long-term bauxite resources in Australia, Brazil, and Guinea, which is home to the world's largest reserves of high-quality metallurgical grade bauxite.

Alumina:

We are the world's largest alumina producer outside of China. The alumina market is global and highly competitive, with many active suppliers, producers, and commodity traders. Our main competitors in the third-party alumina market are Aluminum Corporation of China, South32 Limited, Hangzhou Jinjiang Group, Rio Tinto, and Norsk Hydro ASA. In recent years, there has been significant growth in alumina refining in China and India. The majority of our product is sold in the form of smelter grade alumina.

Key factors influencing competition in the alumina market include cost position, price, reliability of bauxite supply, quality, and proximity to customers and end markets. We had an average cost position in the first quartile of global alumina production in 2021. Our refineries are strategically located next to low-cost bauxite mines, which provide a stable and consistent long-term supply of bauxite to our refining portfolio. Our alumina refineries include sophisticated refining technology to maximize efficiency with the bauxite qualities from these internal mines.

Aluminum:

In our Aluminum segment, competition is dependent upon the type of product we are selling.

The market for primary aluminum is global, and demand for aluminum varies widely from region to region. We compete with commodity traders, such as Glencore, Trafigura, J. Aron and Gerald Group, and aluminum producers such as Emirates Global Aluminum, Norsk Hydro ASA, Rio Tinto, Century Aluminum, Vedanta Aluminum Ltd., and United Company RUSAL Plc.

Several of the most critical competitive factors in our industry are product quality, production costs (including source, reliability of supply, and cost of energy), price, access and proximity to raw materials, customers and end markets, timeliness of delivery, customer service (including technical support), product innovation, and breadth of offerings. Where aluminum products compete with other materials, the diverse characteristics of aluminum are also a significant factor, particularly its light weight, strength, and recyclability.

The strength of our position in the primary aluminum market is largely attributable to: our integrated supply chain; long-term energy arrangements; the ability of our casthouses to provide customers with a diverse product portfolio in terms of shapes and alloys; and our decreasing demand for fossil fuels, as approximately 81% of the aluminum smelting portfolio operated by the Company was powered by renewable energy sources in 2021. The Company intends to continue to focus on optimizing capacity utilization.

Patents, Trade Secrets and Trademarks

The Company believes that its domestic and international patent, trade secret and trademark assets provide it with a competitive advantage. The Company's rights under its intellectual property, as well as the technology and products made and sold under them, are important to the Company as a whole and, to varying degrees, important to each business segment. Alcoa's business as a whole is not, however, materially dependent on any single patent, trade secret or trademark. As a result of product development and technological advancement, the Company continues to pursue patent protection in jurisdictions throughout the world. As of December 31, 2021, Alcoa's worldwide patent portfolio consisted of approximately 400 granted patents and 180 pending patent applications. The Company also has a number of domestic and international registered trademarks that have significant recognition within the markets that are served, including the name "Alcoa" and the Alcoa symbol.

In connection with the Separation Transaction, Alcoa Corporation and ParentCo entered into certain intellectual property license agreements that provide for a license of certain patents, trademarks, and know-how from ParentCo or Alcoa Corporation, as applicable, to the other, on a perpetual, royalty-free, non-exclusive basis, subject to certain exceptions.

Government Regulations and Environmental Matters

Alcoa's global operations subject it to compliance with various types of government laws, regulations, and other requirements which often provide discretion to government authorities and could be interpreted, applied, or modified in ways to make the Company's operations or compliance activities more costly. These laws and regulations include those relating to safety and health (including those made in response to the ongoing COVID-19 pandemic), competition, data privacy and security, environmental compliance, and trade, such as tariffs or other import or export restrictions that may increase the cost of raw material or cross-border shipments and impact our ability to do business with certain countries or individuals. For a discussion of the risks associated with certain applicable laws and regulations, see Part I Item 1A of this Form 10-K.

Environmental

Alcoa is subject to extensive federal, state/provincial, and local environmental laws and regulations and other requirements, in the U.S. and abroad, including those relating to the release or discharge of materials into the air, water and soil, waste management, pollution prevention measures, the generation, storage, handling, use, transportation and disposal of hazardous materials, the exposure of persons to hazardous materials, and greenhouse gas emissions. We manage environmental assessments and cleanups at approximately 60 locations, which include currently owned or operated facilities and adjoining properties, previously owned or operated facilities and adjoining properties, and waste sites, such as U.S. Superfund (Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)) sites. In 2021, capital expenditures for new or expanded facilities for environmental control were approximately $111 and approximately $174 is expected in 2022. See Part II Item 8 of this Form 10-K in Note S to the Consolidated Financial Statements under caption Contingencies for additional information.

Safety and Health

We are subject to a broad range of foreign, federal, state, and local laws and regulations relating to occupational health and safety, and our safety program includes measures required for compliance. In addition, as the COVID-19 pandemic continues, we may be subject to government regulations, including potential vaccine mandates, in various locations where we operate. We have incurred, and will continue to incur, capital expenditures to meet our health and safety compliance requirements, as well as to continually improve our safety systems. We believe that future compliance with occupational health and safety laws and regulations will not have a material adverse effect on our results of operations, financial condition, or cash flows.

For a discussion of the risks associated with certain applicable laws and regulations, see Part I Item 1A of this Form 10-K.

Human Capital Resources

Our core values – Act with Integrity, Operate with Excellence, Care for People, and Lead with Courage – guide us as a company, including our approach to human capital management. We believe that our people are our greatest asset. The success and growth of our business depend in large part on our ability to attract, develop, and retain a diverse population of talented, qualified, and highly skilled employees at all levels of our organization, including the individuals who comprise our global workforce, our executive officers and other key personnel.

Our Company policies, including the Code of Conduct, Harassment and Bullying Free Workplace Policy, and EHS Vision, Values, Mission, and Policy, support our mission to advance our Company culture and core values. Alcoa maintains a Human Rights Policy that applies globally to the Company, its partnerships, and other business associates, and is committed to abiding by international human rights principles encompassed in the Universal Declaration of Human Rights, the International Labor Organization's Declaration on Fundamental Principles and Rights at Work, the United Nations Global Compact, and the United Nations Guiding Principles on Business and Human Rights.

Employees

As of December 31, 2021, Alcoa had approximately 12,200 employees in 16 countries. Approximately 8,700 of our global employees are covered by collective bargaining agreements with certain unions and varying expiration dates, including approximately 1,000 employees in the U.S., 1,600 employees in Europe, 1,400 employees in Canada, 2,000 employees in South America, and 2,600 employees in Australia. Approximately 900 U.S. employees are covered by a collective bargaining agreement in place with the United Steelworkers (USW). There are also U.S. collective bargaining agreements in place, with varying expiration dates, with the International Association of Machinists and Aerospace Workers (IAM) and the International Brotherhood of Electric Workers (IBEW).

In 2021, the Company completed the sale of its Warrick Rolling Mill in Indiana, which reduced the number of total employees by approximately 1,170. Additionally, the Company is in the process of hiring employees for the restart of the Alumar smelter in Brazil. As of December 31, 2021, approximately 250 employees have been hired.

Safety and Health

The safety and health of our employees, contractors, temporary workers, and visitors are our top priorities and key to our ability to attract and retain talent. We aspire to work safely, all the time, everywhere. We strive to foster a culture of hazard and risk awareness, the effective understanding and use of our safe systems of work, proactive incident reporting, and knowledge sharing to attain this goal.

Our systems are designed to prevent loss of life and serious injury at our locations. Our safety programs and systems include rigorous safety standards and controls, periodic risk-based audits, a formal and standardized process for investigating fatal and all serious injury potential incidents, management of critical risks and safety hazards, and efforts to eliminate hazards or implement controls to prevent and mitigate risks.

We document any incident that has the potential to cause a serious injury, and strive to maintain a culture of speaking up, where incidents are reported and ideas are shared. We have operating standards based on human performance, which teaches employees how to anticipate and recognize situations where errors are likely to occur, in order to allow us to predict, reduce, manage, and prevent fatalities and injuries. We integrate our temporary workers, contractors, and visitors into our safety programs and data through our OneAlcoa: United for Safety initiative.

Operational employees are required to take safety and health training that is determined by their specific roles, tasks, areas where they work, job functions, and responsibilities. Salaried employees are expected to include a safety objective in their annual performance objectives. We believe having an individual safety objective empowers our employees to be more involved in creating our safety culture. To further support this, we have included a safety metric focused on reducing fatalities and serious injuries in our annual incentive program for the past several years.

See Part II Item 7 of this Form 10-K in Management's Discussion and Analysis of Financial Condition and Results of Operations under caption Business Update – Coronavirus for additional information on the health and safety protocols implemented by the Company for the protection of its workers during the COVID-19 pandemic.

Inclusion, Diversity, and Equality

We seek to provide a safe, respectful, and inclusive workplace that reflects the diversity of the communities in which we operate and makes Alcoa a desired employer. We seek to hire local candidates when possible and continue to focus on the diversity of our candidate pool.

We remain focused on advancing inclusion, diversity, and equality. As of December 31, 2021, women comprised approximately 17.2% of our global workforce. We are committed to achieving gender balance across Alcoa through long-term actions to improve diversity and inclusion. To support these efforts, for the past several years, we have included a metric in our annual incentive plan focused on increasing the gender diversity of our global workforce.

We also recognize the benefits and importance of diversity among our board of directors and senior management. Of the 10 directors on our board of directors, 30% are women, 20% are racially/ethnically diverse, and 30% hold citizenship outside of the United States. Additionally, 33% of our Executive Team are women.

In October 2020, we launched our Global Inclusion & Diversity Council of diverse leaders across the Company to support the execution of our inclusion and diversity strategy aimed at building an inclusive culture where employees feel valued, empowered, and respected. For 2021, our annual incentive plan included a metric focused on increased hiring of underrepresented groups. We offer several global resources and inclusion groups for our employees, including: AWARE – Alcoans working actively for racial-ethnic equality; EAGLE, our LGBT+ Equality inclusion group; and AWN – Alcoa Women's Network.

Available Information

The Company's internet website address is www.alcoa.com. Alcoa makes available free of charge on or through its website its Annual Reports on Form 10-K, Quarterly Reports on Form 10-Q, Current Reports on Form 8-K, and amendments to those reports as soon as reasonably practicable after the Company electronically files such material with, or furnishes it to, the Securities and Exchange Commission (the SEC). These documents can be accessed on the investor relations portion of our website www.alcoa.com/investors. This information can also be found on the SEC's internet website, www.sec.gov. The information on the Company's website is included as an inactive textual reference only and is not a part of, or incorporated by reference in, this Annual Report on Form 10-K.

Dissemination of Company Information

Alcoa Corporation intends to make future announcements regarding Company developments and financial performance through its website, www.alcoa.com, as well as through press releases, filings with the SEC, conference calls, and webcasts.

Information about our Executive Officers

The names, ages, positions, and areas of responsibility of the executive officers of the Company as of the filing date of this Form 10-K are listed below.

Roy C. Harvey, 48, is President and Chief Executive Officer of Alcoa Corporation. He became Chief Executive Officer in November 2016 and assumed the role of President in May 2017. Mr. Harvey served as Executive Vice President of ParentCo and President of ParentCo's Global Primary Products (GPP) division from October 2015 to November 2016. From June 2014 to October 2015, he was Executive Vice President, Human Resources and Environment, Health, Safety and Sustainability at ParentCo. Prior to that time, Mr. Harvey served as Chief Operating Officer, and was also Chief Financial Officer, for GPP at ParentCo. In addition to these roles, Mr. Harvey served in the roles of Director of Investor Relations and Director of Corporate Treasury at ParentCo. Mr. Harvey joined ParentCo in 2002 as a business analyst for the GPP division in Knoxville, Tennessee.

William F. Oplinger, 55, has served as Executive Vice President and Chief Financial Officer of Alcoa Corporation since November 2016. Mr. Oplinger served as Executive Vice President and Chief Financial Officer of ParentCo from April 1, 2013 to November 2016. Mr. Oplinger joined ParentCo in 2000, and through 2013 held key corporate positions in financial analysis and planning and also served as Director of Investor Relations. Mr. Oplinger also held principal positions in the ParentCo's GPP division, including as Controller, Operational Excellence Director, Chief Financial Officer, and Chief Operating Officer.

Renato De C.A. Bacchi, 45, has served as Executive Vice President and Chief Strategy Officer of Alcoa Corporation since February 1, 2022. In this role, Mr. Bacchi is responsible for strategy, corporate and business development, energy, non-operated joint ventures, and curtailed and closed sites. He was previously Senior Vice President and Treasurer from November 2019 through January 2022 and was Vice President and Treasurer from November 2016 through October 2019. Prior to Separation, Mr. Bacchi served as the Assistant Treasurer of ParentCo from October 2014 through October 2016 and the Director, Corporate Treasury from 2012 to 2014. Prior to this time, Mr. Bacchi held various roles of increasing responsibility in areas include finance, strategy, procurement, energy and sales. Mr. Bacchi joined ParentCo in Brazil in 1997.

Sonya Elam Harden, 57, has served as Executive Vice President and Chief External Affairs Officer of Alcoa Corporation since August 2020. In this role, Ms. Elam Harden is responsible for global government affairs, community relations, and sustainability, and she oversees the Alcoa Foundation. Ms. Elam Harden was the Interim Head of External Affairs of Alcoa Corporation from March 2020 through July 2020 and served as the Vice President, Government Affairs for the Western Hemisphere from November 2016 through July 2020. Prior to Alcoa Corporation's separation from ParentCo, Ms. Elam Harden held various roles of increasing responsibility in communications, marketing, and government affairs at ParentCo, including as Director of Communications for the GPP division from November 2010 through October 2016 and as Director of Marketing from October 2009 to November 2010. Ms. Elam Harden initially joined ParentCo in 1989, and rejoined in 2001, after having left ParentCo in 1998.

Jeffrey D. Heeter, 56, has served as Executive Vice President and General Counsel of Alcoa Corporation since November 2016. In this role, Mr. Heeter has overall responsibility for the Company's global legal, compliance, governance and security matters. He previously also served as the Secretary of Alcoa Corporation from November 2016 to December 2019. Mr. Heeter served as Assistant General Counsel and an Assistant Officer of ParentCo from 2014 to November 2016. Mr. Heeter was Group Counsel for the GPP division of ParentCo from 2010 to 2014. From 2008 to 2010, Mr. Heeter was General Counsel of Alcoa of Australia in Perth, Australia. Mr. Heeter joined ParentCo in 1998.

Tammi A. Jones, 42, has served as Executive Vice President and Chief Human Resources Officer of Alcoa Corporation since April 2020. Ms. Jones oversees all aspects of human resources management, including talent and recruitment, compensation and benefits, inclusion and diversity, training and development, and labor relations. Ms. Jones served as Vice President, Compensation and Benefits from January 2019 through March 2020 and was the Director, Organizational Effectiveness from April 2017 to December 2018. From April 2015 through March 2017, Ms. Jones served as Human Resources Director, Aluminum (GPP), and she served as Human Resources Director for ParentCo Wheels and Transportation Products from April 2013 to April 2015. Ms. Jones joined ParentCo in 2006 and held a variety of human resource positions at ParentCo, including Human Resources Director, Europe Building & Construction and Human Resources Director, UK and Ireland in ParentCo's Building and Construction Systems division.

Benjamin D. Kahrs, 45, has served as Executive Vice President and Chief Innovation Officer of Alcoa Corporation since November 2019. Mr. Kahrs oversees the Company's innovations and technologies, including, the Company's Technical Center for research and development (R&D) activities, and the Information Technology and Automated Solutions functions. He was Senior Vice President, Manufacturing Excellence and R&D from November 2018 through October 2019 and was Senior Vice President, Technology and Corporate Development from November 2016 to November 2018. Mr. Kahrs served as Vice President, Strategy and Technology of the GPP division of ParentCo from November 2015 to November 2016 and was Location Manager at the Point Comfort, Texas facility from August 2012 to November 2015. Mr. Kahrs initially joined ParentCo in 1999, and rejoined in 2007, after having left ParentCo in 2004.

John D. Slaven, 60, has served as Executive Vice President and Chief Operations Officer since November 2019. Mr. Slaven joined Alcoa Corporation in February 2019 as Executive Vice President and Chief Strategy Officer. In his current role, Mr. Slaven is responsible for the daily operations of the Company's bauxite, alumina, and aluminum assets. From 2006 until 2019, Mr. Slaven was Partner and Managing Director at the Boston Consulting Group, a consulting firm, where he most recently led the North American Metals and Mining, Infrastructure and Public Transport practices. Prior to this time, from 2002 through early 2006, Mr. Slaven worked for ParentCo, where he implemented its Asia growth strategy, revitalized the Latin America business, and led ParentCo's sales and marketing growth in Asia before returning to the U.S. to lead the corporate strategy, financial planning, and analysis functions.

Kelly R. Thomas, 52, has served as Executive Vice President and Chief Commercial Officer of Alcoa Corporation since February 14, 2022. In this role, Ms. Thomas is responsible for leading the Company' commercial function, including sales and trading, marketing, supply chain, commercial operations, and procurement. Prior to joining Alcoa, Ms. Thomas was the Vice President, Finance at Vista Metals Corporation, a metal construction company, from October 2015 to February 2022 and the Chief Operating Officer at Electronic Recyclers International, an electronics recycler, from June 2014 through September 2015. Prior to this time, from 2010 to 2014, Ms. Thomas held various positions at Aleris Corporation. Ms. Thomas joined Reynolds Metals in 1999, later acquired by ParentCo, and held various roles in sales, risk management, and marketing at ParentCo from 2001 to 2009.

Item 1A. Risk Factors.

There are inherent risks associated with Alcoa's business and industry. In addition to the factors discussed elsewhere in this report, the following risks and uncertainties could have a material adverse effect on our business, financial condition, or results of operations, including causing Alcoa's actual results to differ materially from those projected in any forward-looking statements. Although the risks are organized by heading, and each risk is described separately, many of the risks are interrelated. You should not interpret the disclosure of any risk factor to imply that the risk has not already materialized. While we believe we have identified and discussed below the key risk factors affecting our business, there may be additional risks and uncertainties that are not presently known to Alcoa or that Alcoa currently deems immaterial also may materially adversely affect us in future periods. See Part II Item 7 of this Form 10-K in Management's Discussion and Analysis of Financial Condition and Results of Operations under caption Forward-Looking Statements.

Commodity Risks

The aluminum industry and aluminum end-use markets are highly cyclical and are influenced by several factors, including global economic conditions, the Chinese market, and overall consumer confidence.

The nature of the industries in which our customers operate causes demand for our products to be cyclical, creating potential uncertainty regarding future profitability. The demand for aluminum is sensitive to, and impacted by, demand for the finished goods manufactured by our customers in industries, such as the commercial construction, transportation, and automotive industries, which may change as a result of changes in the global economy, foreign currency exchange rates, energy prices, or other factors beyond our control. The demand for aluminum is also highly correlated to economic growth, and we could be adversely affected by large or sudden shifts in the global inventory of aluminum and the resulting market price impacts.

We believe the long-term prospects for aluminum and aluminum products are positive; however, we are unable to predict the future course of industry variables or the strength of the global economy and the effects of government intervention. Our business, financial condition, and results of operations may be materially affected by the conditions in the global economy generally and in global capital markets, including in the end markets and geographic regions in which we and our customers operate (including as a result of the COVID-19 pandemic). Many of the markets in which our customers participate are also cyclical in nature and experience significant fluctuations in demand for their products based on economic conditions, consumer demand, raw material and energy costs, and government actions. Many of these factors are beyond our control.

The Chinese market is a significant source of global demand for, and supply of, commodities, including aluminum. Chinese production rates of aluminum, both from new construction and installed smelting capacity, can fluctuate based on Chinese government policy, such as the level of enforcement of capacity limits and/or licenses and environmental policies. In addition, industry overcapacity, a sustained slowdown in Chinese aluminum demand, or a significant slowdown in other markets, that is not offset by decreases in supply of aluminum or increased aluminum demand in emerging economies, such as India, Brazil, and several Southeast Asian countries, could have an adverse effect on the global supply and demand for aluminum and aluminum prices. Also, changes in the aluminum market can cause changes in the alumina and bauxite markets, which could also materially affect our business, financial condition, or results of operations. As a result of these factors, our profitability is subject to significant fluctuation.

A decline in consumer and business confidence and spending, severe reductions in the availability and cost of credit, and volatility in the capital and credit markets could adversely affect the business and economic environment in which we operate and the profitability of our business. We are also exposed to risks associated with the creditworthiness of our suppliers and customers. If the availability of credit to fund or support the continuation and expansion of our customers' business operations is curtailed or if the cost of that credit is increased, the resulting inability of our customers or of their customers to either access credit or absorb the increased cost of that credit could adversely affect our business by reducing our sales or by increasing our exposure to losses from uncollectible customer accounts. These conditions and a disruption of the credit markets could also result in financial instability of some of our suppliers and customers. The consequences of such adverse effects could include the interruption of production at the facilities of our customers, the reduction, delay or cancellation of customer orders, delays or interruptions of the supply of raw materials we purchase, and bankruptcy of customers, suppliers, or other creditors. Any of these events could adversely affect our business, financial condition, and results of operations.

We could be materially adversely affected by volatility and declines in aluminum, alumina, and bauxite prices, including global, regional, and product-specific prices, or by significant changes in production costs which are linked to LME or other commodities.

The overall price of primary aluminum consists of several components: (i) the underlying base metal component, which is typically based on quoted prices from the LME; (ii) the regional premium, which comprises the incremental price over the base LME component that is associated with the physical delivery of metal to a particular region (e.g., the Midwest premium for metal sold in the United States); and (iii) the product premium, which represents the incremental price for receiving physical metal in a particular shape (e.g., foundry, billet, slab, rod, etc.) and/or alloy. Each of the above three components has its own drivers of variability.

The LME price volatility is typically driven by macroeconomic factors (including political instability), global supply and demand of aluminum (including expectations for growth, contraction, and the level of global inventories), and trading activity of financial

investors. LME cash prices reached the highest level in over a decade in October 2021 at $3,180 per metric ton, with the low point of the year coming in January at $1,952.

While global inventories declined in 2021, high LME inventories could lead to a reduction in the price of aluminum and declines in the LME price have had a negative impact on our business, financial condition, and results of operations. Regional premiums tend to vary based on the supply of and demand for metal in a particular region, associated transportation costs, and import tariffs. Product premiums generally are a function of supply and demand for a given primary aluminum shape and alloy combination in a particular region. Periods of industry overcapacity may also result in a weak aluminum pricing environment.

A sustained weak LME aluminum pricing environment, deterioration in LME aluminum prices, or a decrease in regional premiums or product premiums could have a material adverse effect on our business, financial condition, or results of operations. Similarly, our operating results are affected by significant changes in key costs of production that are commodity or LME-linked.

Most of our alumina contracts contain two pricing components: (1) the API price basis and (2) a negotiated adjustment basis that takes into account various factors, including freight, quality, customer location, and market conditions. Because the API component can exhibit significant volatility due to market exposure, revenues associated with our alumina operations are exposed to market pricing.

While the majority of our bauxite is directed to our refineries, our third-party bauxite contracts vary in pricing structure and length, and can be impacted by changes in global aluminum and alumina bauxite market prices, as well as changes in bauxite quality.

Market-driven balancing of global aluminum supply and demand may be disrupted by non-market forces.

In response to market-driven factors relating to the global supply and demand of aluminum and alumina, including energy prices and environmental policies, other industry producers have independently undertaken to reduce or increase production. Changes in production may be delayed or impaired by the ability to secure, or the terms of long-term contracts, to buy energy or raw materials.

The impact of non-market forces on global aluminum industry capacity, such as political instability or pressures or governmental policies in certain countries relating to employment, the environment, or maintaining or further developing industry self-sufficiency, may affect overall supply and demand in the aluminum industry. For example, active conflict between Russia and Ukraine could adversely impact macroeconomic conditions and result in heightened economic sanctions from the U.S. and the international community in a manner that adversely affects our industry. The disruption of the market-driven balancing of the global supply and demand of aluminum, a resulting weak pricing environment and margin compression may adversely affect our business, financial condition, and results of operations.

Our operations and profitability have been and could continue to be adversely affected by changes in the cost or availability of raw materials or other key inputs, or by disruptions in the supply chain.

Our business, financial condition, and results of operations are affected by changes in the cost of raw materials, including energy, carbon products, caustic soda, and other key inputs, as well as freight costs associated with transportation of raw materials to refining and smelting locations. We may not be able to fully offset the effects of higher raw material costs or energy costs through price increases, productivity improvements, or cost reduction programs. In addition, due to global supply chain disruptions stemming from the COVID-19 pandemic, we may not be able to obtain sufficient supply of our raw materials or energy in a timely manner, including due to shortages, inflationary cost pressures, or transportation delays, which could cause disruption in our operations or production curtailments. For example, we have seen shortages in the supply chain of certain raw materials such as magnesium. Though we have been able to source our raw materials in adequate amounts from other supplies or our own stockpiles to date, there can be no guarantee that our operations or profitability will not be adversely affected in the future. Declines in the costs of alumina and energy during a particular period may not be adequate to offset sharp declines in metal price in that period. Increases in the cost of raw materials or decreases in input costs that are disproportionate to concurrent sharper decreases in the price of aluminum could have a material adverse effect on our operating results. Our suppliers, vendors, and customers could experience similar constraints that could impact our operations and profitability.

Our operations consume substantial amounts of energy and could be disrupted, and our profitability could decline, if energy costs rise or if energy supplies are interrupted or become uncertain.

Our refineries and smelters consume substantial amounts of natural gas and electricity in the production of alumina and aluminum. The prices for and availability of energy are subject to volatile market conditions that can be affected by factors beyond our control such as weather, political, regulatory, and economic conditions. For example, significantly higher market power prices in Europe in 2021 have caused competitors' smelters to announce production cuts.

Though we have ownership in certain hydroelectricity assets, we rely on third parties for our supply of energy resources consumed in the manufacture of our products. Energy supply contracts for our operations vary in length and market exposure, and we could be, and have been, negatively impacted by:

- significant increases in LME prices, or spot electricity, fuel oil and/or natural gas prices;

- unavailability of or interruptions or uncertainty in energy supply or unplanned outages due to political instability, droughts, hurricanes, wildfires, other natural disasters, equipment failure, or other causes;
- unavailability of long-term energy from renewable sources in particular locations or at competitive rates;
- curtailment of one or more refineries or smelters due to the inability to extend energy contracts upon expiration or negotiate new arrangements on cost-effective terms, the unavailability of energy at competitive rates; or,
- curtailment of one or more facilities due to high energy costs that render their continued operation uneconomic, discontinuation of power supply interruptibility rights granted to us under a regulatory regime in the country in which the facility is located, or due to a determination that energy arrangements do not comply with applicable laws, thus rendering the operations that had been relying on such country's energy framework uneconomic.

Events, such as those listed above, can result in high energy costs, the disruption of an energy source, finding a replacement energy source at a higher cost, the requirement to repay all or a portion of the benefit we received under a power supply interruptibility regime, or the requirement to remedy any non-compliance of an energy framework to comply with applicable laws, could disrupt our operations or result in production curtailments and could have a material adverse effect on our business, financial condition or results of operations.

Business Strategy Risks

We have incurred, and may incur in the future, significant costs associated with our strategy to be a lower cost, competitive, sustainable, and integrated aluminum production business and we may not be able to realize the anticipated benefits from announced plans, programs, initiatives, and capital investments.

We are executing a strategy to be a low cost, competitive, sustainable, and integrated aluminum production business by implementing productivity and cost-reduction initiatives, optimizing our portfolio of assets, divesting non-core assets, and investing in technology to advance sustainably. We have been taking decisive actions to lower the cost base of our operations through procurement strategies for raw materials, labor productivity, improving operating performance, deploying Company-wide business process models, and reducing overhead costs. In October 2019, we initiated a multi-year review of our production assets to drive lower costs and sustainable profitability. The portfolio review included 1.5 million metric tons of smelting capacity, including evaluation of options for improvement, curtailment, closure, or divestiture; as of December 31, 2021, the Company has taken action on approximately 75 percent of its 1.5 million tons of smelting capacity under review, and approximately 58 percent of alumina refining capacity under review. Though we have made progress on this strategy, we may not be able to realize the expected benefits or cost savings from this strategy.

The Company met its target for net proceeds from non-core asset sales of $500 million to $1 billion within twelve to eighteen months of the target announced in October 2019. In 2021, we generated net cash proceeds of $966 million from sales of non-core assets. Such proceeds provide a source of funding for other portfolio actions including curtailment and closure decisions. There is no assurance that additional non-core asset sales will provide funding for future portfolio decisions.

We have made and may continue to plan and execute other actions to grow or streamline our portfolio. There is no assurance that anticipated benefits of our strategic actions will be realized. With respect to portfolio optimization actions such as divestitures, curtailments, closures, and restarts, we may face barriers to exit from unprofitable businesses or operations, including high exit costs or objections from various stakeholders, the lack of availability of buyers willing to purchase such assets at prices acceptable to us, delays due to any regulatory approvals or government intervention, continuing environmental obligations, and third parties unwilling to release us from guarantees or other credit support provided in connection with the sale of assets. In addition, we may retain liabilities from such transactions, have ongoing indemnification obligations, and incur unforeseen liabilities for divested entities if a buyer fails to honor all commitments.

Our business operations are capital intensive, and portfolio optimization actions such as the curtailment or closure of operations or facilities may include significant costs and charges, including asset impairment charges and other measures. There can be no assurance that such actions will be undertaken or completed in their entirety as planned at the anticipated cost or will result in being beneficial to the Company. The effect of closures, curtailments, and divestitures over time will reduce the Company's cash flow and earnings capacity and result in a less diversified portfolio of businesses, and we will have a greater dependency on remaining businesses for our financial results. Additionally, curtailing certain existing facilities, whether temporarily or permanently, may require us to incur curtailment and carrying costs related to those facilities, as well as further increased costs should production be resumed at any curtailed facility, which could have an adverse effect on our business, financial results, and results of operations.

Our announced multi-year portfolio review of Company assets includes evaluating our portfolio to assess each facility's strategic benefits, competitiveness, and viability. Following this review, we expect to be a low cost, first quartile producer across our product segments of bauxite, alumina, and aluminum, and have up to 85% of smelting production from renewable energy sources, which aligns with our long-term goal of having the lowest carbon-producing refiners and smelters in the industry. We may not be able to implement, fully or in a cost-effective or timely way, the actions necessary to achieve this strategy, which actions could include capturing, maintaining and/or expanding margins from new products, continued product innovation investment in research and development projects and new technology, and cost-effective long-term energy solutions. We may not achieve the expected results

from technology innovation or other benefits or expected profitability associated with this strategy and executing on these actions also diverts senior management time and resources from our regular business operations, each of which could adversely affect the Company's business, financial condition, and results of operations.

Joint ventures, other strategic alliances, and strategic business transactions may not achieve intended results. We may experience operational challenges in integrating or segregating assets for such a venture or transaction, and such a venture or transaction could increase the number of our outstanding shares or amount of outstanding debt and affect our financial position.

We participate in joint ventures, have formed strategic alliances, and may enter into other similar arrangements in the future. For example, AWAC is an unincorporated global joint venture between Alcoa and Alumina Limited. AWAC consists of a number of affiliated entities, which own, operate, or have an interest in, bauxite mines and alumina refineries, as well as an aluminum smelter, in seven countries. In addition, Alcoa is minority owner of a joint venture with the Saudi Arabian Mining Company (Ma'aden). Although the Company has, in connection with these and our other existing joint ventures and strategic alliances, sought to protect our interests, joint ventures, and strategic alliances inherently involve special risks. Whether or not the Company holds majority interests or maintains operational control in such arrangements, our joint venture and other business partners may take certain actions and positions, or experience difficulties, that may negatively impact the Company and/or its reputation, such as:

- advancing economic, political, social, or business interests or goals that are inconsistent with, or opposed to those of, the Company and our stakeholders;
- exercising veto rights to block actions that we believe to be in our or the joint venture's or strategic alliance's best interests;
- taking action contrary to our policies or objectives with respect to our investments; or,
- as a result of financial or other difficulties, be unable or unwilling to fulfill their obligations under the joint venture, strategic alliance, or other agreements, such as contributing capital to expansion or maintenance projects.

We continuously evaluate and may in the future enter into additional strategic business transactions. Any such transactions could happen at any time, could be material to our business, and could take any number of forms, including, for example, an acquisition, merger, sale or distribution of certain assets, refinancing, or other recapitalization or material strategic transaction. There can be no assurance that our joint ventures, strategic alliances, or additional strategic business transactions will be beneficial to us, whether due to the above-described risks, unfavorable global economic conditions, increases in costs, foreign currency fluctuations, political risks, government interventions, retained liabilities, indemnification obligations, or other factors. Evaluating potential transactions and integrating completed ones may divert the attention of our management from ordinary operating matters. In addition, to the extent we consummate an agreement for the sale and disposition of an asset or asset group we may experience operational difficulties segregating them from our retained assets and operations, which could impact the execution or timing of such dispositions and could result in disruptions to our operations and/or claims for damages, among other things.

If we engage in a strategic transaction, we may require additional financing that could result in an increase in the number of our outstanding shares of stock or the aggregate amount and/or cost of our debt, which may result in an adverse impact to our credit ratings or adversely impact our business, financial condition, or results of operations. The number of shares of our stock or the aggregate principal amount of our debt that we may issue in connection with such a transaction could be significant.

Global Operational Risks

The COVID-19 pandemic has adversely affected, and in the future could adversely affect, the Company's business, financial condition, or results of operations.

In December 2019, there was an outbreak of a novel strain of coronavirus (COVID) in China that has since spread to all regions of the world. The outbreak was declared a pandemic by the World Health Organization in March 2020. The COVID-19 pandemic and preventative measures taken to contain or mitigate the outbreak caused business slowdowns or shutdowns in affected areas and significant disruption in economies and the global financial markets.

While the Company has maintained its operations since the onset of the pandemic, there can be no assurance that these trends will continue or not reverse. To date, the Company has experienced isolated interruptions from its supply sources but has identified alternate solutions to avoid any significant production impacts. In relation to the Company's workforce, operating locations have experienced elevated levels of absenteeism but ultimately have had minimal contractor- and employee-related disruptions to operations.

The COVID-19 pandemic is continuing. Uncertainty around the magnitude and duration of a global public health crisis can affect our business in a multitude of ways and in varying magnitudes. Although the ultimate impact of the COVID-19 pandemic on our business, financial condition, and results of operations is not yet known, it could adversely affect:

- Global demand for aluminum, negatively impacting our ability to generate cash flows from operations;
- Our operations, including causing interruptions, reductions, or closures of our operations, due to decreased demand for our products, government regulations and/or fewer workers in the facilities due to illness or public health restrictions;

- Commercial sustainability of key vendors or transportation disruptions within our supply chain, which could result in higher inventory costs and/or inability to obtain key raw materials or fulfill customer orders;
- The liquidity of our customers, which could negatively impact the collectability of outstanding receivables and our cash flows;
- Alcoa's ability to fund capital expenditures and required maintenance at our facilities, which could negatively impact our results of operations and profitability;
- Global financial and credit markets and our ability to obtain additional credit or financing under acceptable terms or at all, which could negatively affect our liquidity and financial condition;
- The Company's ability to meet financial covenants in our outstanding debt and credit facility agreements;
- Investment return on pension assets and interest rates, and contribution deferrals, resulting in increased required Company contributions or unfavorable contribution timing, negatively impacting future cash flows;
- Alcoa's ability to generate income in certain jurisdictions, negatively impacting the realizability of our deferred tax assets;
- The recoverability of certain long-lived and intangible assets, including goodwill;
- The financial condition of our investments and key joint venture partners, negatively impacting the results of operations, cash flows, and recoverability of investment balances;
- The effectiveness of hedging instruments;
- Legal obligations resulting from employee claims related to health and safety; and,
- Our ability to efficiently manage certain corporate functions and other activities as a result of employees working remotely.

Prolonged adverse conditions could negatively impact our business, financial condition, and results of operations, and result in asset impairment charges, including long-lived assets or goodwill, or affect the realizability of deferred tax assets. The situation surrounding COVID-19 remains fluid and could cause renewed instability in the global markets and economies in the near term, particularly if there are surges in COVID-19 cases globally and/or in the locations in which Alcoa operates before the pandemic reaches an endemic stage. The duration and magnitude of the impact depends on future developments that cannot be accurately predicted, such as additional outbreaks, the emergence and spread of variants, infection rates in areas where we operate, the extent and effectiveness of containment actions, including the timing, breadth of distribution, and availability and effectiveness of vaccination efforts in the markets where we operate, and the impact of these and other factors on our employees, customers, suppliers, joint venture partners, and equity method investments. In addition, further outbreaks causing renewed implementation or extension of existing or new government mandates or orders requiring vaccines or testing could also impact the availability of our employees or contractors and our ability to retain current workers, attract new workers, and could result in labor disruptions, which could impact our ability to manufacture our products and could have a material adverse effect on our business, financial condition, and results of operations.

The impact of the COVID-19 pandemic could have a material adverse effect on our business, financial condition, and results of operations, and may also have the effect of heightening many of the other risks and uncertainties described in this "Risk Factors" section.

Our participation in increasingly competitive and complex global markets exposes us to risks, including legal and regulatory risks and changes in conditions beyond our control, that could adversely affect our business, financial condition, or results of operations.

We have operations or activities in numerous countries and regions outside the United States, including Australia, Brazil, Canada, Europe, Guinea, and the Saudi Arabia. The risks associated with the Company's global operations include:

- geopolitical risks, such as political instability, coups d'états, civil unrest, strikes and work stoppages, expropriation, nationalization of properties by a government, imposition of sanctions, changes to import or export regulations and fees, renegotiation, revocation or nullification of existing agreements, leases, licenses, and permits, and changes to mining royalty rules or laws;
- economic and commercial instability risks, including those caused by sovereign and private debt default, corruption, and changes in local government laws, regulations, and policies, such as those related to tariffs and trade barriers, trade tensions, taxation, exchange controls, employment regulations, and repatriation of earnings;
- weakening macroeconomic conditions;
- contracting manufacturing activity, especially in the global automotive sector;
- war or terrorist activities;
- major public health issues, such as an outbreak of a pandemic or epidemic, which could cause disruptions in our operations, supply chain, or workforce;
- information systems failures or disruptions, including due to cyber attacks;
- difficulties enforcing intellectual property and contractual rights, or limitations in the protection of technology, data, and intellectual property, in certain jurisdictions; and,
- unexpected events, accidents, or environmental incidents, including natural disasters.

We have experienced some of these events, and while the impact of any of the foregoing factors is difficult to predict, any one or more of them could adversely affect our business, financial condition, or results of operations. Existing insurance arrangements may not provide sufficient coverage or reimbursement for significant costs that may arise from such events.

Unexpected or uncontrollable events or circumstances in any of the foreign markets in which we operate, including actions by foreign governments such as changes in foreign policy or fiscal regimes, termination of our leases or agreements with such foreign governments, increased government regulation, or forced curtailment or continuation of operations, could materially and adversely affect our business, financial condition, or results of operations.

Our global operations expose us to risks related to economic, political, and social conditions, including the impact of trade policies and adverse industry publicity, which may negatively impact our business and our ability to operate in certain locations.

We are subject to risks associated with doing business internationally, including foreign or domestic government fiscal and political crises, political and economic disputes and sanctions, social requirements and conditions, and adverse industry publicity. These factors, among others, bring uncertainty to the markets in which we compete, and may adversely affect our business, financial condition, and results of operations.

In addition, we operate in communities around the world, and social issues in the communities where we operate could affect our ability to maintain our operations; furthermore, incidents related to our industry could generate negative publicity and impact the social acceptability of our operations in such locations, including by damaging our reputation, our relationships with stakeholders, and our competitive position. Growing expectations of hosting communities as well as increasing social activism pose additional challenges to us maintaining our social license to operate and expand our business. For example, community and stakeholder concerns in Juruti, Brazil have affected our ability to access certain mining areas at times. Though Alcoa has systems in place to assess and manage risks, including risks associated with maintaining and protecting our social license to operate, expectations that the private sector play a significant role in promoting and supporting the delivery of the United Nation's Sustainable Development Goals (SDGs) are escalating. In certain jurisdictions, there are increasing regulatory developments to protect minority groups, such as Indigenous People in Australia. This could have an adverse effect on our ability to secure expansions to our operations at all or in the expected timeframe, could significantly increase our cost of doing business, and could disrupt our operations.

In the United States, in recent years, the U.S. government has taken actions with respect to the implementation of significant changes to certain trade policies, including import tariffs and quotas, modifications to international trade policy, the withdrawal from or renegotiation of certain trade agreements, and other changes that have affected U.S. trade relations with other countries, any of which may require us to significantly modify our current business practices or may otherwise materially and adversely affect our business or those of our customers. The U.S. government continues to review trade policies and negotiate new agreements with countries globally that could impact the Company. For example, the U.S. government is negotiating agreements with countries in relation to the tariffs initially applied under Section 232 of the Trade Expansion Act of 1962 (Section 232) in 2018. In 2021, the U.S. and European Union (EU) reached agreement whereby the U.S. lifted the Section 232 duties and applied a tariff-rate-quota allowing duty-free importation of aluminum from the EU based on historical volumes, and the EU suspended its retaliatory tariffs that had been in place on certain U.S. products. To the extent that further agreements are reached on a broader range of imports, or these tariffs and other trade actions result in a decrease in international demand for aluminum produced in the United States or otherwise negatively impact demand for our products, our business may be adversely impacted, and could further exacerbate aluminum and alumina price volatility and overall market uncertainty.

We are exposed to fluctuations in foreign currency exchange rates and interest rates, as well as inflation and other economic factors in the countries in which we operate.

Economic factors, including inflation and fluctuations in foreign currency exchange rates and interest rates, competitive factors in the countries in which we operate, and volatility or deterioration in the global economic and financial environment, could affect our business, financial condition, and results of operations. Changes in the valuation of the U.S. dollar against other currencies, particularly the Australian dollar, Brazilian real, Canadian dollar, euro, and Norwegian kroner, which are the currencies of certain countries in which we have operations, may affect our profitability, as some important inputs are purchased in other currencies, while our products are generally sold in U.S. dollars. As the U.S. dollar strengthens, the cost curve shifts down for smelters outside the United States, but costs for our U.S. smelting portfolio may not decline.

Changes in tax laws or exposure to additional tax liabilities could affect our future profitability.

We are subject to income taxes in both the United States and various non-U.S. jurisdictions. Changes in foreign and domestic tax laws, regulations, or policies, or their interpretation and application by regulatory bodies, or exposure to additional tax liabilities could affect our future profitability. For example, in October 2021, a new framework for international tax was agreed to by 137 member countries and jurisdictions of the Organisation for Economic Co-operation and Development (OECD), with rules targeted to be finalized in 2022 and implemented by participating jurisdictions as early as 2023. The impact to the Company of such agreement is uncertain until applicable rules are promulgated and implemented by the participating jurisdictions. Our domestic and international tax liabilities are dependent upon the distribution of profits among these different jurisdictions. Our tax expense includes estimates of additional tax that may be incurred for tax exposures and reflects various estimates and assumptions. The assumptions include

assessments of future earnings of the Company that could impact the valuation of our deferred tax assets. Our future results of operations could be adversely affected by changes in the effective tax rate as a result of a change in the mix of earnings in countries with differing statutory tax rates, changes in the overall profitability of the Company, changes in tax legislation and rates, changes in generally accepted accounting principles, and changes in the valuation of deferred tax assets and liabilities. Significant changes to tax laws or regulations and the positions of taxing authorities could have a substantial impact, positive or negative, on our effective tax rate, cash tax expenditures and cash flows, and deferred tax assets and liabilities.

We are subject to tax audits by various tax authorities in many jurisdictions, such as Australia, Brazil, Canada, and Spain. For example, in July 2020, AofA received Notices of Assessment (the Notices) from the Australian Taxation Office (ATO) related to the pricing of certain historic third-party alumina sales. The Notices asserted claims for income tax payable by AofA of approximately $156 (A$214), exclusive of interest and penalties. The Notices also include claims for compounded interest on the tax amount totaling approximately $516 (A$707). In accordance with the ATO's dispute resolution practices, AofA paid 50% of the assessed income tax amount exclusive of interest and any penalties to the ATO during the third quarter of 2020, and the ATO is not expected to seek further payment prior to final resolution of the matter. If AofA is ultimately successful, any amounts paid to the ATO as part of the 50% payment would be refunded. The ATO has also issued a position paper with its preliminary view on the imposition of administrative penalties related to the tax assessment, proposing penalties of approximately $94 (A$128). AofA disagrees with the ATO's proposed position on penalties and submitted a response to the position paper in the fourth quarter of 2020. After the ATO completes its review of AofA's response, the ATO could issue a penalty assessment. The Company does not agree with the ATO's positions, and AofA will continue to defend this matter and pursue all available dispute resolution methods, up to and including the filing of proceedings in the Australian Courts. We regularly assess the potential outcomes of examinations by tax authorities in determining the adequacy of our provision for income taxes. The results of tax audits and examinations of previously filed tax returns or related litigation and continuing assessments of our tax exposures could materially affect our financial results. See Part II Item 8 of this Form 10-K in Notes Q and S to the Consolidated Financial Statements under captions Unrecognized Tax Benefits and Contingencies, respectively.

We may be exposed to significant legal proceedings, investigations, or changes in foreign and/or U.S. federal, state, or local laws, regulations, or policies.

Our results of operations or liquidity in a particular period could be affected by new or increasingly stringent laws, regulatory requirements or interpretations, or outcomes of significant legal proceedings or investigations adverse to the Company. We may become subject to unexpected or rising costs associated with business operations, compliance measures, or provision of health or welfare benefits to employees due to changes in laws, regulations, or policies. We are also subject to a variety of legal and compliance risks, including, among other things, potential claims relating to health and safety, environmental matters, intellectual property rights, product liability, data privacy, taxes and compliance with U.S. and foreign export, anti-bribery, and competition laws, and sales and trading practices. We could be subject to fines, penalties, interest, or damages (in certain cases, treble damages). In addition, if we violate the terms of our agreements with governmental authorities, we may face additional monetary sanctions and other remedies as a court deems appropriate.

While we believe we have adopted appropriate risk management and compliance programs to address and reduce these risks, the global and diverse nature of our operations means that these risks continue to exist, and additional legal proceedings and contingencies may arise from time to time. In addition, various factors or developments can lead the Company to change current estimates of liabilities or make estimates for matters previously not susceptible of reasonable estimates, such as a significant judicial ruling, judgment, or settlement, or significant regulatory developments or changes in applicable law. A future adverse ruling or settlement or unfavorable changes in laws, regulations or policies, or other contingencies that the Company cannot predict with certainty could have a material adverse effect on our results of operations or cash flows in a particular period. See Part I Item 3 of this Form 10-K and Part II Item 8 of this Form 10-K in Note S to the Consolidated Financial Statements under caption Contingencies.

We are subject to a broad range of health, safety and environmental laws, regulations, and other requirements in the jurisdictions in which we operate that may expose us to substantial claims, costs, and liabilities.

Our operations worldwide are subject to numerous complex and increasingly stringent federal, state, local and foreign laws, regulations, policies, and permitting, licensing, and other requirements, including those related to health, safety, environmental, and waste management and disposal matters, which may expose us to substantial claims, costs, and liabilities. We may be subject to fines, penalties, and other damages, such as natural resource or community damages and the costs associated with the investigation and cleanup of soil, surface water, groundwater, and other media under laws such as CERCLA (commonly known as Superfund) or similar U.S. and foreign regulations. These laws, regulations, policies, and permitting, licensing, and other requirements could change or could be, and have been, applied or interpreted in ways that could (i) require us to enjoin, curtail, close or otherwise modify our operations and sites, including the implementation of corrective measures, the installation of additional equipment or structures, or the undertaking of other remedial actions, or (ii) subject us to enforcement risk or impose on or require us to incur additional capital expenditures, compliance or other costs, fines, penalties, or damages, any of which could adversely affect our results of operations, cash flows and financial condition, and the trading price of our common stock.

The costs of complying with such laws, regulations, policies, and other requirements, including participation in assessments, remediation activities, and cleanups of sites, as well as internal voluntary programs, are significant and will continue to be so for the foreseeable future. Environmental laws may impose cleanup liability on owners and occupiers of contaminated property, including previously owned, non-operational, or divested properties, regardless of whether the owners and occupiers caused the contamination or whether the activity that caused the contamination was lawful at the time it was conducted. As a result, we may be subject to claims arising from current or former conditions at sites that we own or operate currently, as well as at sites that we owned or operated in the past, and at contaminated sites that have always been owned or operated by third parties, regardless of whether we caused the contamination or whether the activity that caused the contamination was lawful at the time it was conducted. Liability may be without regard to fault and may be joint and several, so that we may be held responsible for more than our share of the contamination or other damages, or even for the entire share.

In addition, because environmental laws, regulations, policies, and other requirements are constantly evolving, we will continue to incur costs to maintain compliance and such costs could increase materially and prove to be more limiting and costly than we anticipate. Evolving standards and expectations can result in increased litigation and/or increased costs, all of which can have a material and adverse effect on our business operations, earnings, and cash flows. Future compliance with environmental, health and safety legislation and other regulatory requirements or expectations may prove to be more limiting and costly than we anticipate and may disrupt our business operations and require significant expenditures. Our business, financial condition, or results of operations in a particular period could be materially affected by certain health, safety, or environmental matters, including remediation costs and damages related to certain sites.

Our operations include impoundment structures, which could impact the environment or cause exposure to hazardous substances or other damage, which could result in material liabilities to us.

Some of our operations generate hazardous waste and other byproducts, which we contain in tailing facilities, residue storage areas, and other structural impoundments that are subject to extensive regulation and increasingly strict industry standards. Overtopping of storage areas caused by extreme weather events, erosion, or unanticipated structural failure of impoundments could result in severe, and in some cases catastrophic, damage to the environment, natural resources, or property, or personal injury and loss of life. These and other similar impacts that our operations may have on the environment, as well as exposures to hazardous substances or wastes associated with our operations, could result in significant costs, civil or criminal damages, fines or penalties, and enforcement actions issued by regulatory or judicial authorities enjoining, curtailing, or closing operations or requiring corrective measures, any of which could materially and adversely affect us.

Climate change, climate change legislation or regulations, and efforts to reduce greenhouse gases and build operational resilience to extreme weather conditions may adversely impact our operations and markets.

Energy is a significant input in a number of our operations and there is growing recognition that consumption of energy derived from fossil fuels is a contributor to climate change. A number of governments or regulatory bodies in areas where we operate, such as in Canada and the EU, have introduced or are contemplating legislative and regulatory change in response to the potential impacts of climate change, which could result in changes to the margins of greenhouse gas (GHG) intensive assets and energy-intensive assets. These regulatory mechanisms relating to carbon may be either voluntary or legislated and the inconsistency of associated regulations may impact our operations directly or indirectly through customers or our supply chain. Assessments of the potential impact of future climate change legislation, regulation and international treaties and accords are uncertain, given the wide scope of potential regulatory change in countries in which we operate and the diversity in the scope and development of such regulations. For example, in 2021, the European Commission proposed a Carbon Border Adjustment Mechanism (CBAM) as a levy on polluting imports and which, if approved, would include aluminum in the first phase of implementation beginning in 2023. We may realize increased capital expenditures, costs, or taxes resulting from required compliance with revised or new legislation or regulations, including costs to purchase or profits from sales of allowances or credits under a carbon credit/pricing or “cap and trade” system, increased insurance premiums and deductibles as new actuarial tables are developed to reshape coverage, a change in competitive position relative to industry peers, and changes to profit or loss arising from increased or decreased demand for goods produced by the Company and, indirectly, from changes in costs of goods sold.

Though we are investing in technology to reduce the production of greenhouse gases in the manufacture of our products, such as our ELYSIS™ joint venture aluminum smelting technology and other technologies that limit the production of carbon in alumina refining, in certain aspects of our operations, our ability to reduce our greenhouse gas emissions is also dependent on the actions of third parties, especially energy providers, and our ability to make significant changes in our greenhouse gas emissions. As a result, we could face additional costs associated with any new regulation of GHG emissions, and our ability to modify our operations to avoid these costs may be limited in the near term.

In addition, regulations to combat climate change could impact the competitiveness of the Company, including the attractiveness of the locations of some of the Company’s assets. The global focus on climate is raising awareness in all countries, such as the agreement at the 26th United Nations Climate Change Conference of the Parties (COP26) by many governments of countries where the Company

operates to combat deforestation, which could adversely affect our ability to mine and operate in sensitive areas like the Jarrah Forest and the Amazon.

The potential physical impacts of climate change or extreme weather conditions on the Company's operations are highly uncertain and will be particular to the geographic circumstances. These may include changes in rainfall patterns, wildfires, heat waves, shortages of water or other natural resources, changing sea levels, changing storm patterns, flooding, increased frequency and intensities of storms, and changing temperature levels. Any of these may disrupt our operations, hinder transportation of products to us or of our products to customers, prevent access to our facilities, negatively impact our suppliers' or customers' operations and their ability to fulfill contractual obligations to us, and/or cause damage to our facilities, all of which may increase our costs, reduce production, and adversely affect our business, financial condition, or results of operations.

We face significant competition globally within and beyond the aluminum industry, which may have an adverse effect on profitability.

We compete with a variety of both U.S. and non-U.S. aluminum industry competitors as well as with producers of other materials, such as steel, titanium, plastics, composites, ceramics, and glass, among others. Use of such materials could reduce the demand for aluminum products, which may reduce our profitability and cash flow. Factors affecting our ability to compete include increased competition from overseas producers, our competitors' pricing strategies, the introduction or advancement of new technologies and equipment by our competitors or our customers, changes in our customers' strategy or material requirements, and our ability to maintain the cost-efficiency of our facilities. Certain competitors possess financial, technical and management resources to develop and market products that may compete favorably against our products, and consolidation among our competitors may also allow them to compete more effectively. In addition, our competitive position depends, in part, on our ability to operate as an integrated aluminum value chain, leverage innovation expertise across businesses and key end markets, and access an economical power supply to sustain our operations in various countries. See Business—Competition.

We may not be able to obtain or maintain adequate insurance coverage.

We maintain various forms of insurance, including insurance covering claims related to our properties and risks associated with our operations. Our existing property and liability insurance coverages contain exclusions and limitations on coverage. In connection with renewals of insurance, we have experienced, or could experience in the future, additional exclusions and limitations on coverage, significantly increased self-insured retentions and deductibles, and significantly higher premiums. We may not be able to procure adequate insurance coverage for certain risks, if at all, and existing insurance arrangements may not provide sufficient coverage or reimbursement for significant costs that may arise. As a result, in the future our insurance coverage may not cover claims to the extent that it has in the past and the costs that we incur to procure insurance may increase significantly, either of which could have an adverse effect on our results of operations.

Cybersecurity Risks

Cyber attacks, security breaches, system failures, software or application vulnerabilities, or other cyber incidents may threaten the integrity of our information technology infrastructure and other sensitive business information, disrupt our operations and business processes, expose us to potential liability, and result in reputational harm and other negative consequences that could have a material adverse effect on our business, financial condition, and results of operations.

We depend on information and communications technology, networks, software, and related systems to operate our business, including production controls and operating systems at our facilities and systems for recording and processing transactions, interfacing with customers, financial reporting, and protecting the personal data of our employees and other confidential information. Our global operations require increased reliance on technology, which expose us to risks of theft of proprietary information, including trade secrets and other intellectual property that could have a material adverse effect on our business, financial condition, and results of operations. The protection of such information, as well as sensitive customer information, personal data of our employees, and other confidential information, is critical to us. We face global cybersecurity threats, which may range from uncoordinated individual attempts to sophisticated and targeted measures, known as advanced persistent threats, directed at the Company. In addition, a greater number of our employees are working remotely as a result of the COVID-19 pandemic, which has increased cybersecurity vulnerabilities and risk to our information technologies systems.

Cyber attacks and other cyber incidents are becoming more frequent and sophisticated, are constantly evolving, and are being made by groups and individuals with significant resources and a wide range of expertise and motives. Cyber attacks and security breaches may include, but are not limited to, unauthorized attempts to access information or digital infrastructure, efforts to direct payments to fictitious parties, viruses, ransomware, malicious codes, hacking, phishing (including through social engineering), denial of service, human error, and other electronic security breaches, any of which could have a material adverse effect on our business, financial condition, and results of operations. As techniques used in cyber attacks change frequently and may not be immediately detectable, we may be unable to anticipate or detect these techniques, such as use of a zero-day exploit (such as Log4j vulnerability) or unknown malware, including the scope and impact of an incident, contain the incident within our systems, or implement preventative or remediation measures. We have in the past experienced attempts and incidents by external parties to penetrate our networks and

systems. In addition, we utilize third-party vendors for certain software applications, storage systems, and cloud computing services. Cyber attacks, security breaches, or other incidents on the information technology systems of our service providers or business partners could impact us. Such attempts and incidents to date have not resulted in any material breaches, disruptions, or loss of information.

We continue to assess potential cyber threats and invest in our information technology infrastructure to address these threats, including by monitoring networks and systems, training employees on cyber threats, and enhancing security policies of the Company and its third-party providers. While the Company continually works to strengthen our systems and security measures, safeguard information, and mitigate potential risks, there is no assurance that such actions will be sufficient to prevent or timely detect cyber attacks or security breaches. Such intrusions could manipulate or improperly use our systems or networks, disclose, or compromise confidential or protected information, destroy, or corrupt data, or otherwise disrupt our operations, any of which could have a material adverse effect on our business, financial condition, and results of operations.

In addition, cybersecurity incidents could negatively impact our reputation and competitive position, and could result in litigation with third parties, regulatory action, loss of business, theft of assets, and significant remediation costs, any of which could have a material adverse effect on our financial condition and results of operations. Such security breaches could also result in a violation of applicable U.S. and international privacy and other laws, and subject us to litigation and governmental investigations and proceedings, any of which could result in our exposure to material civil or criminal liability. For example, the European Union's General Data Privacy Regulation subjects companies to a range of compliance obligations regarding the handling of personal data. In the event our operations are found to be in violation of the GDPR's requirements, we may be subject to significant civil penalties, business disruption and reputational harm, any of which could have a material adverse effect on our business, financial condition, or results of operations. Cyber attacks or breaches could require significant management attention and resources and result in the diminution of the value of our investment in research and development, which could have a material adverse effect on our business, financial condition, or results of operations.

Though we have disaster recovery and business continuity plans in place, if our information technology systems, or those of our third-party providers, are damaged, breached, interrupted, or cease to function properly for any reason, and, if the disaster recovery and business continuity plans do not effectively resolve the incident on a timely basis, we may suffer interruptions in our ability to manage or conduct business and we may be exposed to reputational, competitive and business harm as well as litigation and regulatory action, which may materially and adversely impact our business, financial condition, or results of operations.

Available Capital and Credit-Related Risks

We cannot guarantee that we will continue to return capital to our stockholders through the payment of cash dividends and/or the repurchase of our common stock. The reduction or discontinuation of the payment of cash dividends to our stockholders or the repurchase of our shares of common stock could adversely affect the market price or liquidity of our shares.

In October 2021, the Company's Board of Directors initiated a quarterly cash dividend program, at $0.10 per share, and authorized a new $500 million share repurchase program. The Board of Directors also previously authorized a $200 million share repurchase program in October 2018, which was fully utilized with the completion of $150 million in repurchases during the fourth quarter of 2021. The share repurchase authorizations do not have predetermined expiration dates. The Company is under no obligation to pay any cash dividends to stockholders or to repurchase our outstanding shares of common stock at any particular price or at all, and the payment of dividends and/or repurchases of stock may be limited, suspended, or discontinued at any time in our discretion and without notice. The Company set each of the current dividend and new share repurchase program authorization at a level it believes is sustainable throughout the commodity cycle, based on our current financial position and reasonable expectations of cash flow. In addition, as described elsewhere in this "Risk Factors" section, the Company's Revolving Credit Facility (as defined below) inhibits the Company's ability to make certain restricted payments, including the amount of dividends and payments to redeem, repurchase, or retire equity securities or other indebtedness.

The Company intends to pay dividends on a quarterly basis. Dividends on Alcoa Corporation common stock are subject to authorization by the Company's Board of Directors. The payment, amount, and timing of dividends, if any, depends upon matters deemed relevant by the Company's Board of Directors, such as Alcoa Corporation's financial position, results of operations, cash flows, capital requirements, business condition, future prospects, any limitations imposed by law, credit agreements or senior securities, and other factors deemed relevant and appropriate.

Declines in asset values or increases in liabilities, including liabilities associated with benefit plans or taxes, can reduce stockholders' equity. A deficit in stockholders' equity could limit our ability under Delaware law to pay dividends and repurchase shares in the future.

The reduction, suspension, or elimination of our cash dividend or our share repurchase program could adversely affect the market price of our stock and/or and significantly increase its trading price volatility. The payment of any future dividends and the existence of a share repurchase program could cause our stock price to be higher than it would otherwise be and could potentially reduce the market liquidity for our stock. Additionally, any future payment of dividends or repurchases of our common stock could negatively

impact our financial position and our ability to fund ordinary and existing operations, capital expenditures, cash taxes, and growth or other opportunities.

Our business and growth prospects may be negatively impacted by limits on our ability to fund capital expenditures.

We require substantial capital to invest in growth opportunities and to maintain and prolong the life and capacity of our existing facilities. Our ability to generate cash flows is affected by many factors, including market and pricing conditions. Insufficient cash generation or capital project overruns may negatively impact our ability to fund as planned our sustaining and return-seeking capital projects, and such postponement in funding capital expenditures or inadequate funding to complete projects could result in operational issues. For 2022, we project capital expenditures of $525 million, of which $450 million is for sustaining capital and $75 million for return-seeking capital. If our technology research and development projects prove feasible with an acceptable expected rate of return, our capital expenditures for return-seeking projects would increase significantly over the next several years. To the extent our access to competitive financial, credit, capital, and/or banking markets becomes impaired, our operations, financial results, and cash flows could be adversely impacted. We may also need to address commercial, political, and social issues in relation to capital expenditures in certain of the jurisdictions in which we operate. If our interest in our joint ventures is diluted or we lose key concessions, our growth could be constrained. Any of the foregoing could have a material adverse effect on our business, results of operations, financial condition, and prospects.

Deterioration in our credit profile or increases in interest rates could increase our costs of borrowing money and limit our access to the capital markets and commercial credit.

The major credit rating agencies evaluate our creditworthiness and give us specified credit ratings. These ratings are based on a number of factors, including our financial strength and financial policies as well as our strategies, operations, and execution of announced actions. These credit ratings are limited in scope and do not address all material risks related to an investment in us, but rather reflect only the view of each rating agency at the time its rating is issued. Nonetheless, the credit ratings we receive impact our borrowing costs as well as our access to sources of capital on terms advantageous to our business. Failure to obtain sufficiently high credit ratings could adversely affect our interest rates in future financings, our liquidity, or our competitive position, and could also restrict our access to capital markets. In addition, our credit ratings could be lowered or withdrawn entirely by a rating agency if, in its judgment, the circumstances warrant. If a rating agency were to downgrade our rating, our borrowing costs could increase, our funding sources could decrease, and we would need to rely on our cash flows from operations. As a result of these factors, a downgrade of our credit ratings could have a materially adverse impact on our future operations, cash flows, and financial position.

Our indebtedness restricts our current and future operations, which could adversely affect our ability to respond to changes in our business and manage our operations, and failure to comply with the agreements relating to our outstanding indebtedness, including due to events beyond our control, could result in an event of default that could materially and adversely affect our business, financial condition, results of operations, or cash flows.

Alcoa and Alcoa Nederland Holding B.V. (ANHBV), a wholly-owned subsidiary of Alcoa, are party to a revolving credit agreement with a syndicate of lenders and issuers named therein (as subsequently amended, the Revolving Credit Facility). The terms of the Revolving Credit Facility and the indentures governing our outstanding notes contain covenants that impose significant operating and financial restrictions on us, including on our ability to, among other things:

- make investments, loans, advances, and acquisitions;
- amend certain material documents;
- dispose of assets;
- incur or guarantee additional debt and issue certain disqualified equity interests and preferred stock;
- make certain restricted payments, including limiting the amount of dividends on equity securities and payments to redeem, repurchase or retire equity securities or other indebtedness;
- engage in transactions with affiliates;
- materially alter the business we conduct;
- enter into certain restrictive agreements;
- create liens on assets to secure debt;
- consolidate, merge, sell or otherwise dispose of all or substantially all of Alcoa's, ANHBV's or a subsidiary guarantor's assets; and,
- take any actions that would reduce our ownership of AWAC entities below an agreed level.

The Revolving Credit Facility requires us to comply with financial covenants which includes maintaining an interest expense coverage ratio of not less than 4.00 to 1.00, and a leverage ratio that is not greater than 2.75 to 1.00. The leverage ratio compares total indebtedness to Consolidated EBITDA (as defined in the Revolving Credit Facility) to determine compliance with the financial covenant. The leverage ratio calculation also determines the maximum indebtedness permitted under the Revolving Credit Facility. The results of the calculation of these ratios, when considering the Company's existing debt obligations, affects and could restrict the amount of additional borrowing capacity under the Company's Revolving Credit Facility or other credit facilities.

In addition, all obligations of Alcoa Corporation or a domestic entity under the Revolving Credit Facility are secured by, subject to certain exceptions, a first priority lien on substantially all assets of Alcoa Corporation and the material domestic wholly-owned subsidiaries of Alcoa Corporation and certain equity interests of specified non-U.S. subsidiaries. All other obligations under the Revolving Credit Facility are secured by, subject to certain exceptions, a first priority security interest in substantially all assets of Alcoa Corporation, ANHBV, the material domestic wholly-owned subsidiaries of Alcoa Corporation, and the material foreign wholly-owned subsidiaries of Alcoa Corporation located in Australia, Brazil, Canada, Luxembourg, the Netherlands, Norway, and Switzerland including equity interests of certain subsidiaries that directly hold equity interests in AWAC entities. Our ability to comply with these agreements may be affected by events beyond our control, including prevailing economic, financial, and industry conditions. These covenants could have an adverse effect on our business by limiting our ability to take advantage of financing, merger and acquisition, or other opportunities. The breach of any of these covenants or restrictions could result in a default under the Revolving Credit Facility or the indentures governing our notes and other outstanding indebtedness, including such indebtedness for which the Company is a guarantor.

See Part II Item 7 of this Form 10-K in Management's Discussion and Analysis of Financial Condition and Results of Operations under caption Liquidity and Capital Resources – Financing Activities for more information on the restrictive covenants in the Revolving Credit Facility.

If an event of default were to occur under any of the agreements relating to our outstanding indebtedness, including the Revolving Credit Facility and the indenture governing our notes, we may not be able to incur additional indebtedness under the Revolving Credit Facility and the holders of the defaulted debt could cause all amounts outstanding with respect to that debt to be due and payable immediately. We cannot assure that our assets or cash flow would be sufficient to fully repay borrowings under our outstanding debt instruments if accelerated upon an event of default, which could have a material adverse effect on our ability to continue to operate as a going concern. Further, if we are unable to repay, refinance, or restructure our secured indebtedness, the holders of such indebtedness could proceed against the collateral securing that indebtedness. In addition, any event of default or declaration of acceleration under one debt instrument also could result in an event of default under one or more of our other debt instruments.

Labor- and Pension-Related Risks

Union disputes and other employee relations issues, as well as labor market conditions, could adversely affect our business, financial condition, or results of operations.

A significant portion of our employees are represented by labor unions in a number of countries under various collective bargaining agreements with varying durations and expiration dates. Union disputes and other employee relations issues could, and have, adversely affect our business, financial condition, or results of operations. For example, in 2021, we faced a workers' strike at our San Ciprián refinery and smelter in Spain, which slowed production and blocked metal shipments until January 2022, after the Company had reached an agreement with the workers' representatives regarding the near-term future of the smelter.

We may not be able to satisfactorily renegotiate collective bargaining agreements when they expire. In addition, existing collective bargaining agreements may not prevent strikes, work stoppages, work slowdowns, union organizing campaigns, or lockouts at our facilities in the future. We may also be subject to general country strikes or work stoppages unrelated to our business or collective bargaining agreements. A labor dispute or work stoppage of employees could have a material adverse effect on production at one or more of our facilities, and depending on the length of work stoppage, on our business, financial condition, or results of operations. Additionally, in the current competitive labor market, if we lose critical or a significant amount of workers to attrition, it may be difficult or costly to find and recruit replacement employees, which could have a material adverse effect on our business, financial condition, and results of operations.

A decline in the liability discount rate, lower-than-expected investment return on pension assets and other factors could affect our business, financial condition, results of operations, or amount of pension funding contributions in future periods.

Our results of operations may be negatively affected by the amount of expense we record for our pension and other postretirement benefit plans, reductions in the fair value of plan assets, and other factors. We calculate income or expense for our plans using actuarial valuations in accordance with accounting principles generally accepted in the United States of America (GAAP).

These valuations reflect assumptions about financial market and other economic conditions, which may change based on changes in key economic indicators. The most significant year-end assumptions used by the Company to estimate pension or other postretirement benefit income or expense for the following year are the discount rate applied to plan liabilities and the expected long-term rate of return on plan assets. In addition, the Company is required to make an annual measurement of plan assets and liabilities, which may result in a significant charge to stockholders' equity. See Part II Item 7 of this Form 10-K in Management's Discussion and Analysis of Financial Condition and Results of Operations under caption Critical Accounting Policies and Estimates—Pension and Other Postretirement Benefits and Part II Item 8 of this Form 10-K in Note O to the Consolidated Financial Statements. Although GAAP expense and pension funding contributions are impacted by different regulations and requirements, the key economic factors that affect GAAP expense would also likely affect the amount of cash or securities we would contribute to the pension plans.

Potential pension contributions include both mandatory amounts required under federal law and discretionary contributions to improve the plans' funded status. While the Company took several actions in 2021 to improve the funded status of its pension plans and adjust its asset allocation to reduce variance risk, declines in the discount rate or lower-than-expected investment returns on plan assets could have a material negative effect on our cash flows. Adverse capital market conditions could result in reductions in the fair value of plan assets and increase our liabilities related to such plans, adversely affecting our liquidity and results of operations.

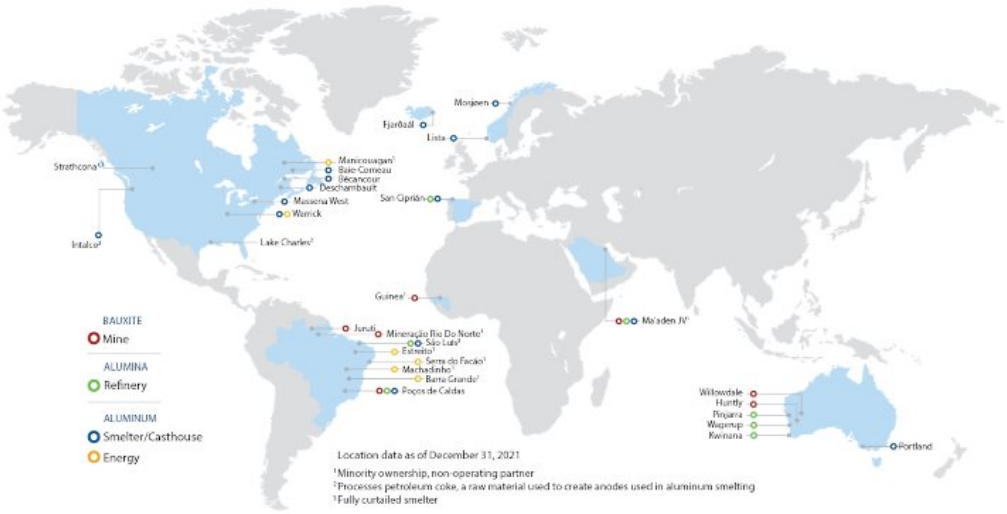
Item 1B. Unresolved Staff Comments.

None.

Item 2. Properties.

Alcoa Corporation's principal executive office, located at 201 Isabella Street, Suite 500, Pittsburgh, Pennsylvania 15212-5858, is leased. Alcoa also leases several office facilities and sites, both domestically and internationally. In addition, Alcoa owns or has an ownership interest in its production sites, both domestically and internationally. Alcoa owns active mines and plants classified under the Bauxite, Alumina, and Aluminum segments of its business. These include facilities and assets around the world used for Alcoa's bauxite mining, alumina refining, aluminum smelting, and casting production and energy generation. Capacity and utilization of these facilities varies by segment and the level of demand for each product. See Part I Item 1 of this Form 10-K for additional information, including the ownership, capacity, and utilization of these facilities, used in the Alumina and Aluminum segments. A discussion of our bauxite mining properties is below.

The following map shows the locations of our operations as of December 31, 2021:



Alcoa Locations and Properties.

Several of our wholly-owned production facilities are encumbered under the Company's Revolving Credit Facility. See Part II Item 7 of this Form 10-K in Management's Discussion and Analysis of Financial Condition and Results of Operations under the caption Liquidity and Capital Resources—Financing Activities for more information on the Company's Revolving Credit Facility.

Although Alcoa's facilities vary in terms of age and condition, management believes that its facilities are suitable and generally adequate to support the current and projected operations of the business. See Part II Item 8 of this Form 10-K in Notes B and K to the Consolidated Financial Statements for more information on properties, plants, and equipment.

Bauxite Mining Properties

Alcoa has access to large bauxite deposit areas with mining rights that extend in many cases more than 15 years from the date of this Form 10-K. The Company obtains bauxite from its own resources and from those belonging to AWAC, located in the countries listed in the table below, as well as pursuant to both long-term and short-term contracts and mining leases. Tons of bauxite are reported on a zero-moisture basis in millions of dry metric tons (mdmt) unless otherwise stated.

The following information concerning our mining properties has been prepared in accordance with the requirements of subpart 1300 of Regulation S-K, which first became applicable to us for the fiscal year ended December 31, 2021. These requirements differ significantly from the previously applicable disclosure requirements of SEC Industry Guide 7. Among other differences, subpart 1300 of Regulation S-K requires us to disclose mineral resources, in addition to mineral reserves, as of the end of the most recently completed fiscal year both in the aggregate and for each of our individually material mining properties. As of December 31, 2021, the Company's individually material mining properties, as determined in accordance with subpart 1300 of Regulation S-K, are our bauxite mining properties in the Darling Range of Western Australia (Darling Range) and Juruti, Brazil (Juruti).

As used in this Form 10-K, the terms "mineral resource," "measured mineral resource," "indicated mineral resource," "inferred mineral resource," "mineral reserve," "proven mineral reserve" and "probable mineral reserve" are defined and used in accordance with subpart 1300 of Regulation S-K. Under subpart 1300 of Regulation S-K, mineral resources may not be classified as "mineral reserves" unless the determination has been made by a qualified person (as defined under subpart 1300 of Regulation S-K) that the mineral resources can be the basis of an economically viable project. Part or all of the mineral deposits (including any mineral resources) in these categories may never be converted into mineral reserves. Further, except for the portion of mineral resources classified as mineral reserves, mineral resources do not have demonstrated economic value. Estimates of inferred mineral resources have too high of a degree of uncertainty as to their existence and may not be converted to a mineral reserve. Therefore, it should not be assumed that all or any part of an inferred mineral resource exists, that it can be the basis of an economically viable project, or that it will ever be upgraded to a higher category. Likewise, it should not be assumed that all or any part of measured or indicated mineral resources will ever be converted to mineral reserves. Management relies on estimates of our recoverable mineral reserves, which estimation is complex due to geological characteristics of the properties and the number of assumptions made and variable factors, some of which are beyond our control.

The following table shows the AWAC and/or Alcoa share (proportion) of annual production tonnage at each of our bauxite mining properties and in the aggregate for each of the last three fiscal years.

Summary of Attributable Annual Bauxite Production (mdmt) for the years ended December 31, 2021, 2020, and 2019, respectively:

Country	Property (Region)	2021	2020	2019
Australia	Darling Range (Western Australia, WA)	34.7	34.8	34.7
Brazil	Juruti (Pará State)	5.8	6.1	6.0
Brazil	Trombetas (Pará State)	2.0	2.1	2.2
Brazil	Poços de Caldas (Minas Gerais)	0.4	0.2	0.3
Guinea	Boké (Sangaredi)	3.5	3.6	3.0
Saudi Arabia	Al Ba'itha (Al Qassim)	1.2	1.2	1.2
		47.6	48.0	47.4

The following tables summarize certain information regarding our bauxite mining properties. The information that follows relating to Darling Range and Juruti is derived, for the most part, from the technical report summaries relating to such properties prepared in compliance with Item 601(b)(96) and subpart 1300 of Regulation S-K. Portions of the following information are based on assumptions, qualifications, and procedures that are not fully described herein. Reference should be made to the full text of the technical report summaries for Darling Range and Juruti, which are filed as Exhibits 96.1 and 96.2, respectively, to this Form 10-K and are incorporated by reference herein.

Bauxite Interests and Operators:

Property (Region)	Access/Transportation	Operator	Owners' Mining Rights[1]	Expiration Date of Mining Rights	Titles, Rights, Leases or Options	Area (hectares)
Darling Range[2] (WA)	Accessed by road. Ore transported via long-distance conveyor and rail to refineries.	AofA	100%	2024	Mining lease from the Western Australia (WA) Government. ML1SA.	702,261
Juruti[3] (Pará State)	Accessed by road from Juruti town, by boat along the Amazon River, or by air from Juruti Airport. Ore transported from the mine to Juruti port by company-operated rail.	AWA Brasil	100%	2100[4]	Mining licenses from the Government of Brazil and Pará. Mining rights do not have a legal expiration date. Operating licenses for the mine, washing plant, and exploration are in the process of being renewed. Operating license for the port remains valid until the government agency formalizes the renewal.	227,276
Trombetas (Pará State)	Accessed by road from Porto Trombetas, by boat along the Trombetas River, or by air from Porto Trombetas Airport. Ore is transported by truck and conveyor to wash plant then by company-operated rail to Trombetas port.	MRN	18.2%	2046[4]	Mine: Mining Concession #950.000/1997 from Government of Brazil. Land Titles held by public communities. Mining zone granted within Saraca-Taquera National Forest. Operating License (LO) No. 1624/2021 for Cipo and Teofilo plateaus valid for 10 years from 10/09/2021.	143,000
Poços de Caldas (Minas Gerais)	Accessed by road. Ore transported from the mine to the refinery by road.	Alcoa Alumínio	100%	2031[4]	Mining licenses from the Government of Brazil and Minas Gerais. Company claims and third-party leases. Operation license expires in 2022 but can be extended subject to meeting any applicable conditions.	7,424
Boké (Sangaredi)	Accessed by road from Sangaredi and public airports. Ore transported by company-operated rail to Kamsar port.	CBG	22.95%	2038	Mining Lease from Government of Guinea. The lease is renewable in 25-year increments. CBG's rights are specified within the Basic Agreement and Amendment 1 to the Basic Agreement with the Government of Guinea.	293,900
Al Ba'itha (Al Qassim)	Accessed by road. Ore is transported to the refinery by rail and truck.	MBAC	25.1%	2037	Mining Lease granted to Ma'aden by Kingdom of Saudi Arabia Ministry of Petroleum and Mineral Resources, with a duration of 30 years. Exclusive rights to utilize bauxite and annexed minerals.	14,776

(1) Owners' Mining Rights reflects AWAC's and/or Alcoa's ownership interest(s) in the properties and related share (proportion) of the mineral resources and reserves and annual production.

(2) For more information, see "Individual Property Disclosure—Darling Range" below.

(3) For more information, see "Individual Property Disclosure—Juruti" below.

(4) Brazilian mineral legislation does not limit the duration of mining concessions; rather, the concession remains in force until the deposit is exhausted. These concessions may be extended later or expire earlier than estimated, based on the rate at which these deposits are exhausted and on obtaining any additional governmental approval, as necessary.

Bauxite Mine Types and Facilities:

Property (Region)	Development Stage	Type of Mine and Mineralization	Processing Plant	Other Facilities
Darling Range[1] (WA)	Production/ Operating	Open-cut mines. Bauxite is lateritic formed through weathering of Archean granites and gneisses	N/A Ore crushing only.	Administrative buildings and workshops, crushers, long-distance conveyors. Power supplied from natural gas.
Juruti[2] (Pará State)	Production/ Operating	Open-cut mines. Bauxite is lateritic formed through weathering of Cretaceous Alter do Chao Formation sedimentary sequence.	Fixed plant for ore crushing and washing.	Mine: Administrative buildings and workshops, water supply pumps and pipeline from Juruti Grande, ore stockpiles, railroad, tailings thickening and settling ponds. Port: Administrative buildings, port control, ore stockpiles, rail siding, and ship loader. Power supplied by thermoelectric units at the mine and port.
Trombetas (Pará State)	Production/ Operating	Open-cut mines. Bauxite is lateritic formed through weathering of Cretaceous Alter do Chao Formation sedimentary sequence.	Ore crushing stations and fixed plant for washing.	Mine: Mine planning offices and workshops, Long-distance conveyors transport ore from several plateaus to central infrastructure area, ore stockpiles, railroad, and tailings, thickening and settling ponds. Port: Administrative buildings, port control, ore stockpiles, ore drying facilities, rail siding, and ship loader. Power supplied by fuel oil generators.
Poços de Caldas (Minas Gerais)	Production/ Operating	Open-cut mines. Bauxite derived from the weathering of nepheline syenite and phonolite.	N/A Run of mine (ROM) trucked to refinery stockpiles.	Mining offices and services are located at the refinery. Power supplied by commercial grid.
Boké (Sangaredi)	Production/ Operating	Open-cut mines. The bauxite deposits within the CBG lease are of two general types. TYPE 1: In-situ laterization of Ordovician and Devonian plateau sediments locally intruded by dolerite dikes and sills. TYPE 2: Sangaredi type deposits are derived from clastic deposition of material eroded from the TYPE 1 laterite deposits and possibly some of the proliths from the TYPE 1 plateaus deposits.	N/A Ore crushed and dried at Kamsar port facilities.	Mine: Administrative buildings, workshops, and water/power supply are in Sangaredi. Port: Administrative buildings, port control, ore stockpiles, ore drying facilities, rail siding, and ship loader. Power supplied by fuel oil generators at the mine and port.
Al Ba'itha (Al Qassim)	Production/ Operating	Open-cut mine. Bauxite occurs as a paleolaterite profile developed at an angular unconformity between underlying late Triassic to early Cretaceous sediments (parent rock sequence Biyadh Formation) and the overlying late Cretaceous Wasia Formation (overburden sequence).	N/A Fixed plant for ore crushing and train loading	The mine includes fixed plants for crushing and train loading; workshops and ancillary services; power plant; and water supply. There is a company village with supporting facilities

(1) For more information, see "Individual Property Disclosure—Darling Range Mines" below.

(2) For more information, see "Individual Property Disclosure—Juruti" below.

Bauxite Mineral Resources and Mineral Reserves

In accordance with subpart 1300 of Regulation S-K, management engaged SLR International Corporation as the qualified persons to prepare technical report summaries for the disclosure of mineral resources and reserves at Darling Range and Juruti. The tables shown below of resources and reserves by mining property were prepared using the results of the procedures performed by the qualified persons, which have no affiliation with or interest in Alcoa or our mining properties.

Summary of Attributable Bauxite Mineral Resources at December 31, 2021:

	Measured			Indicated			Measured + Indicated			Inferred		
Property (Region)	Tonnage (mdmt)[1]	Alumina (%)	Silica (%)	Tonnage (mdmt)[1]	Alumina (%)	Silica (%)	Tonnage (mdmt)[1]	Alumina (%)	Silica (%)	Tonnage (mdmt)[1]	Alumina (%)	Silica (%)
Darling Range (WA)[2]	48.0	32.9	1.1	34.8	31.9	1.1	82.8	32.3	1.1	320.0	32.8	1.2
Juruti (Pará State)[3]	5.7	44.7	5.4	58.6	45.4	4.4	64.2	45.3	4.5	563.8	45.7	4.7
Trombetas (Pará State)[4]	45.7	49.6	4.4	5.6	48.5	5.2	51.3	49.5	4.5	24.4	49.9	3.7
Poços de Caldas (Minas Gerais)[5]	2.8	38.0	4.7	10.7	36.9	5.7	13.4	37.1	5.5	21.4	35.2	5.9
Boké (Sangaredi)[6]	—	—	—	1,350.7	46.6	2.3	1,350.7	46.6	2.3	168.1	45.8	2.4
Al Ba'itha (Al Qassim)[7]	—	—	—	—	—	—	—	—	—	0.7	48.3	11.7

(1) This table shows only the AWAC and/or Alcoa share (proportion) of mineral resources. The reference point for the mineral resource is the in situ predicted dry tonnage and grade of material to be delivered to the refinery stockpile following the application of mining design parameters. Certain totals may not sum due to rounding.

(2) Alumina for the Darling Range is stated as Available Alumina (as $A.Al_2O_3$) and Silica is stated as Reactive Silica (as $R.SiO_2$). Further, mineral resources are estimated using a three-year trailing average of arms-length sales of bauxite from Darling Range, approximately $24 per ton. Darling Range mineral resources are estimated at a $\geq$ 27.5% $A.Al_2O_3$ and $\leq$3.5 % $R.SiO_2$ cut-off grade and at a minimum mining thickness of 1.5 m.

(3) Alumina for Juruti is stated as Available Alumina (as A.Al_2O_3) and Silica is stated as Reactive Silica (as R.SiO_2). Juruti mineral resources are estimated at a pit discard cut-off value based on a benefit calculation that determines whether a block is economically viable. Further, mineral resources are estimated using a one-year weighted average bauxite price of approximately $35 (wet-base) per ton, based on contractual agreements with an Alumina segment refinery.

(4) Alumina for Trombetas is stated as Available Alumina (as A.Al_2O_3) and Silica is stated as Reactive Silica (as R.SiO_2). Trombetas bauxite is defined using a ≥ 46% A.Al_2O_3 grade.

(5) Alumina for Poços de Caldas is stated as Available Alumina (as A.Al_2O_3) and Silica is stated as Reactive Silica (as R.SiO_2). Poços de Caldas mineral resources are estimated at a pit discard cut-off value based on a benefit calculation that determines whether a block is economically viable.

(6) Alumina for Boké is stated as Total Alumina (as T.Al_2O_3) and Silica is stated as Total Silica (as T.SiO_2). Boké resources are estimated at a ≥ 41% T.Al_2O_3 and ≤10 % T.SiO_2 cut-off grade. CBG represents an equity-affiliate of the Company's. Information provided for Boké is based on the best information available to Alcoa at the timing of filing. Final information of the investment could vary from provided figures.

(7) Alumina for Al Ba'itha is stated as Total Available Alumina (as TAA) and Silica is stated as Total Silica (as T.SiO_2). Al Ba'itha mineral resources are estimated at a ≥ 40% TAA cut-off grade and a minimum mining thickness of 1.0 m.

The following table shows only the AWAC and/or Alcoa share (proportion) of mineral reserves. These levels of reserves are consistent with historical levels of reserves for the Company's mining locations and consistent with the Company reserves strategy. Given the Company's extensive bauxite resources, the abundant supply of bauxite globally, and the length of the Company's rights to bauxite, it is not cost-effective to establish bauxite reserves that reflect the total size of the bauxite resources available to the Company. Certain totals may not sum due to rounding.

Summary of Attributable Bauxite Mineral Reserves at December 31, 2021:

	Proven			Probable			Total		
Property (Region)	**Tonnage** (mdmt)	**Alumina** (%)	**Silica** (%)	**Tonnage** (mdmt)	**Alumina** (%)	**Silica** (%)	**Tonnage** (mdmt)	**Alumina** (%)	**Silica** (%)
Darling Range[1]	108.6	32.4	1.0	132.7	32.2	1.4	241.3	32.3	1.2
Juruti (Pará State)[2]	50.9	47.7	3.5	37.7	46.3	3.4	88.5	47.1	3.5
Trombetas (Pará State)[3]	7.7	48.7	4.7	2.2	48.9	4.7	10.0	48.8	4.7
Poços de Caldas (Minas Gerais)[4]	1.4	39.0	3.7	1.8	38.8	4.0	3.2	38.9	3.9
Boké (Sangaredi)[5]	82.7	47.1	1.9	4.1	49.5	2.5	86.9	47.2	1.9
Al Ba'itha (Al Qassim)[6]	18.2	50.0	8.0	31.1	46.6	10.4	49.3	47.9	9.5

(1) Alumina for the Darling Range is stated as Available Alumina (as A.Al_2O_3) and Silica is stated as Reactive Silica (as R.SiO_2). Darling Range mineral reserves are estimated at variable cut-off grades, dependent on operating costs and ore quality for blending to meet refinery target grades. Optimization is based on a three-year trailing average of arms-length sales of bauxite from Darling Range, approximately $24 per ton.

(2) Alumina for Juruti is stated as Available Alumina (as A.Al_2O_3) and Silica is stated as Reactive Silica (as R.SiO_2). Juruti mineral reserves are estimated at a pit discard cut-off value based on a benefit calculation that determines whether a block is economically viable. Further, mineral reserves are estimated using a one-year weighted average bauxite price of approximately $27 per ton, based on contractual agreements with an Alumina segment refinery.

(3) Alumina for Trombetas is stated as Available Alumina (as A.Al_2O_3) and Silica is stated as Reactive Silica (as R.SiO_2). Trombetas mineral reserves are estimated based on the amount of Measured and Indicated resources that have been determined to meet the criteria for approval as defined within the environmental license for operation.

(4) Alumina for Poços de Caldas is stated as Available Alumina (as A.Al_2O_3) and Silica is stated as Reactive Silica (as R.SiO_2). Poços de Caldas mineral reserves are estimated at a pit discard cut-off value based on a benefit calculation that determines whether a block is economically viable.

(5) Alumina for Boké is stated as Total Alumina (as T.Al_2O_3) and Silica is stated as Total Silica (as T.SiO_2). Boké reserves are estimated at a ≥ 45% T.Al_2O_3 and ≤10 % T.SiO_2 cut-off grade. CBG represents an equity-affiliate of the Company's. Information provided for Boké is based on the best information available to Alcoa at the timing of filing. Final information of the investment could vary from provided figures.

(6) Alumina for Al Ba'itha is stated as Total Available Alumina (as TAA) and Silica is stated as Total Silica (as T.SiO_2). Al Ba'itha mineral reserves are estimated at a ≥ 40% TAA cut-off grade.

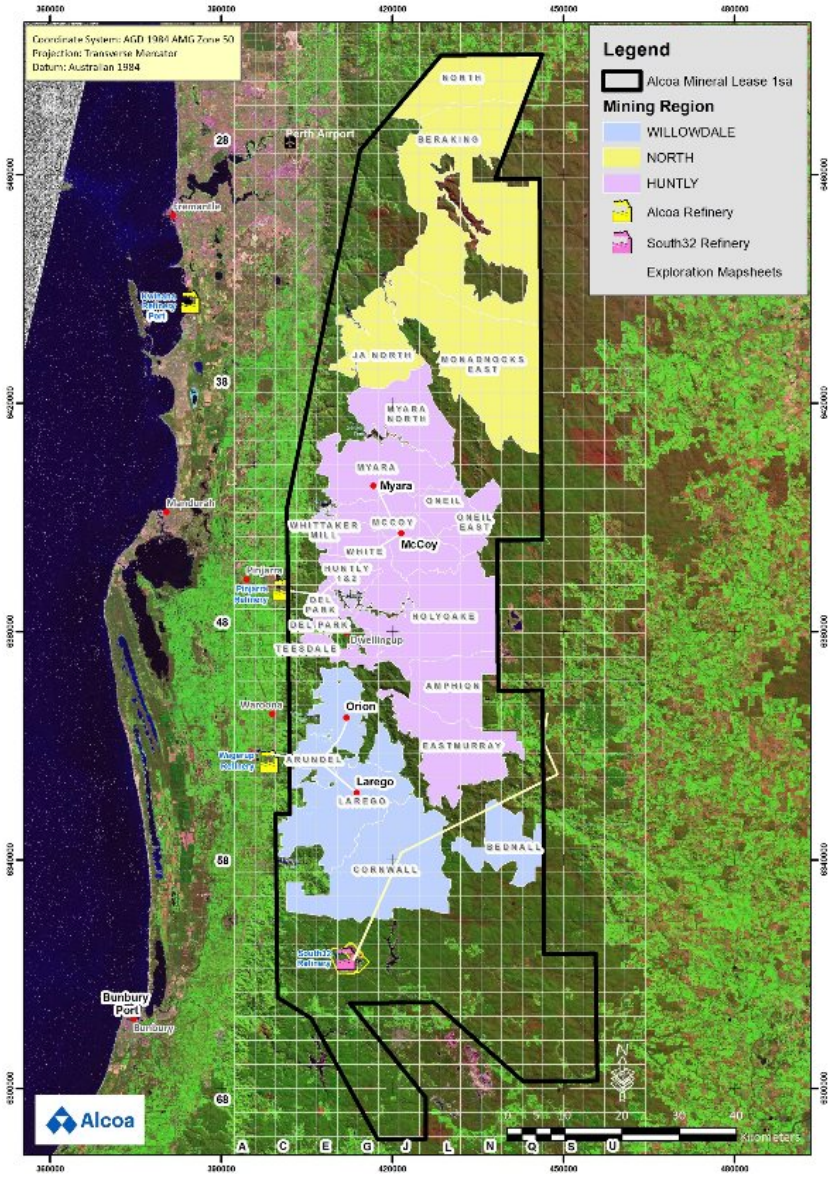
Individual Property Disclosure—Darling Range

Property Location and Description

The Darling Range bauxite deposits comprise the mining centers of (i) Huntly, located approximately 80 kilometers (km) to the southeast of Perth and 30 km east of Pinjarra, Western Australia, Australia, and (ii) Willowdale, located approximately 100 km south-southeast of Perth and 15 km east of Waroona, Western Australia, Australia. The Huntly and Willowdale mining centers/regions are

separate open pit, surface mines and are both located within Mining Lease ML1SA. Darling Range is owned and operated by Alcoa through AofA.

All spatial data used for mineral resource and reserve estimation are reported using a local grid based on Australian Map Grid 1984 system (Zone 50) and using the Australian Geodetic Datum 1984 coordinate set. The approximate coordinates of the mining areas are 410,000 meters (m) East and 6,390,000 m North (Huntly) and 410,000 m East and 6,365,000 m North (Willowdale).



Darling Range Location, Lease Area, Mining Centers, and Mining Regions.

Refer to Exhibit 96.1—Technical Report Summary for Darling Range, Western Australia in Sections 2.0 through 5.0 for more information on the Darling Range mining centers – their history, location, accessibility, and other relevant details.

Infrastructure

The figure above illustrates the relative location of each of the individual mining areas within the Huntly and Willowdale centers. These areas include, but are not limited to, Myara, Larego, Orion, and Arundel.

Mining infrastructure in the Darling Range is generally concentrated in the Myara area in the northwest of the Huntly mining center, and at the Larego area (20 km southeast of the Wagerup refinery) in the center of the Willowdale mining center (having been relocated 16 km southwards from the Orion Hub during 2021). Both infrastructure areas include:

- ore crushing and handling facilities;
- ore stockpile stacker/reclaimer;
- maintenance facilities;
- sampling stations;
- site offices including a production tracking room;
- haul road networks;
- overland conveyors, as illustrated on the above map;
- water supplies consisting of abstraction from licensed surface water sources supplemented with treated wastewater from vehicle washdowns, stormwater runoff, and maintenance workshops; and,
- power supply lines direct from certain of the Company's refineries.

Personnel are sourced from the area around Perth, Western Australia, which benefits from a skilled workforce due to the relatively large number of operating mines in the region

Huntly is accessible from the South Western Highway via Del Park Road, which connects the town of North Dandalup in the north with Dwellingup in the south. From Del Park Road, a 3km road following the route of the bauxite conveyor to the Pinjarra refinery provides access to the Huntly site administration offices. Willowdale is similarly accessible, 19 km from the South Western Highway via Nanga Brook Road, a road to the east of Waroona. There are several airstrips in the region, although the closest major airport is in Perth, approximately 70 km north of North Dandalup. The nearest commercial port is at the Kwinana refinery, approximately 40 km south of Perth.

While an extensive haul road network and overland conveyors transport crushed bauxite from the main mining hub to the Wagerup and Pinjarra refineries, bauxite is also transferred to the Kwinana refinery via the Kwinana freight railway system, using the Kwinana–Mundijong line.

Alcoa's Darling Range mining operations do not produce mine waste in the same manner as conventional mining operations and waste dumps are not constructed.

Alcoa's Darling Range facilities are in a well-maintained condition. Net book value of these facilities for the year-ended 2021 is $421 million included in Properties, plants, and equipment, net on the Consolidated Balance Sheet.

Refer to Exhibit 96.1—Technical Report Summary for Darling Range, Western Australia in Sections 14.0 and 15.0 for more information on the surface infrastructure and facilities of the Darling Range.

Land Tenure and Permitting

Bauxite occurrences were first recorded in the Darling Range in 1902, with studies and exploration subsequently conducted by the Geological Survey of Western Australia until the 1950s. Commercial exploration took place from 1957 by Western Mining Corporation Ltd (WMC, later WANL), across a large portion of southwest Western Australia within a Special Mineral Lease (ML1SA) granted in 1961. Commercial mining first took place within the Darling Range in 1963 at the former Jarrahdale mining center with WANL having joined with Alcoa. The Huntly and Willowdale mines commenced commercial production in 1972 and 1984, respectively. Huntly supplies bauxite to the Kwinana and Pinjarra refineries (approximately 27 Mtpa), while Willowdale supplies the Wagerup refinery (approximately 10 Mtpa).

The ML1SA lease allows for exploration and mining of bauxite within the tenement boundaries. ML1SA was granted in 1961, by the State Government of Western Australia under the Alumina Refinery Act, 1961, for four 21-year periods, and the current lease expires on September 24, 2024. Prior to September 24, 2024, Alcoa will notify the State Government of Western Australia of its intention to exercise its right to renew for a further 21-year period to extend the concession to 2045. The State Government concession agreement includes the provision for conditional renewal beyond 2045. Alcoa pays rent for each square mile of ML1SA in accordance with the Alumina Refinery Agreement Act 1961 (WA), providing exclusive rights to explore for and mine bauxite on all Crown Land within the ML1SA. The current lease covers an area of 702,261 hectares (ha).

There are certain annual requirements to maintain the existing permits and approvals associated with ML1SA, including:

- submission of annual mine plans for mining associated with the Wagerup Refinery;
- maintain public Completion Criteria documentation for its bauxite mining operations;
- annual submission and approval of Mining and Management Programs (MMPs) that include five-year mining schedules;
- annual reporting of bauxite processed and any non-compliances to maintain environmental operational licenses; and,
- maintain compliance with environmental protection orders.

The ML1SA area includes sub-lease arrangements made between Alcoa and the Worsley Alumina joint venture participants. The agreements, made in August 2001 and September 2016, provide bauxite mining concessions to the Worsley Participants. No Mineral Resources or Mineral Reserves attributable to the Darling Range mining areas have been declared within these sub-lease areas.

Constraints on mining activities within the ML1SA concession are in place which prevent mining within: 200m of the top water level of drinking water reservoirs; National Parks; Aboriginal Heritage Sites; Old Growth Forest; formal Conservation Areas; and, 50m of granite outcrop (greater than 1 ha). Mineral resources and mineral reserves have not been defined in these restricted areas.

Mining on a day-only basis is conducted in “noise zones” where noise from the mining operations will potentially exceed allowable levels. The operation actively seeks to maintain lower noise levels than those mandated, thus mining in these areas is undertaken by contract miners using smaller equipment on day shifts only.

The Company has all environmental permits and operating licenses required for mining activities. Outcomes of and compliance with the management and monitoring programs are tracked within Alcoa’s Environmental Management System and reported within the Annual Environmental Review report.

Refer to Exhibit 96.1—Technical Report Summary for Darling Range, Western Australia in Section 3.0 for more information on Land Permitting and Tenure for the Darling Range.

Geology and Exploration

The Darling Range comprises a low incised plateau formed by uplift along the north-south trending Darling Fault, a major structural lineament that extends for over 250 km, from Bindoon in the north to Collie in the south. Bauxite deposits have been identified throughout the Darling Range and generally occur as erratically distributed alumina-rich lenses. Lateralization and subsequent periodic activity of the Darling Fault has resulted in the current landform of scarps and deeply incised valleys on the western edge of the Darling Range.

Systematic exploration for bauxite within the region commenced in the 1960s and is currently conducted on a continuous basis to establish optimal mine plans to achieve a uniform quality of bauxite production. Current mine plans include further exploration throughout all areas where Alcoa has mining permits to sustain future production.

Refer to Exhibit 96.1—Technical Report Summary for Darling Range, Western Australia in Section 6.0 through 11.0 for more information on the geology, mineralization, and exploration history of the Darling Range, including Quality Assurance / Quality Control (QA/QC) procedures and data used in the current mineral resource estimate.

Mining and Processing

The Huntly and Willowdale mines employ conventional open pit surface mining practices and equipment. Following definition of mineral reserve blocks, vegetation is cleared after which Alcoa operations commence stripping topsoil and secondary overburden removal using small excavators, scrapers, and trucks. Soil is stockpiled at the site, away from the proposed pit, for rehabilitation purposes. After completion of mining, overburden is progressively backfilled into adjacent exhausted pits, topsoiled, and rehabilitated by re-establishment of native vegetation, creating a stable post-mining landform that replicates the pre-existing environment.

The process plant for the Darling Range operations consists of two separate crushing facilities at the Huntly and Willowdale mines, respectively. Both facilities crush the run of mine (ROM) ore and convey the crushed ore to three separate refineries located at Pinjarra, Kwinana, and Wagerup. The Pinjarra refinery is located adjacent to the east of the town of Pinjarra and is approximately 25 km southwest of the Huntly mining areas. The Kwinana refinery, also supplied by Huntly, is approximately 50 km northwest of Huntly in the city of Kwinana, approximately 40 km south of Perth. The Wagerup refinery, supplied by Willowdale, is located immediately adjacent to the west of the South Western Highway, approximately 8 km south of Waroona and 20 km west of the Willowdale mining area.

The process plant is a dry crushing operation and therefore water is not required as a consumable for the plant. As such, Alcoa’s Darling Range mining operations do not produce mine waste in the same manner as conventional mining operations and waste dumps are not constructed.

Refer to Exhibit 96.1—Technical Report Summary for Darling Range, Western Australia in Sections 12.0 and 13.0 for a detailed description of the mineral reserves and mining methods used in the Darling Range.

Environmental and Social

Alcoa's mine sites are monitored in accordance with the conditions of Government authorizations and its operational licenses at Huntly and Willowdale. Outcomes of and compliance with the management and monitoring programs are tracked within Alcoa's Environmental Management System and reported within a Triennial Environmental Review report.

Alcoa works proactively with key regulatory agencies to address operational non-compliances and implement operational improvements to reduce releases to the environment. None of the reportable non-compliances represent a risk that could adversely affect its license to operate.

Refer to Exhibit 96.1—Technical Report Summary for Darling Range, Western Australia in Section 17.0 for more information on the environmental, social, compliance, and permitting aspects of the Darling Range.

Mineral Resources and Mineral Reserves

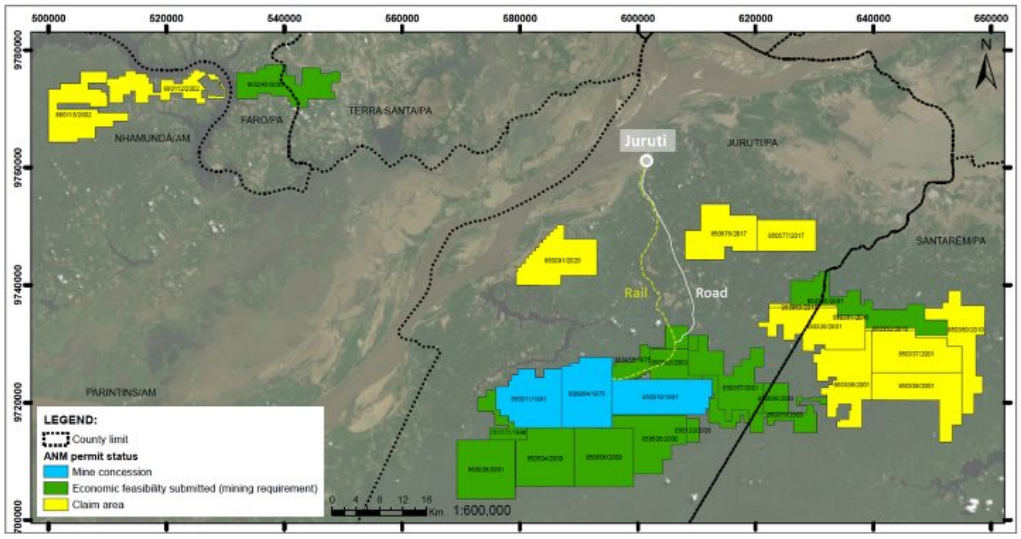
For information on Darling Range mineral resources and mineral reserves, refer to the tables above. For comparative purposes, probable reserves were 132.7 and 95.8 for the years ended 2021 and 2020, respectively, and proven reserves were 108.6 and 43.2, for the years ended 2021 and 2020, respectively. Additionally, refer to Exhibit 96.1—Technical Report Summary for Darling Range, Western Australia for more information on the mineral resources and mineral reserves of the Darling Range mines.

Individual Property Disclosure—Juruti

Property Location and Description

The Juruti bauxite mine is located in the west of Para State in northern Brazil. The mine is approximately 55 km south from the town of Juruti on the southern shore of the Amazon River. The mine is owned and operated by Alcoa through Alcoa World Alumina Brasil Ltda. (AWA Brasil). The Juruti bauxite mine represents an established mining operation which commenced commercial production of bauxite in 2009.

All spatial data used for the mineral resource and mineral reserve estimation are reported using a local grid based on SIRGAS 2000 (21S). The approximate coordinates of the mining area for the Capiranga Central, Mauari, São Francisco, Mutum and Santarém plateaus are 618,879 m East and 9,721,768 m North, and for the Nhamundá plateau are 521,657 m East and 9,773,299 m North.



Juruti Location and Bauxite Mine Permit Areas.

Refer to Exhibit 96.1—Technical Report Summary for Juruti, Brazil in Sections 2.0 through 5.0 for more information on the Juruti mine – history, location, accessibility, and other relevant details.

Infrastructure

Infrastructure required for bauxite mining operations is well-established and available, the majority of which is located within the area of the Juruti bauxite mine. The required infrastructure includes the following:

- rail siding and loading equipment;
- bauxite beneficiation plant for ore crushing and washing;
- mine waste facilities including tailings thickening lagoons and tailings disposal ponds;
- ROM and product stockpiles and materials handling conveyors;
- ancillary buildings (offices, warehouses, laboratory, workshops);
- fuel station;
- water supply intake raft, pumps, and approximate 9 km pipeline from the Juruti Grande stream;
- power generation via thermoelectric units at the mine and port;
- surface water management including drainage channels and pumps;
- off-site rail corridor between the mine and port; and,
- port facilities including rail siding, material handling equipment, ship loader.

The Juruti mining area is connected to Juruti town and port facilities by a road that joins to the PA-257 road near the town, and a dedicated railway between the mining area and port. There are very few major roads across the region and the only major road in this area is the PA-257.

The nearest major city to Juruti is Santarem, approximately 160 km to the east and is only accessible by boat or by air from Juruti Airport (JRT) to Santarem-Maestro Wilson Fonseca Airport (STM). National roads connect Santarem to wider Para State including the port city of Belem on Brazil's northern coast, approximately 1,300 km by road via the 230 and PA-151 roads.

Juruti began production in 2009 and the facilities are in a well-maintained condition. Net book value of these facilities for the year-ended 2021 is $406 million included in Properties, plants, and equipment, net on the Consolidated Balance Sheet.

Refer to Exhibit 96.1—Technical Report Summary for Juruti, Brazil in Sections 14.0 and 15.0 for more information on the surface infrastructure and facilities of the Juruti mine.

Land Tenure and Permitting

All exploration and mining activities are managed by the National Mining Agency, Agencia Nacional de Mineracao (ANM), under the Mining Code (1967). Permits are granted by the ANM falls into two categories:

- Exploration Permits: granted to support ongoing exploration activities. On submittal of an approved Exploration Report, the holder is then granted one year to present a Mining Plan as a precursor to obtaining a Mining Concession. Exploration Permits require:
    - initial application fee and submission by a registered professional geologist or mining engineer;
    - annual fee payment to the ANM;
    - declaration of exploration expenditures on an annual basis; and,
    - survey visit fee payment to the ANM.
- Mining Concession: following a successful Mining Plan submission, enabling exploitation once Environmental Licenses are granted. Concession holders are required to:
    - commence mining activities within 6 months of being granted;
    - submit annual reports on all mining / processing activities (Relatorio Annual de Lavra, or RAL) to the ANM;
    - make compensation payments to landowners in line with the agreements made for mining easement; and,
    - make Brazilian Mineral Royalty payments (Compensacao Financeira pela Exploracao de Recursos Minerais, or CFEM).

At Juruti there are three continuous mining concessions for an aggregated 29,410 hectares (ha), where current mineral reserves are determined. Brazilian mineral legislation does not limit the duration of mining concessions and instead the concession remains in force until the deposit is exhausted. These concessions may be extended later or expire earlier than estimated, based on the rate at which the deposits are exhausted and on obtaining any additional governmental approval, as necessary, such as operational licenses and environmental approvals.

In addition to the mining rights, there are thirteen requests for mining concessions, fourteen exploration permits, and two requests for exploration permits. The aggregated area for these permits is 197,866 ha.

The mining operations at Juruti take place on third-party land and, in accordance with the Mining Concession requirements, Alcoa currently has agreements in place with respective landowners. Agreements form a "mining easement," which grants Alcoa access to the mining areas in exchange for compensation payments. As a result, there are no other titles, claims, leases, or options applicable to the exploration or mining permit areas which may limit Alcoa's rights. Similarly, there are no liens or encumbrances.

The Company has all environmental permits and operating licenses required for mining activities; there are no liens or encumbrances.

Refer to Exhibit 96.1—Technical Report Summary for Juruti, Brazil in Sections 3.0 and 17.0 for more information on Land Permitting and Tenure for the Juruti mine.

Geology and Exploration

The bauxite deposit of the Juruti bauxite mine consist of several lateritic bauxite plateaus which exist over a large lateral extent (several km) in comparison to the total thickness of the deposit (typically up to 20 m below surface).

Systematic exploration for bauxite within the region has persisted since Alcoa's ownership and is currently conducted on a continuous basis to establish optimal mine plans to achieve a uniform quality of bauxite production. Current mine plans include further exploration throughout all areas where Alcoa has mining permits to sustain future production.

Refer to Exhibit 96.1—Technical Report Summary for Juruti, Brazil in Sections 6.0 through 11.0 for more information on the geology, mineralization, and exploration history of the Juruti mine, including QA/QC procedures and data used in the current mineral resource estimate.

Mining and Processing

Juruti is an active mining operation using surface strip mining methods over a total of eight plateaus whereby land clearance, topsoil removal, and overburden stripping is followed by bauxite deposit excavation and stockpiling. Waste is subsequently backfilled, and overburden and topsoil are re-instated for surface rehabilitation.

Juruti produces both a washed and unwashed bauxite product; however, all Tonnage is presented on a zero-moisture basis. Bauxite processing takes place at a dedicated plant facility located at the Juruti mine site which has been operating since 2009 and comprises a simple comminution (crushing, screening) and washing circuit designed to remove fine particles from the ore.

Fine materials removed from ore are deposited in a thickening pond for settling and water reclamation, after which solid tailings are discarded into separate tailings ponds. There is currently one thickening pond and seven disposal ponds.

Refer to Exhibit 96.1—Technical Report Summary for Juruti, Brazil in Sections 12.0 and 13.0 for a detailed description of the mineral reserves and mining methods used in the Juruti mine.

Environmental and Social

Alcoa submits an Annual Environmental Report in compliance with the Juruti operating licenses and approvals. This report includes detailed descriptions of activities undertaken for the year and environmental and social monitoring. No significant compliance issues were identified in the 2019/2020 and 2020/2021 Annual Environmental Reports.

Additionally, Alcoa works proactively with key regulatory agencies to address operational non-compliances and implement operational improvements to reduce releases to the environment. None of the reportable non-compliances represent a risk that could adversely affect its license to operate.

Refer to Exhibit 96.1—Technical Report Summary for Juruti, Brazil in Section 17.0 for more information on the environmental, social, compliance, and permitting aspects of the Juruti mine.

Mineral Resources and Mineral Reserves

For information on Juruti mineral resources and mineral reserves, refer to the tables, above. For comparative purposes, probable reserves were 37.6 and 41.3 for the years ended 2021 and 2020, respectively, and proven reserves were 50.9 and 51.8, for the years ended 2021 and 2020, respectively. Additionally, refer to Exhibit 96.1—Technical Report Summary for Juruti, Brazil for more information on the mineral resources and mineral reserves of the Juruti mine.

Internal Controls

Alcoa has a long history of mining bauxite, with the majority of bauxite production having been used to supply Alcoa refineries. Despite having longstanding and robust processes for sampling, analysis, ore definition, and grade control, it is only within the last ten years that structured and documented QA/QC practices have spread beyond the laboratories of many of the operations.

Internal controls used by the company are informed by internal reviews, representation on Technical Committees of Joint Venture operations, and by reviews, audits, and studies performed by third-party mining consultants. The controls include: surveying of drillhole collar locations, drill sample logging, collection and security, database verification and security, QA/QC programs, internal and third-party qualified person statistical analysis, internal and third-party qualified person model validation, and reconciliation. Modelling and analysis of the Company's resources is completed internally and reviewed by a qualified person, with the exception of Al Ba'itha where modelling and analysis is completed by a third-party consultant.

As the ore bodies are shallow and generally horizontal, two-dimensional seam modelling has been the standard practice; however, many operations are implementing more conventional 3D block modelling using geostatistical interpolation methods. Mineral resource estimation is validated internally through visual comparison of drillholes and model blocks as well as through the use of swath plots and statistical distributions. Mineral resource estimation is reviewed and adopted by a qualified person. Mineral reserve estimation is completed internally and reviewed by a qualified person, with the exception of Boké and Al Ba'itha where reserve estimation is completed by a third-party consultant.

Labelled samples from the drill site are securely transported for logging or temporary storage by the drilling contractor or Alcoa personnel. Additional transport to internal or external laboratories is controlled and completed, as necessary, by Alcoa personnel or by courier.

Drillhole databases are all site specific; most sites use industry standard drillhole database software, applications, and processes with security and backup protocols in place. Prior to modelling, secondary validation and cleansing of the modelling datasets is performed. Wherever possible, data collection is digital to allow direct loading into the database.

The Company has well-established QA/QC programs that are site specific and range from in-development to mature. Although some programs are limited to laboratory protocols only covering analysis of duplicate pulps and standards, others involve, to varying degrees, the range of activities from twin hole drilling and collection of field duplicates, submission of blind duplicates and standards and submission of duplicate samples to umpire laboratories. Regardless of the level of QA/QC, all sites have well established and documented sampling and analysis regimes. QA/QC practices and available data is reviewed by a qualified person.

As discussed above, management relies on estimates for our mineral reserves and these estimates could change due to a number of factors, including future changes in: permitting requirements, geological conditions, ongoing mine planning, macroeconomic and industry conditions, and regulatory disclosure requirements. See Part I Item 1A of this Form 10-K for more information on risks.

Item 3. Legal Proceedings.

In the ordinary course of its business, Alcoa is involved in a number of lawsuits and claims, both actual and potential. Proceedings that were previously disclosed may no longer be reported because, as a result of rulings in the case, settlements, changes in our business, or other developments, in our judgment, they are no longer material to Alcoa's business, financial position or results of operations. See Part II Item 8 of this Form 10-K in Note S to the Consolidated Financial Statements for additional information.

In addition to the matters discussed below, various other lawsuits, claims, and proceedings have been or may be instituted or asserted against Alcoa Corporation, including those pertaining to environmental, safety and health, commercial, tax, product liability, intellectual property infringement, employment, employee and retiree benefit matters, and other actions and claims arising out of the normal course of business. While the amounts claimed in these other matters may be substantial, the ultimate liability is not readily determinable because of the considerable uncertainties that exist. Accordingly, it is possible that the Company's liquidity or results of operations in a particular period could be materially affected by one or more of these other matters. However, based on facts currently available, management believes that the disposition of these other matters that are pending or asserted will not have a material adverse effect, individually or in the aggregate, on the financial position of the Company.

Environmental Matters

Alcoa is involved in proceedings under CERCLA and analogous state or other statutory or jurisdictional provisions regarding the usage, disposal, storage, or treatment of hazardous substances at a number of sites. The Company has committed to participate, or is engaged in negotiations with authorities relative to its alleged liability for participation, in clean-up efforts at several such sites. The most significant of these matters are discussed in Part II Item 8 of this Form 10-K in Note S to the Consolidated Financial Statements under the caption Contingencies.

In August 2005, Dany Lavoie, a resident of Baie-Comeau in the Canadian Province of Québec, filed a Motion for Authorization to Institute a Class Action and for Designation of a Class Representative against Alcoa Canada Ltd., Alcoa Limitée, Société Canadienne de Metaux Reynolds Limitée, and Canadian British Aluminum in the Superior Court of Québec in the District of Baie-Comeau, alleging that defendants, as the present and past owners and operators of an aluminum smelter in Baie-Comeau, had negligently allowed the emission of certain contaminants from the smelter on the lands and houses of the St. Georges neighborhood and its environs causing property damage and personal injury. In May 2007, the court authorized a class action suit on behalf of all people who suffered property or personal injury damages caused by the emission of polycyclic aromatic hydrocarbons from the Company's aluminum smelter in Baie-Comeau. In September 2007, plaintiffs filed the claim against the original defendants. The Soderberg smelting operations that plaintiffs allege to be the source of emissions of concern ceased operations in 2013 and have been dismantled. A court appointed expert, engaged to perform analysis of the potential impacts from the emissions in accordance with a sampling protocol agreed to by the parties, submitted its report to the court in May 2019. In 2021, plaintiffs filed their amended claim and expert reports, and defendants filed their amended defense and expert reports. In October 2021, the parties participated in mediation and expect to conclude the mediation in early 2022 without a material impact to the Company's financial results.

Asbestos Litigation

Some of our subsidiaries as premises owners are defendants in active lawsuits filed in various U.S. jurisdictions on behalf of persons seeking damages for alleged personal injury as a result of occupational exposure to asbestos at various facilities. Our subsidiaries and acquired companies all have had numerous insurance policies over the years that provide coverage for asbestos based claims. Many of these policies provide layers of coverage for varying periods of time and for varying locations. We have significant insurance coverage and believe that our reserves are adequate for known asbestos exposure related liabilities. The costs of defense and settlement have not been and are not expected to be material to the results of operations, cash flows, and financial position of Alcoa Corporation.

Item 4. Mine Safety Disclosures.

The information concerning mine safety violations or other regulatory matters required by Section 1503(a) of the Dodd-Frank Wall Street Reform and Consumer Protection Act and Item 104 of Regulation S-K (17 CFR 229.104) is included in Exhibit 95.1 of this report, which is incorporated herein by reference.

PART II

Item 5. Market for Registrant's Common Equity, Related Stockholder Matters, and Issuer Purchases of Equity Securities.

Shares of the Company's common stock are listed on the New York Stock Exchange and trade under the symbol "AA."

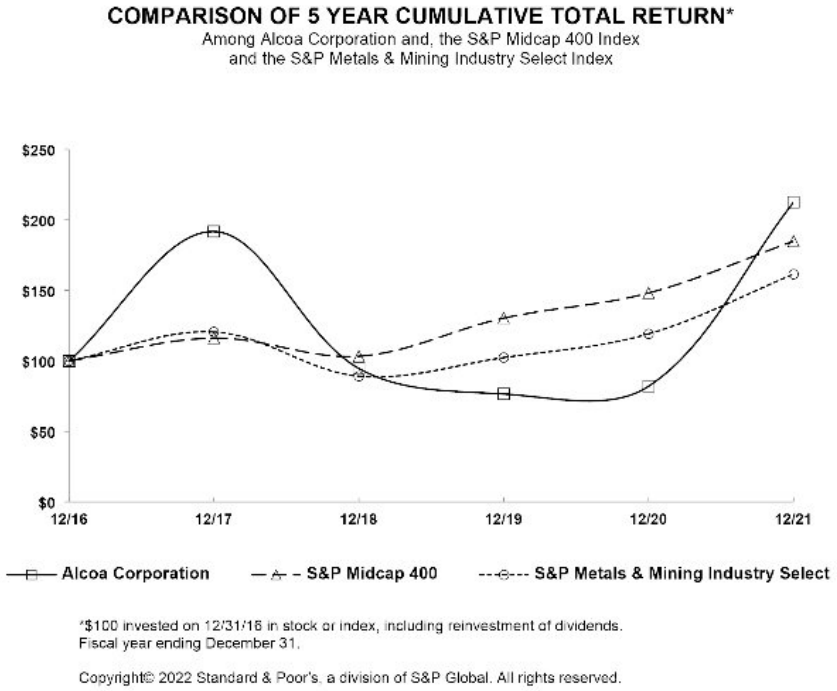
On October 14, 2021, Alcoa Corporation announced the initiation of a quarterly cash dividend program and the Board of Directors declared the first quarterly cash dividend of $0.10 per share of the Company's common stock, which was paid on November 19, 2021 to stockholders of record as of the close of business on October 29, 2021. Alcoa Corporation did not pay dividends in 2020 or 2019. The Company intends to pay cash dividends on a quarterly basis. Dividends on Alcoa Corporation common stock are subject to authorization by the Company's Board of Directors. The payment, amount, and timing of dividends, if any, depends upon matters deemed relevant by the Company's Board of Directors, such as Alcoa Corporation's financial position, results of operations, cash flows, capital requirements, business condition, future prospects, any limitations imposed by law, credit agreements or senior securities, and other factors deemed relevant and appropriate. The Company's revolving credit facility restricts our ability to pay dividends in certain circumstances. See Part II Item 7 of this Form 10-K in Management's Discussion and Analysis of Financial Condition and Results of Operations under caption Liquidity and Capital Resources – Financing Activities for more information.

As of February 18, 2022, there were approximately 8,700 holders of record of shares of the Company's common stock. Because many of Alcoa Corporation's shares are held by brokers and other institutions on behalf of stockholders, the Company is unable to estimate the total number of stockholders represented by these holders.

Stock Performance Graph

The following graph compares Alcoa Corporation's cumulative total stockholder return (i.e., stock price change plus reinvestment of dividends) with the cumulative total stockholder returns of (1) the S&P MidCap 400® Index, and (2) the S&P Metals & Mining Industry Select Index. This comparison was based on an initial investment of $100, including the reinvestment of any dividends, on December 31, 2016 through December 31, 2021.

The stock performance information included in this graph is based on historical results and is not necessarily indicative of future stock price performance.



*$100 invested on 12/31/16 in stock or index, including reinvestment of dividends.
Fiscal year ending December 31.

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December 31,	2016	2017	2018	2019	2020	2021
Alcoa Corporation	$ 127	$ 192	$ 95	$ 77	$ 82	$ 213
S&P Midcap 400	106	116	103	130	148	185
S&P Metals & Mining Industry Select	112	121	89	102	119	162

Issuer Purchases of Equity Securities

In the fourth quarter of 2021, the Company repurchased 3,184,300 shares of its common stock for $150 (weighted average share price of $46.95 (includes $0.02 broker commission)); these shares were immediately retired. These purchases exhausted the remaining dollar value of shares that were available for repurchase under the Board of Directors' October 17, 2018 authorization, as described below.

Period	Total Number of Shares Purchased	Weighted Average Price Paid Per Share	Total Number of Shares Purchased as Part of Publicly Announced Programs	Approximate Dollar Value of Shares that May Yet be Purchased Under the Programs[1]
October 1 to October 31	-	$ -	-	$ 650,000,000
November 1 to November 30	2,109,400	47.42	2,109,400	550,000,000
December 1 to December 31	1,074,900	46.04	1,074,900	500,000,000
Total	3,184,300	46.95	3,184,300	

(1) On October 17, 2018, Alcoa Corporation announced that its Board of Directors approved a common stock repurchase program under which the Company may purchase shares of its outstanding common stock up to an aggregate transactional value of $200, depending on cash availability, market conditions, and other factors. As of December 31, 2021, $0 remained available for repurchase under this authorization.

On October 14, 2021, Alcoa Corporation announced that its Board of Directors approved a new common stock repurchase program under which the Company may purchase shares of its outstanding common stock up to an aggregate transactional value of $500, depending on cash availability, market conditions, and other factors. As of December 31, 2021, $500 remained available for purchase under this authorization.

Repurchases under these programs may be made using a variety of methods, which may include open market purchases, privately negotiated transactions, or pursuant to a Rule 10b5-1 plan. These programs do not have predetermined expiration dates. Alcoa Corporation intends to retire repurchased shares of common stock.

Item 6. RESERVED

Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations.

(dollars in millions, except per-share amounts, average realized prices, and average cost amounts; dry metric tons in millions (mdmt); metric tons in thousands (kmt))

Forward-Looking Statements

This report contains statements that relate to future events and expectations and as such constitute forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995. Forward-looking statements include those containing such words as "anticipates," "endeavors," "strive", "working," "potential," "ambition," "develop," "reach," "believes," "could," "estimates," "expects," "forecasts," "goal," "intends," "may," "outlook," "plans," "projects," "seeks," "sees," "should," "targets," "will," "would," or other words of similar meaning. All statements by Alcoa Corporation that reflect expectations, assumptions or projections about the future, other than statements of historical fact, are forward-looking statements, including, without limitation, forecasts concerning global demand growth for bauxite, alumina, and aluminum, and supply/demand balances; statements, projections or forecasts of future or targeted financial results, or operating or sustainability performance; statements about strategies, outlook, and business and financial prospects; and statements about capital allocation and return of capital. These statements reflect beliefs and assumptions that are based on Alcoa Corporation's perception of historical trends, current conditions, and expected future developments, as well as other factors that management believes are appropriate in the circumstances. Forward-looking statements are not guarantees of future performance and are subject to known and unknown risks, uncertainties, and changes in circumstances that are difficult to predict. Although Alcoa Corporation believes that the expectations reflected in any forward-looking statements are based on reasonable assumptions, it can give no assurance that these expectations will be attained and it is possible that actual results may differ materially from those indicated by these forward-looking statements due to a variety of risks and uncertainties. Such risks and uncertainties include, but are not limited to: (a) current and potential future impacts of the COVID-19 pandemic and related regulatory developments on the global economy and our business, financial condition, results of operations, or cash flows and judgments and assumptions used in our estimates; (b) material adverse changes in aluminum industry conditions, including global supply and demand conditions and fluctuations in London Metal Exchange-based prices and premiums, as applicable, for primary aluminum and other products, and fluctuations in indexed-based and spot prices for alumina; (c) deterioration in global economic and financial market conditions generally and which may also affect Alcoa Corporation's ability to obtain credit or financing upon acceptable terms or at all; (d) unfavorable changes in the markets served by Alcoa Corporation; (e) the impact of changes in foreign currency exchange and tax rates on costs and results; (f) increases in energy or raw material costs or uncertainty of energy supply or raw materials; (g) the inability to achieve improvement in profitability and margins, cost savings, cash generation, revenue growth, fiscal discipline, sustainability targets, or strengthening of competitiveness and operations anticipated from portfolio actions, operational and productivity improvements, technology advancements, and other initiatives; (h) the inability to realize expected benefits, in each case as planned and by targeted completion dates, from acquisitions, divestitures, restructuring activities, facility closures, curtailments, restarts, expansions, or joint ventures; (i) political, economic, trade, legal, public health and safety, and regulatory risks in the countries in which Alcoa Corporation operates or sells products; (j) labor disputes and/or work stoppages and strikes; (k) the outcome of contingencies, including legal and tax proceedings, government or regulatory investigations, and environmental remediation; (l) the impact of cyberattacks and potential information technology or data security breaches; (m) risks associated with long-term debt obligations; (n) the timing and amount of future cash dividends and share repurchases; (o) declines in the discount rates used to measure pension and other postretirement benefit liabilities or lower-than-expected investment returns on pension assets, or unfavorable changes in laws or regulations that govern pension plan funding; and, (p) the other risk factors discussed in Part I Item 1A of this Form 10-K and other reports filed by Alcoa Corporation with the U.S. Securities and Exchange Commission, including those described in this report.

Alcoa Corporation disclaims any obligation to update publicly any forward-looking statements, whether in response to new information, future events or otherwise, except as required by applicable law. Market projections are subject to the risks described above and other risks in the market.

Overview

Our Business

Alcoa Corporation (Alcoa or the Company) is a vertically integrated aluminum company comprised of bauxite mining, alumina refining, aluminum production (smelting and casting), and energy generation. Aluminum is a commodity that is traded on the London Metal Exchange (LME) and priced daily. Additionally, alumina is subject to market pricing through the Alumina Price Index (API), which is calculated by the Company based on the weighted average of a prior month's daily spot prices published by the following three indices: CRU Metallurgical Grade Alumina Price, Platts Metals Daily Alumina PAX Price, and FastMarkets Metal Bulletin Non-Ferrous Metals Alumina Index. As a result, the price of both aluminum and alumina is subject to significant volatility and, therefore, influences the operating results of Alcoa Corporation.

Through direct and indirect ownership, Alcoa Corporation has 28 operating locations in nine countries around the world, situated primarily in Australia, Brazil, Canada, Iceland, Norway, Spain, and the United States. Governmental policies, laws and regulations, and other economic factors, including inflation and fluctuations in foreign currency exchange rates and interest rates, affect the results of operations in these countries.

Business Update

COVID-19 Pandemic

In response to the ongoing COVID-19 pandemic, Alcoa implemented comprehensive measures to protect the health of the Company's workforce, prevent infection in our locations, mitigate impacts, and safeguard business continuity. As a result of these measures and the aluminum industry being classified as an essential business, all of Alcoa's bauxite mines, alumina refineries, and aluminum manufacturing facilities continue to remain in operation. The Company continues, through its operations leadership team and global crisis response team, to ensure that each location's preparedness and response plans are up to date.

To date, the Company has experienced isolated interruptions from its supply sources but has identified alternate solutions to avoid any significant production impacts. In relation to the Company's workforce, operating locations have experienced elevated levels of absenteeism but ultimately have had minimal contractor- and employee-related disruptions to operations. The magnitude and duration of the COVID-19 pandemic continues to be unknown. The pandemic could have adverse future impacts on the Company's business, financial condition, operating results, and cash flows. Further adverse conditions or prolonged deterioration of conditions could negatively impact our financial condition and result in asset impairment charges, including long-lived assets or goodwill, or affect the realizability of deferred tax assets.

As a result of the pandemic's impact on the macroeconomic environment, management evaluated the future recoverability of the Company's assets, including goodwill and long-lived assets, and the realizability of deferred tax assets while considering the Company's current market capitalization. Management concluded that no COVID-19 related asset impairments or additional valuation allowances were required during the year ended December 31, 2021.

Strategy Update and Actions

The Company has a goal to innovate and create low-carbon solutions. The Company has a comprehensive portfolio of products manufactured through low-carbon emitting processes in its Sustana™ family of products and future-oriented research and development projects focused on reducing carbon output. The Company intends to progress low-carbon solutions on a cost-competitive basis, supported by its operational and technical experience.

The Company announced the initiation of a quarterly cash dividend program and paid the first quarterly cash dividend of $0.10 per share of the Company's common stock in November 2021, totaling $19. Also in the fourth quarter, the Company repurchased 3.2 million shares under a previously authorized $200 common stock repurchase program, concluding the program. The Company authorized a new $500 common stock repurchase program in the fourth quarter of 2021.

In the first quarter of 2021, the Company reached its target, announced in October 2019, to generate between $500 and $1,000 from non-core asset sales by completing the divestiture of the Warrick Rolling Mill in a transaction valued at $670. Additionally in 2021, the Company completed two other significant non-core asset sales of the Eastalco and Rockdale smelter sites for $100 and $240, respectively.

In 2021, Alcoa made significant progress on its smelting portfolio review reaching approximately 75 percent of its target to improve, curtail, close, or divest 1.5 million metric tons of smelting capacity within the five-year program ending in 2024. As detailed below, notable portfolio actions in 2021 include the two-year curtailment and future repowering of the smelter in San Ciprián, Spain, the permanent closure of the smelter in Wenatchee, Washington, the full smelter restart now underway at Alumar in Brazil, and the repowering of Portland Aluminium in Australia, including restart of a portion of the smelter's curtailed capacity.

The Company continues to review the 4 million metric tons of alumina refining capacity which is also part of the five-year program although no actions were announced in 2021. Progress to date on the alumina refining capacity includes the December 2019 announced permanent closure of 2.3 million metric tons of capacity at the Point Comfort alumina refinery in Texas, which had been fully curtailed since 2016.

Strengthening the Company's balance sheet has been a focus since Alcoa Corporation's separation in 2016. As discussed below, the Company made significant progress with long-term debt and pension actions, reducing its long-term debt, including current portion and short-term borrowings, to $1,802 at December 31, 2021 from $2,542 at the prior year end, and reducing the net pension and other postretirement benefits liability to $973 from $2,395, in the respective periods. With these reductions, the Company achieved its proportional adjusted net debt target.

San Ciprián Smelter and Refinery

Since 2020, the Company has been evaluating potential solutions for the San Ciprián (Spain) aluminum smelter which has incurred persistent and recurring financial losses. The San Ciprián smelter incurred a net loss $72 (pre- and after-tax) in 2021, excluding Restructuring and other charges, net.

On September 27, 2021, the labor force at the San Ciprián refinery and aluminum facilities resumed the strike that had previously been suspended since January 2021. Under the strike conditions, the refinery reduced production and related shipments, and the

aluminum facilities stopped all metal shipments. Further, the San Ciprián refining and aluminum operations faced significantly higher energy and raw materials costs, as well as the loss of value-add premiums during the strike. Strike-related delays in shipments and higher costs also had unfavorable impacts on the Company's working capital and operating cash flow.

On December 29, 2021, with the support of the workers' representatives, the Company announced the two-year curtailment of 228 kmt of smelting capacity at the San Ciprián aluminum smelter. The temporary curtailment, which began in January 2022, is the result of an agreement reached with the workers at the site to suspend production due to exorbitant energy prices in Spain. Under the terms of the agreement, the Company is responsible for certain employee and contractual obligations during the curtailment period. As a result, the Company recorded charges of $62 in the fourth quarter of 2021 in Restructuring and other charges, net on the Statement of Consolidated Operations. Cash outlays related to these obligations are expected to be split between 2022 and 2023. The Company plans to begin the restart of the smelter in January 2024. The San Ciprián smelter will continue to incur some operating costs for the casthouse as well as resources to maintain and improve the smelter for restart.

Additionally, in connection with the agreement, the Company made commitments of $103 and restricted cash to be made available in the future to cover $68 in capital improvements at the site and $35 in smelter restart costs, with the majority of cash spend expected in 2023. Restricted cash is included in Other noncurrent assets on the Consolidated Balance Sheet.

The casthouse and alumina refinery will continue to operate during the curtailment period.

Alumar Smelter

On September 20, 2021, the Company announced its plan to restart its 268 kmt per year share of capacity at the Alumar smelter in São Luís, Brazil, which had been fully curtailed since 2015. The process to restart the idle capacity began in September. The first molten metal is expected in the second quarter of 2022, and the smelter is expected to be operational at full capacity in the fourth quarter of 2022. The cost of the restart is anticipated to be approximately $75, including approximately $10 in capital expenses, with the majority to be spent in 2022.

The restart leverages the site's integration with an alumina refinery, new long-term contracts for renewable energy and an available skilled workforce, as well as tax efficiencies and a strong U.S. dollar. With this planned restart, Alcoa will have approximately 80 percent of its 2.99 million metric tons of global aluminum smelting capacity operating.

Other Portfolio Actions

Wenatchee—On December 9, 2021, as part of the Company's ongoing strategic review, the Company announced the permanent closure of the Wenatchee aluminum smelter in Washington. The smelter has been fully curtailed since 2015. Charges related to the closure totaled $90 in the fourth quarter of 2021 and included a charge of $10 for the write down of remaining inventories to net realizable value recorded in Cost of goods sold on the Statement of Consolidated Operations and a charge of $80 recorded in Restructuring and other charges, net on the Statement of Consolidated Operations. The restructuring charges were comprised of: $30 to write-off the remaining net book value of various assets; $23 of asset impairments; $21 to establish reserves related to environmental and demolition obligations, $5 related to take-or-pay contractual obligations; and, $1 of severance and employee termination costs from the separation of approximately 10 employees. Cash outlays related to the permanent closure of the site are expected to be approximately $60 over the next five years, with approximately $10 estimated to be spent in 2022.

Portland—On November 7, 2021, the Company announced the Portland Aluminium joint venture's plan to restart 35 kmt of curtailed annual capacity at the Portland aluminum smelter in Australia (19 kmt Alcoa share). Alcoa's share of the restart costs are approximately $15, with the majority to be spent in 2022 through the expected completion in the third quarter. Once the restart is complete, the plant will operate at approximately 95 percent of its total capacity and Alcoa will have approximately 186 kmt of consolidated annual capacity at Portland. Energy to operate the restored capacity will be supplied under a new agreement which will supplement the March 2021 agreements, see below.

On March 18, 2021, the Company signed agreements to repower the Portland aluminum smelter in the State of Victoria, Australia. The agreements with three separate providers commenced on August 1, 2021 and are effective through June 30, 2026. Further, the Australian Federal Government has committed to the joint venture, subject to approval, to provide up to $15 (A$20) per year for four years to underwrite the smelter's participation in the Reliability and Emergency Reserve Trader (RERT) scheme. The arrangement will recognize the smelter's ability to rapidly shed load when required to help protect the power grid from unexpected interruptions when it is under duress.

Fixed Price Commitments—As part of the planned restart of the Alumar smelter in São Luís, Brazil, the Company began entering into fixed price commitments on aluminum sales and certain input costs in the third quarter 2021, to protect project economics through 2023. Once the smelter is operational in 2022, the fixed price commitments will settle monthly through 2023. Further, starting in October 2021, Alcoa began entering into fixed price commitments to reduce price risk associated with aluminum produced during the San Ciprián strike. The commitments related to San Ciprián metal will settle in 2022 as the metal is consumed by the facilities' casthouse which continues to operate to meet customer commitments.

Lake Charles—On July 28, 2021, as part of the Company's ongoing strategic review, Alcoa made the decision to permanently close the previously curtailed anode facility in Lake Charles, Louisiana, United States. The anode facility within the Lake Charles site has been fully curtailed since 2015. The Company recorded restructuring and other charges of $27 in the third quarter of 2021, comprised of asset impairments of $22 and cash-based charges for closure and asset retirement obligations of $5. Majority of cash outlays related to demolition and environmental related activities are expected in 2022. The Company's petroleum coke calciner located at the same site in Lake Charles remains in operation, unaffected by the closure of the anode facility.

Non-core assets

Rockdale—On October 29, 2021, the Company completed the sale of the previously closed Rockdale smelter site in the state of Texas in a transaction valued at $240. Upon the closing of the transaction, the Company received $230 in cash and recorded a net gain of $202 in Other (income) expenses, net (pre- and after-tax) on the Statement of Consolidated Operations.

Eastalco—In June 2021, the Company completed the sale of the previously closed Eastalco smelter site in the state of Maryland in a transaction valued at $100. Upon the closing of the transaction, the Company received $94 in cash and recorded a gain of $90 in Other (income) expenses, net ($90 pre- and $89 after-tax) on the Statement of Consolidated Operations.

Warrick Rolling Mill—On November 30, 2020, the Company entered into an agreement to sell its rolling mill located at Warrick Operations (Warrick Rolling Mill), an integrated aluminum manufacturing site near Evansville, Indiana (Warrick Operations), to Kaiser Aluminum Corporation (Kaiser). On March 31, 2021, the Company completed the sale for total consideration of approximately $670, which included the assumption of $69 in other postretirement benefits. The Company recorded a net gain of $30 in Other (income) expenses, net (pre- and after-tax) on the Statement of Consolidated Operations.

Upon closure, the Company recorded estimated liabilities for future site separation commitments and remaining transaction costs associated with the sales agreement. At December 31, 2021, the remaining reserve was approximately $70; over half of the expected cash outlay is to be spent within the next 12 months, with the remainder to be spent through 2023.

Alcoa retains ownership of the site's 269 kmt aluminum smelter and its electricity generating units at Warrick Operations and supplies metal to Kaiser under a market-based supply agreement.

Strengthening the Balance Sheet

In the fourth quarter of 2021, the Company purchased group annuity contracts to transfer the obligation to pay remaining retirement benefits for approximately 14,000 retirees and beneficiaries from its U.S. defined benefit pension plans and transferred approximately $1,540 in both plan obligations and plan assets. The transfers were completed on November 23, 2021 and December 16, 2021. As a result, the Company recorded a non-cash settlement loss of $848 (pre- and after-tax) in Restructuring and other charges, net on the Statement of Consolidated Operations in the fourth quarter of 2021. See Part II Item 8 of this Form 10-K in Note O to the Consolidated Financial Statements for additional information.

In September 2021, the Company used cash on hand to redeem outstanding $500 of 7.00% Senior Notes due 2026 (see Liquidity and Capital below).

In March 2021, the Company issued $500 of 4.125% Senior Notes due 2029. The Company used the net proceeds, together with cash on hand, to make discretionary contributions of $500 to its U.S. defined benefit pension plans applicable to salaried and hourly employees on April 1, 2021, and $750 to redeem its outstanding 6.75% Senior Notes due 2024 (see Liquidity and Capital below).

Other Spain Matters

San Ciprián Carbon Dioxide Compensation Credits—In June 2021, the Spanish Ministry of Industry, Trade and Tourism (the Ministry) initiated the process to request repayment of $40 (€34) in carbon dioxide compensation credits $13 (€11) for 2018 and $27 (€23) for 2019, which were subject to a three-year clawback provision based on continued operations and employment. The request for repayment is related to Alcoa's communication of the decision to implement the collective dismissal process and its potential impact on operations and employment at San Ciprián. Alcoa disagrees with the Ministry's position as the collective dismissal process was not concluded and qualifying operations and employment at San Ciprián have been maintained. Accordingly, the Company has filed an appeal.

Spain has a compensatory mechanism for the indirect cost of carbon dioxide and provides associated credits. Such carbon dioxide compensation credits are typically recorded as a reduction to Costs of goods sold. Upon receipt of the credits in each of the applicable years, the Company recorded the cash received as deferred income (liability) due to the clawback provisions. Further, Alcoa did not receive carbon dioxide compensation credits earned in 2020 and 2021 based on the same circumstances.

Avilés and La Coruña—In July 2019, the Company completed the divestiture of the Avilés and La Coruña (Spain) aluminum facilities to PARTER Capital Group AG (PARTER) in a sale process endorsed by the Spanish government and supported by the workers' representatives following a collective dismissal process. In connection with the divestiture, Alcoa committed to make financial contributions to the divested entities of up to $95; a total of $78 was paid through December 31, 2021. In the fourth quarter of 2021,

the Company reversed the remaining reserve of $17 in accordance with the terms of the agreement, as the period for which the divested entities could incur qualifying capital expenditures had lapsed.

In early 2020, PARTER sold a majority stake in the facilities to an unrelated party. Alcoa had no knowledge of the subsequent transaction prior to its announcement and on August 28, 2020, Alcoa filed a lawsuit with the Court of First Instance in Madrid, Spain asserting that the sale was in breach of the sale agreement between Alcoa and PARTER.

Related to this subsequent sale transaction, certain proceedings and investigations have been initiated by or at the request of the employees of the facilities against their current employers, the new owners of the current employers, and Alcoa, alleging that certain agreements from the 2019 collective dismissal process remain in force and that, under such agreements, Alcoa remains liable for certain related employment benefits. One such proceeding is a collective case before the Spanish National Court, filed on November 10, 2020, wherein the workers' representatives and employees are seeking to have the terms of a Collective Dismissal Agreement signed between Alcoa and the workers in January 2019 be fulfilled. Other proceedings include: a second collective claim filed in National Court on behalf employees that were not affected by the 2019 collective dismissal process, numerous individual labor claims filed in the labor courts of Avilés and La Coruña and the initiation of a separate criminal investigation by the National Court.

On June 15, 2021, the Spanish National Court ruled that the collective dismissal agreement for the divested Avilés and La Coruña aluminum facilities should be applied to the situation of the claimant workers, and that Alcoa should be liable for the severance of those employees to the extent they were affected by the 2019 collective dismissal process. Alcoa has appealed this ruling to the Supreme Court of Spain.

In July 2021, the Spanish National Court appointed a judicial director to oversee the facilities and later declared the facilities insolvent. In early 2022, the insolvency administrators appointed by the courts (one for each facility) announced their intention to collectively dismiss all employees at the two facilities.

In February 2022, Alcoa and relevant stakeholders initiated discussions to explore a potential global resolution of all pending matters involving Alcoa arising from the prior sale of the two facilities, including a waiver of all claims and investigations previously initiated by or at the request of the employees of the facilities. As of the date of this filing, these initial discussions are ongoing.

If a global resolution is not reached, Alcoa will continue with its appeal to the National Court ruling to the Spanish Supreme Court and will strongly defend all other pending and future legal proceedings arising from the sale of the Avilés and La Coruña facilities. Alcoa believes it has acted in good faith, in full compliance with the law and with all of the terms that it committed to in the contract for the sale of the Avilés and La Coruña facilities to PARTER and in the agreements that it entered into with the representatives of the workers of both facilities.

The estimated range of reasonably possible loss is $0 to $70. Due to the uncertainty regarding both the outcome of the discussions and the likelihood of securing waivers for all claims, Alcoa is unable to reasonably predict the ultimate outcome of this matter.

Basis of Presentation. The Consolidated Financial Statements of Alcoa Corporation are prepared in conformity with accounting principles generally accepted in the United States of America (GAAP). In accordance with GAAP, certain situations require management to make estimates based on judgments and assumptions, which may affect the reported amounts of assets and liabilities and the disclosure of contingent assets and liabilities at the date of the financial statements. They also may affect the reported amounts of revenues and expenses during the reporting periods. Actual results could differ from those estimates upon subsequent resolution of identified matters.

Results of Operations

The discussion that follows includes a comparison of our results of operations and liquidity and capital resources for the fiscal years ended December 31, 2021 and 2020. For a comparison of changes for the fiscal years ended December 31, 2020 and 2019, refer to Management's Discussion and Analysis of Financial Condition and Results of Operation in Part II Item 7 of Alcoa Corporation's Annual Report on Form 10-K for the year ended December 31, 2020 (filed February 25, 2021).

Statement of Operations	For the year ended December 31, 2021	2020
Sales	$ 12,152	$ 9,286
Cost of goods sold (exclusive of expenses below)	9,153	7,969
Selling, general administrative, and other expenses	227	206
Research and development expenses	31	27
Provision for depreciation, depletion, and amortization	664	653
Restructuring and other charges, net	1,128	104
Interest expense	195	146
Other (income) expenses, net	(445)	8
Total costs and expenses	10,953	9,113
Income before income taxes	1,199	173
Provision for income taxes	629	187
Net income (loss)	570	(14)
Less: Net income attributable to noncontrolling interest	141	156
Net income (loss) attributable to Alcoa Corporation	$ 429	$ (170)

Selected Financial Metrics	2021	2020
Diluted income (loss) per share attributable to Alcoa Corporation common shareholders	$ 2.26	$ (0.91)
Third-party shipments of alumina (kmt)	9,629	9,641
Third-party shipments of aluminum products (kmt)	3,007	3,016
Average realized price per metric ton of alumina	$ 326	$ 273
Average realized price per metric ton of primary aluminum	$ 2,879	$ 1,915
Average Alumina Price Index (API)(1)	$ 324	$ 270
Average London Metal Exchange (LME) 15-day lag(2)	$ 2,443	$ 1,693

(1) API (Alumina Price Index) is a pricing mechanism that is calculated by the Company based on the weighted average of a prior month's daily spot prices published by the following three indices: CRU Metallurgical Grade Alumina Price, Platts Metals Daily Alumina PAX Price, and FastMarkets Metal Bulletin Non-Ferrous Metals Alumina Index.

(2) LME (London Metal Exchange) is a globally recognized exchange for commodity trading, including aluminum. The LME pricing component represents the underlying base metal component, based on quoted prices for aluminum on the exchange.

Earnings Summary

	Annual Comparison
Overview	Net income attributable to Alcoa Corporation increased $599 primarily as a result of: • Higher average realized prices for aluminum and alumina • Higher gains on the sale of non-core assets • Higher equity earnings primarily from the Ma'aden aluminum joint venture due to higher aluminum prices • Favorable pricing at the Brazil hydro-electric facilities Partially offset by: • Higher restructuring costs in 2021 • Higher energy costs, primarily due to a new gas contract at the Australia alumina refineries and higher market prices in Europe and Brazil • Higher taxes on improved earnings in jurisdictions with higher tax rates and recognition of a valuation allowance on deferred tax assets of a Spanish subsidiary • Unfavorable currency impacts due to a weaker U.S. dollar against most major currencies • Higher raw material costs due to inflation and isolated supply chain issues
Sales	Sales increased $2,866 primarily as a result of: • Higher average realized prices of aluminum and alumina • Restart of the Bécancour smelter • Higher value-add product sales • Favorable pricing at the Brazil hydro-electric facilities Partially offset by: • Absence of sales from the divested Warrick Rolling Mill • Curtailment of the Intalco (Washington) smelter

	Annual Comparison
Cost of goods sold	Cost of goods sold as a percentage of sales decreased 10.5% primarily as a result of: • Higher average realized prices for aluminum and alumina • Higher value-add product sales • Favorable pricing at the Brazil hydro-electric facilities Partially offset by: • Higher market energy prices, primarily due to a new gas contract, commencing June 2020, for the Australia alumina refineries and higher market prices in Europe and Brazil • Higher market prices for raw materials primarily due to inflation and isolated supply chain issues
Selling, general administrative, and other expenses	Selling, general administrative, and other expenses increased $21 primarily as a result of: • Higher labor and variable compensation costs • Net unfavorable currency impacts
Provision for depreciation, depletion, and amortization	The Provision for depreciation, depletion, and amortization increased $11 primarily as a result of: • Higher depreciation at the Australia mine sites primarily due to completion of mine moves • Unfavorable currency impacts due to a weaker U.S. dollar against most major currencies Partially offset by: • Lower depreciation due to the sale of the Warrick Rolling Mill
Interest expense	Interest expense increased $49 primarily as a result of: • Early redemption costs for the $750 6.75% Senior Notes and $500 7.00% Senior Notes • Interest on the $750 5.5% Senior Notes issued in July 2020 • Interest on the $500 4.125% Senior Notes issued in March 2021 Partially offset by: • Absence of interest on $750 6.75% Senior Notes redeemed early in April 2021 • Absence of interest on $500 7.00% Senior Notes redeemed early in September 2021
Other (income) expenses, net	Other (income) expenses, net increased $453 primarily as a result of: • Gain on the sale of non-core assets including the former Rockdale site, former Eastalco site, and Warrick Rolling Mill • Higher equity earnings primarily from the Ma'aden aluminum joint venture due to higher aluminum prices • Lower non-service costs related to pension and OPEB Partially offset by: • Absence of a gain related to the divestiture of the Gum Springs waste treatment facility
Restructuring and other charges, net	In 2021, Restructuring and other charges, net of $1,128, primarily related to: • $858 for U.S. pension group annuity contracts and lump sum settlements • $80 for the permanent closure of the previously curtailed Wenatchee (Washington) smelter • $63 for Suriname pension group annuity contract • $62 for the temporary curtailment of the San Ciprián (Spain) smelter • $47 for the settlement of certain pension benefits • $27 for the permanent closure of the anode portion of the Lake Charles (Louisiana) facility • $13 related to additional take-or-pay contract costs at the curtailed Intalco and Wenatchee smelters (prior to closure) • $11 to record additional environmental related reserves • $9 in settlements and curtailments of certain other postretirement benefits related to the sale of the Warrick Rolling Mill Partially offset by: • $22 of reversals for environmental and asset retirement obligation reserves at previously closed locations • $17 for the reversal of a reserve related to the divested Avilés and La Coruña entities • $6 for the reversal of a take-or-pay obligation at Sao Luis smelter due to the announced restart In 2020, Restructuring and other charges, net of $104, primarily related to: $59 for settlements and curtailments of certain pension and other postretirement benefits; $28 (net) for costs related to the curtailment of the Intalco (Washington) smelter; and, $20 for additional contract costs related to the curtailed Wenatchee (Washington) smelter.

	Annual Comparison
Provision for income taxes	The Provision for income taxes in 2021 was $629 on income before taxes of $1,199 or 52.5%. In comparison, the 2020 Provision for income taxes was $187 on income before taxes of $173 or 108.1%. The increase in taxes is primarily attributable to the overall higher income before taxes as noted in the discussion of results above. Additionally, a valuation allowance of $103 was recorded in 2021 against the net deferred tax assets of Alúmina Española, S.A (Española). Management concluded that it is more likely than not that Española's net deferred tax assets, which consist primarily of tax loss carryforwards, will not be realized as the entity's sole operating asset, the San Ciprián refinery, is in a three-year cumulative loss position for the period ended December 31, 2021. In 2020, the Company generated losses in jurisdictions where it maintains a full tax valuation reserve resulting in no tax benefit. Accordingly, taxes in the jurisdictions where the Company records and pays tax expense represent a higher effective rate on income before taxes.
Noncontrolling interest	Net income attributable to noncontrolling interest was $141 in 2021 compared with $156 in 2020. Despite the higher alumina price in 2021, net income attributable to noncontrolling interest decreased in 2021 due to: higher depreciation, higher restructuring charges primarily for pension actions, higher taxes due to both higher profits before taxes and a valuation allowance established against deferred taxes, and higher elimination of intercompany profit in inventory, partially offset by higher other income related to Ma'aden equity income, and non-core asset sales.

Segment Information

Alcoa Corporation is a producer of bauxite, alumina, and aluminum products. The Company's operations consist of three worldwide reportable segments: Bauxite, Alumina, and Aluminum. Segment performance under Alcoa Corporation's management reporting system is evaluated based on a number of factors; however, the primary measure of performance is the Adjusted EBITDA (Earnings before interest, taxes, depreciation, and amortization) of each segment. The Company calculates Segment Adjusted EBITDA as Total sales (third-party and intersegment) minus the following items: Cost of goods sold; Selling, general administrative, and other expenses; and Research and development expenses. Alcoa Corporation believes that the presentation of Adjusted EBITDA is useful to investors because such measure provides both additional information about the operating performance of Alcoa Corporation and insight on the ability of Alcoa Corporation to meet its financial obligations. The presentation of Adjusted EBITDA is not intended to be a substitute for, and should not be considered in isolation from, the financial measures reported in accordance with GAAP. Alcoa Corporation's Adjusted EBITDA may not be comparable to similarly titled measures of other companies.

Segment Adjusted EBITDA totaled $3,053 in 2021, $1,317 in 2020, and $1,626 in 2019. The following information provides production, shipments, sales, and Segment Adjusted EBITDA data for each reportable segment, as well as certain realized price and average cost data, for each of the three years in the period ended December 31, 2021. See Part II Item 8 of this Form 10-K in Note E to the Consolidated Financial Statements for additional information.

Bauxite

		2021		**2020**
Production (mdmt)		47.6		48.0
Third-party shipments (mdmt)		5.7		6.5
Intersegment shipments (mdmt)		42.4		42.2
Total shipments (mdmt)		48.1		48.7
Third-party sales	$	236	$	272
Intersegment sales		711		941
Total sales	$	947	$	1,213
Segment Adjusted EBITDA	$	172	$	495
Operating costs	$	912	$	835
Average cost per dry metric ton of bauxite shipped	$	19	$	17

Production in the above table can vary from Total shipments due primarily to differences between the equity allocation of production and off-take agreements with the respective equity investment. Operating costs in the table above includes all production-related costs: conversion costs, such as labor, materials, and utilities; depreciation, depletion, and amortization; and plant administrative expenses.

Overview. This segment represents the Company's global bauxite mining operations. A portion of this segment's production represents the offtake from equity method investments in Brazil and Guinea, as well as AWAC's share of production related to the equity investment in Saudi Arabia. The bauxite mined by this segment is sold primarily to internal customers within the Alumina segment; a portion of the bauxite is sold to external customers. Bauxite mined by this segment and used internally is transferred to the

Alumina segment at negotiated terms that are intended to approximate market prices; sales to third-parties are conducted on a contract basis. Generally, this segment's sales are transacted in U.S. dollars while costs and expenses are transacted in the local currency of the respective operations, which are the Australian dollar and the Brazilian real. Most of the operations that comprise the Bauxite segment are part of AWAC (see Noncontrolling Interest in Earnings Summary above).

Business Update. The Bauxite segment had a solid year of production, following a year of production records in 2020, despite lower demand from the Alumina segment related to the Alumar refinery ship unloader outage, see Alumina below.

In December 2021, third-party bauxite sales out of Western Australia ceased due to the expiration of the Company's export license; export sales out of Western Australia represented approximately $27 and $45 of total third-party sales for 2021 and 2020, respectively, and represented only 3% of total bauxite shipments from the Western Australian mines. Going forward, all Western Australia bauxite production will be consumed internally by the Company's refineries.

Mining operations are relocated periodically in support of optimizing the value extracted from bauxite reserves. During 2021, the Company completed the process of moving the Willowdale mining operations to the next planned location in the Darling range and started the process of moving the Juruti mining operations, which is expected to complete by the end of 2022. During 2021, the Company incurred $38 and $8 in capital expenditures related to the Willowdale and Juruti mining operation relocations, respectively.

	Annual Comparison
Production	Production was stable across Alcoa owned mines with a slight decrease primarily due to lower demand from the Alumar refinery as a result of the ship unloader outage.
Third-party sales	Third-party sales decreased $36 primarily as a result of: • Lower third-party realized prices • Lower third-party sales volumes primarily due to port congestion in Western Australia
Intersegment sales	Intersegment sales decreased $230 primarily as a result of: • Lower average internal prices on sales to the Alumina segment
Segment Adjusted EBITDA	Segment adjusted EBITDA decreased $323 primarily as a result of: • Lower realized prices • Higher costs primarily associated with timing of maintenance and slightly higher energy costs • Unfavorable currency impacts due to a weaker U.S. dollar mainly against the Australian dollar • Lower third-party sales volumes

Forward-Look. In 2022, the Company projects total bauxite shipments to range between 48.0 and 49.0 million metric tons, consistent with 2021 as improved demand from the Alumina segment, see Alumina below, offsets lower third-party shipments with the expiration of the Company's license to export bauxite from Australia. Further, the segment expects continued levels of high capital expenditures as the Juruti mining relocation will offset the decline in spend related to the completion of the Willowdale relocation in 2021.

Alumina

		2021		**2020**
Production (kmt)		13,259		13,475
Third-party shipments (kmt)		9,629		9,641
Intersegment shipments (kmt)		4,287		4,243
Total shipments (kmt)		13,916		13,884
Third-party sales	$	3,139	$	2,627
Intersegment sales		1,586		1,268
Total sales	$	4,725	$	3,895
Segment Adjusted EBITDA	$	1,002	$	497
Average realized third-party price per metric ton of alumina	$	326	$	273
Operating costs	$	3,678	$	3,379
Average cost per metric ton of alumina shipped	$	264	$	243

In the above table, Total shipments include metric tons that were not produced by the Alumina segment. Such alumina was purchased to satisfy certain customer commitments or requirements. The Alumina segment bears the risk of loss of the purchased alumina until control of the product has been transferred to this segment's customer. Additionally, operating costs in the table above includes all production-related costs: raw materials consumed; conversion costs, such as labor, materials, and utilities; depreciation and amortization; and plant administrative expenses.

Overview. This segment represents the Company's worldwide refining system, which processes bauxite into alumina. The alumina produced by this segment is sold primarily to internal and external aluminum smelter customers; a portion of the alumina is sold to external customers who process it into industrial chemical products. Approximately two-thirds of Alumina's production is sold under supply contracts to third parties worldwide, while the remainder is used internally by the Aluminum segment. Alumina produced by this segment and used internally is transferred to the Aluminum segment at prevailing market prices. A portion of this segment's third-party sales are completed through the use of alumina traders. Generally, this segment's sales are transacted in U.S. dollars while costs and expenses are transacted in the local currency of the respective operations, which are the Australian dollar, the Brazilian real, and the euro. Most of the operations that comprise the Alumina segment are part of AWAC (see Noncontrolling Interest in Earnings Summary above). This segment also includes AWAC's 25.1% ownership interest in the mining and refining joint venture company in Saudi Arabia.

Business Update. The Alumina segment had a strong year of production following 2020, a record year for the segment, despite certain production issues, as noted below.

During 2021, the average API (on 30-day lag) remained stable throughout the first half of the year before trending favorably in the second half of the year, reaching a high point in November 2021. As discussed above, the majority of third-party alumina sales are linked to the API and the favorable price trend has resulted in strong results for the segment.

On September 27, 2021, the labor force at the San Ciprián refinery and smelting facilities resumed the strike that had previously been suspended since January 2021. Under the strike conditions, the refinery reduced production and related shipments. On December 29, 2021, the Company reached an agreement with the workers' representatives and the refinery immediately resumed normal operations. See Part II Item 7 of this Form 10-K in Business Update for additional information.

In July 2021, one of two ship unloaders at the Alumar refinery in São Luís, Brazil, which Alcoa operates, sustained structural damage, reducing the amount of bauxite that can be unloaded. Until late September, the refinery supplemented the bauxite supply from the one functioning loader with existing, on-hand inventory and reduced production by one-third, to about 7 kmt per day. In early October, alumina production was restored to approximately 95 percent capacity and full capacity was achieved by the end of the fourth quarter. As a result, the Alumar refinery also incurred additional maintenance and rental costs. See Part II Item 7 of this Form 10-K in Business Update for additional information.

Capacity. The Alumina segment had a base capacity of 13,843 kmt with 214 kmt of curtailed refining capacity. In early 2022, the Company updated nameplate capacity of certain facilities to reflect capital expenditures, upgrades, or other investments which expanded production capacity, and productivity initiatives and process and supply changes that improved capacity in a sustained manner. There was no change in curtailed capacity.

	Annual Comparison
Production	Production decreased 2% primarily as a result of: • Reduced alumina capacity at the Alumar refinery due to the ship unloader outage • Slightly lower production at the San Ciprián refinery, which saw reduced production in both periods due to strike conditions present in the fourth quarter of each year Partially offset by: • Record production at the Kwinana refinery in Western Australia
Third-party sales	Third-party sales increased $512 primarily as a result of: • Higher average realized price of $53/ton principally driven by a higher average API
Intersegment sales	Intersegment sales increased $318 primarily as a result of: • Higher average realized prices on sales to the Aluminum segment
Segment Adjusted EBITDA	Segment adjusted EBITDA increased $505 primarily as a result of: • Higher average realized price of $53/ton principally driven by a higher average API • Lower costs for bauxite Partially offset by: • Higher energy prices in Australia due to a new gas contract and higher market energy prices in Spain and Brazil • Net unfavorable currency impacts due to a weaker U.S. dollar mainly against the Australian dollar • Unfavorable impacts related to the ship unloader outage at Alumar • Higher costs associated with impoundments

Forward-Look. The Company projects total alumina shipments to range between 14.2 and 14.4 million metric tons in 2022, up from 2021 with the resolution of the strike at the San Ciprián refinery and recovery from the Alumar unloader outage. Additionally, in 2022, the Alumina segment expects to continue to be challenged by high energy prices and expects higher raw material prices.

Aluminum

Total Aluminum information	2021	2020
Third-party aluminum shipments (kmt)	3,007	3,016
Third-party sales	$ 8,766	$ 6,365
Intersegment sales	18	12
Total sales	$ 8,784	$ 6,377
Segment Adjusted EBITDA	$ 1,879	$ 325

Primary aluminum information	2021	2020
Production (kmt)	2,193	2,263
Third-party shipments (kmt)	2,924	2,710
Third-party sales	$ 8,420	$ 5,190
Average realized third-party price per metric ton	$ 2,879	$ 1,915
Total shipments (kmt)	2,949	2,773
Operating costs	$ 6,593	$ 5,222
Average cost per metric ton of primary aluminum shipped	$ 2,235	$ 1,883

In the above table, total aluminum third-party shipments and total primary aluminum shipments include metric tons that were not produced by the Aluminum segment. Such aluminum was purchased by this segment to satisfy certain customer commitments or requirements. The Aluminum segment bears the risk of loss of the purchased aluminum until control of the product has been transferred to this segment's customer. Until the sale of the Warrick Rolling Mill on March 31, 2021, total aluminum information included flat-rolled aluminum while Primary aluminum information did not. Operating costs includes all production-related costs: raw materials consumed; conversion costs, such as labor, materials, and utilities; depreciation and amortization; and plant administrative expenses.

The average realized third-party price per metric ton of primary aluminum includes three elements: a) the underlying base metal component, based on quoted prices from the LME; b) the regional premium, which represents the incremental price over the base LME component that is associated with the physical delivery of metal to a particular region (e.g., the Midwest premium for metal sold in the United States); and c) the product premium, which represents the incremental price for receiving physical metal in a particular shape (e.g., billet, slab, rod, etc.) or alloy.

Overview. This segment consists of the Company's (i) worldwide smelting and casthouse system, which processes alumina into primary aluminum, and the (ii) portfolio of energy assets in Brazil, Canada, and the United States.

Aluminum's combined smelting and casting operations produce primary aluminum products, virtually all of which are sold to external customers and traders. The smelting operations produce molten primary aluminum, which is then formed by the casting operations into either common alloy ingot (e.g., t-bar, sow, standard ingot) or into value-add ingot products (e.g., foundry, billet, rod, and slab). A variety of external customers purchase the primary aluminum products for use in fabrication operations, which produce products primarily for the transportation, building and construction, packaging, wire, and other industrial markets. Results from the sale of aluminum powder and scrap are also included in this segment, as well as the impacts of embedded aluminum derivatives related to energy supply contracts.

The energy assets supply power to external customers in Brazil and the United States, as well as internal customers in the Aluminum (Canadian smelters and Warrick (Indiana) smelter) and, to a lesser extent, the Alumina segments (Brazilian refineries).

Generally, this segment's aluminum sales are transacted in U.S. dollars while costs and expenses of this segment are transacted in the local currency of the respective operations, which are the U.S. dollar, the euro, the Norwegian krone, the Icelandic króna, the Canadian dollar, the Brazilian real, and the Australian dollar.

This segment also includes Alcoa Corporation's 25.1% ownership interest in the smelting joint venture company in Saudi Arabia (Alcoa's interest in the rolling mill joint venture was divested in June 2019).

Business Update. The Aluminum segment maintained solid production compared with 2020, capitalizing on improved market pricing during the year. During 2021, the average LME (on 15-day lag) trended favorably throughout the year, reaching a high point in October 2021.

On September 27, 2021, the labor force at the San Ciprián refinery and smelting facilities resumed the strike that had previously been suspended since January 2021. Under the strike conditions, the smelter stopped all metal shipments and the production of value-add products. Further, the San Ciprián smelting operations experienced significantly higher energy and raw materials costs. On December 29, 2021, the Company reached an agreement with the workers' representatives and announced a two-year curtailment of smelting capacity at the facility. See Part II Item 7 of this Form 10-K in Business Update for additional information on the announcement and

related charges taken as a result of the agreement reached with the workers. The San Ciprián smelter incurred a net loss $72 (pre- and after-tax) in 2021, excluding Restructuring and other charges, net.

In December 2021, the company announced the permanent closure of the 146 kmt of aluminum smelting capacity at the Wenatchee aluminum smelter (Washington). The smelter had been fully curtailed since 2015. See Part II Item 8 of this Form 10-K in Note D to the Consolidated Financial Statements for additional information.

In November 2021, Alcoa announced the Portland Aluminium joint ventures plan to restart 19 kmt of curtailed annual capacity at the Portland aluminum smelter (Australia). The restart is expected to complete in the third quarter of 2022. Once the restart is complete, the plant will operate at approximately 95 percent of its total capacity and Alcoa will have approximately 186 kmt of consolidated annual capacity at Portland. See Part II Item 7 of this Form 10-K in Business Update for additional information.

In September 2021, Alcoa announced the restart of 268 kmt of curtailed annual capacity at the Alumar aluminum smelter (Brazil). The smelter had been fully curtailed since 2015. The restart is expected to complete in the fourth quarter of 2022 with the first molten metal expected in the second quarter of 2022. See Part II Item 7 of this Form 10-K in Business Update for additional information.

In March 2021, the Company completed the sale of the Warrick Rolling Mill to Kaiser Aluminum Corporation. Results from the divested rolling mill are included in the Aluminum segment's results through the first quarter of 2021. Alcoa retains ownership of the 269 kmt of annual smelting capacity at the Warrick smelter. As part of the sale, Alcoa entered into a market-based metal supply agreement, a long-term ground lease, and a transition services agreement with Kaiser. See Part II Item 8 of this Form 10-K in Note C to the Consolidated Financial Statements for additional information.

Capacity. The Aluminum segment had a base capacity of 2,962 kmt with 685 kmt of curtailed smelting capacity. In early 2022, the Company updated nameplate capacity of certain facilities to reflect capital expenditures, upgrades, or other investments which expanded production capacity, and productivity initiatives and process and supply changes that improved capacity in a sustained manner. Base and curtailed capacity were reduced by 146 kmt for the permanent closure of the Wenatchee smelter in December 2021.

	Annual Comparison
Production	Production decreased 3% primarily as a result of: • Curtailment of the Intalco smelter, completed in the third quarter of 2020 Partially offset by: • Restart of the Bécancour smelter, completed in the third quarter of 2020
Third-party sales	Third-party sales increased $2,401 primarily as a result of: • Higher average realized price of $964/ton principally driven by a higher average LME (on a 15-day lag) and higher regional premiums • Restart of the Bécancour smelter • Increase in value-add product sales on higher price and increased volume • Favorable market pricing at the Brazilian hydro-electric facilities Partially offset by: • Absence of sales from the divested Warrick Rolling Mill • Curtailment of the Intalco smelter
Segment Adjusted EBITDA	Segment adjusted EBITDA increased $1,554 primarily as a result of: • Higher average realized price driven by higher average LME and regional premiums • Favorable market pricing at the Brazilian hydro-electric facilities • Increase in value-add product sales • Favorable impacts from the curtailment of the Intalco smelter Partially offset by: • Higher alumina costs, driven by an increase in API, as well as higher market prices for other raw materials • Higher energy prices, primarily in Spain and Norway • Unfavorable currency impacts due to a weaker U.S. dollar against most major currencies

Forward-Look. The Company projects total aluminum shipments to range between 2.5 and 2.6 million metric tons in 2022, a decrease from 2021 primarily due to the two-year curtailment of the San Ciprián smelter, the absence of first quarter sales from the divested Warrick Rolling Mill, partially offset by the announced restarts of smelter capacity in Alumar and Portland. Additionally, the Company engages in trading activity when favorable market conditions allow, such as in 2021. Availability of trading opportunities in 2022 may impact the Company's shipment projection.

Further, in 2022 the Aluminum segment expects to benefit from the avoidance of the high energy costs related to the curtailment of the San Ciprián smelter. The Aluminum segment expects to continue to be challenged by high raw material costs across the smelting portfolio and by high energy prices in Norway.

Reconciliations of Certain Segment Information

Reconciliation of Total Segment Third-Party Sales to Consolidated Sales

	2021	2020
Bauxite	$ 236	$ 272
Alumina	3,139	2,627
Aluminum:		
Primary aluminum	8,420	5,190
Other[1]	346	1,175
Total segment third-party sales	12,141	9,264
Other	11	22
Consolidated sales	$ 12,152	$ 9,286

(1) Other includes third-party sales of flat-rolled aluminum and energy, as well as realized gains and losses related to embedded derivative instruments designated as cash flow hedges of forward sales of aluminum. Following the sale of the Warrick Rolling Mill on March 31, 2021, Other no longer includes the sales of flat-rolled aluminum.

Reconciliation of Total Segment Operating Costs to Consolidated Cost of Goods Sold

	2021	2020
Bauxite	$ 912	$ 835
Alumina	3,678	3,379
Primary aluminum	6,593	5,222
Other[1]	737	1,233
Total segment operating costs	11,920	10,669
Eliminations[2]	(2,214)	(2,213)
Provision for depreciation, depletion, amortization[3]	(639)	(627)
Other[4]	86	140
Consolidated cost of goods sold	$ 9,153	$ 7,969

(1) Prior to the sale of the Warrick Rolling Mill on March 31, 2021, Other largely relates to the Aluminum segment's flat-rolled aluminum product division.

(2) Represents the elimination of cost of goods sold related to intersegment sales between Bauxite and Alumina and between Alumina and Aluminum.

(3) Depreciation, depletion, and amortization is included in the operating costs used to calculate average cost for each of the bauxite, alumina, and primary aluminum product divisions (see Bauxite, Alumina, and Aluminum above). However, for financial reporting purposes, depreciation, depletion, and amortization is presented as a separate line item on Alcoa Corporation's Statement of Consolidated Operations.

(4) Other includes costs related to Transformation, and certain other items that impact Cost of goods sold on Alcoa Corporation's Statement of Consolidated Operations that are not included in the operating costs of the segments (see footnotes 1 and 3 in the Reconciliation of Total Segment Adjusted EBITDA to Consolidated Net Income (Loss) Attributable to Alcoa Corporation below).

Reconciliation of Total Segment Adjusted EBITDA to Consolidated Net Income (Loss) Attributable to Alcoa Corporation

	2021	2020
Net income (loss) attributable to Alcoa Corporation:		
Total segment Adjusted EBITDA	$ 3,053	$ 1,317
Unallocated amounts:		
Transformation[1]	(44)	(45)
Intersegment eliminations	(101)	(8)
Corporate expenses[2]	(129)	(102)
Provision for depreciation, depletion, and amortization	(664)	(653)
Restructuring and other charges, net	(1,128)	(104)
Interest expense	(195)	(146)
Other income (expenses), net	445	(8)
Other[3]	(38)	(78)
Consolidated income (loss) before income taxes	1,199	173
Provision for income taxes	(629)	(187)
Net income attributable to noncontrolling interest	(141)	(156)
Consolidated net income (loss) attributable to Alcoa Corporation	$ 429	$ (170)

(1) Transformation includes, among other items, the Adjusted EBITDA of previously closed operations.

(2) Corporate expenses are composed of general administrative and other expenses of operating the corporate headquarters and other global administrative facilities, as well as research and development expenses of the corporate technical center.

(3) Other includes certain items that impact Cost of goods sold and other expenses on Alcoa Corporation's Statement of Consolidated Operations that are not included in the Adjusted EBITDA of the reportable segments.

Environmental Matters

See Part II Item 8 of this Form 10-K in Note S to the Consolidated Financial Statements under caption Contingencies—Environmental Matters.

Liquidity and Capital Resources

Alcoa Corporation's primary future cash flows are centered on operating activities, particularly working capital, as well as capital expenditures and capital returns. Alcoa's ability to fund its cash needs depends on the Company's ongoing ability to generate and raise cash in the future.

In 2021, the Company capitalized on strong market conditions through stable operational performance to reach record annual net income. The strong financial results allowed the Company to significantly improve its balance sheet, capital structure, and liquidity profile through the successful completion of the following actions:

- On March 31, completed the sale of the Warrick Rolling Mill for initial net cash proceeds of $583;
- In March, issued $500 of 4.125% Senior Notes due 2029;
- On April 1, made discretionary contribution of $500 to its U.S. defined benefit pension plans;
- On April 7, fully redeemed $750 of 6.75% Senior Notes due 2024 at a redemption price equal to 103.375% plus accrued and unpaid interest;
- In June, completed the sale of the former Eastalco site for net cash proceeds of $94;
- On September 30, fully redeemed $500 of 7.00% Senior Notes due 2026 at a redemption price equal to 103.5% plus accrued and unpaid interest;
- On October 29, completed the sale of the Rockdale site for net cash proceeds of $230.

Further, management has taken the following actions in 2021 in regard to Alcoa's liquidity levers:

- Amended the Company's Revolving Credit Facility to provide a more favorable leverage ratio calculation and a more favorable minimum interest expense coverage ratio;
- Allowed to expire (effective October 4, 2021) the NOK 1.3 billion (approximately $149) multicurrency revolving credit facility agreement. No amounts were drawn on the facility in both 2020 and 2021; and,
- Terminated a receivables purchase agreement, effective November 8, 2021, which provided Alcoa the ability to sell up to $120 of its receivables. No receivables were sold under this agreement.

Management believes that the Company's cash on hand, future operating cash flows, and liquidity options, combined with its strategic actions, are adequate to fund its short term and long term operating and investing needs. Further, the above actions have provided the

Company with significant flexibility related to its use of cash; the Company has no significant debt maturities until 2027 and no significant cash contribution requirements related to its U.S. pension plan obligations for the foreseeable future (refer to Material Cash Commitments, below, for more information).

Although management believes that Alcoa's future cash from operations and other liquidity options will provide adequate resources to fund operating and investing needs, the Company's access to, and the availability of, financing on acceptable terms in the future will be affected by many factors, including: (i) Alcoa Corporation's credit rating; (ii) the liquidity of the overall capital markets; and (iii) the current state of the economy and commodity markets. There can be no assurances that the Company will continue to have access to capital markets on terms acceptable to Alcoa Corporation.

Changes in market conditions caused by the COVID-19 pandemic could have adverse effects on Alcoa's ability to obtain additional financing and cost of borrowing. Inability to generate sufficient earnings could impact the Company's ability to meet the financial covenants in our outstanding debt and revolving credit facility agreements and limit our ability to access these sources of liquidity or refinance or renegotiate our outstanding debt or credit agreements on terms acceptable to the Company. Additionally, the impact on market conditions from the COVID-19 pandemic could adversely affect the liquidity of Alcoa's customers, suppliers, and joint venture partners and equity method investments, which could negatively impact the collectability of outstanding receivables and our cash flows.

At December 31, 2021, the Company's cash and cash equivalents were $1,814, of which $1,732 was held outside the United States. Alcoa Corporation has a number of commitments and obligations related to the Company's operations in various foreign jurisdictions, resulting in the need for cash outside the United States. Alcoa Corporation continuously evaluates its local and global cash needs for future business operations, which may influence future repatriation decisions. See Part II Item 8 of this Form 10-K in Note Q to the Consolidated Financial Statements for additional information related to undistributed net earnings.

Cash from Operations

Cash provided from operations was $920 in 2021 compared with $394 in 2020. Notable changes to the sources and (uses) of cash include:

- $1,608 higher net income generation, excluding the impacts from restructuring charges, primarily on higher aluminum and alumina pricing;
- ($862) in certain working capital accounts (receivables, inventories, and accounts payable, trade), primarily an increase in receivables balances on higher aluminum and alumina prices in 2021 and higher inventories and accounts payable balances on higher raw material and energy prices;
- ($236) from higher pension contributions, including a $500 discretionary contribution to the Company's U.S. defined benefit pension plan in 2021, partially offset by a $250 pension contribution to the Company's U.S. pension plans in 2020 to cover deferred contributions and a discretionary payment;
- $182 relating to changes in taxes, primarily higher income taxes payable on higher income in Canada and Australia where final tax payments of approximately $250 in total are due in the subsequent year; and,
- $115 from changes in accrued expenses, including lower payments on restructuring and other postretirement benefits.

In the third quarter of 2020, AofA paid approximately $74 (A$107) to the ATO related to the tax dispute described in Note S to the Consolidated Financial Statements in Part II Item 8 of this Form 10-K. Upon payment, AofA recorded a noncurrent prepaid tax asset, as the Company continues to believe it is more likely than not that AofA's tax position will be sustained and therefore is not recognizing any tax expense in relation to this matter. In accordance with Australian tax laws, the initial interest assessment and additional interest are deductible against AofA's taxable income resulting in approximately $169 (A$219) and $14 (A$19) lower cash tax payments in 2020 and 2021, respectively. If AofA is ultimately successful, the interest deduction would become taxable as income in the year the dispute is resolved. In addition, should the ATO decide in the interim to reduce any interest already assessed, the reduction would be taxable as income at that point in time. During 2021, AofA continued to record its tax provision and tax liability without effect of the ATO assessment, since it expects to prevail. The tax payable will remain on AofA's balance sheet as a noncurrent liability, increased by the tax effect of subsequent periods' interest deductions, until dispute resolution, which is expected to take several years. At December 31, 2021, the noncurrent liability resulting from the cumulative interest deductions was approximately $174 (A$238).

Financing Activities

Cash used for financing activities was $1,158 in 2021 compared with cash provided from financing activities of $514 in 2020.

The use of cash in 2021 was primarily $775 for the full, early repayment of $750 aggregate principal amount of 2024 Notes (including $25 redemption premium) in April 2021, $518 for the full, early repayment of $500 aggregate principal amount of 2026 Notes (including $18 redemption premium) in September 2021, $194 in net cash paid to Alumina Limited (see Noncontrolling interest in Results of Operations above), $150 for the repurchase of common stock, $19 for dividends paid on common stock, and $17 in

financial contributions primarily related to the divested Spanish facilities. The uses of cash were partially offset by the issuance of $500 aggregate principal amount 2029 Notes by ANHBV in March 2021 with net proceeds of approximately $493.

The source of cash in 2020 was primarily due to the issuance of $750 aggregate principal amount of 2027 Notes by ANHBV in July 2020 resulting in net proceeds of $736. The net proceeds were partially offset by $183 in net cash paid to Alumina Limited and $38 in financial contributions related to the divested Spanish facilities.

Credit Facilities. The Company has a senior secured $1,500 revolving credit and letter of credit facility in place for working capital and/or other general corporate purposes (the Facility). The Facility was established on September 16, 2016, was amended in each of 2017, 2018, 2019, 2020, and 2021 and is scheduled to mature on November 21, 2023. Subject to the terms and conditions under the Facility, the Company may borrow funds or issue letters of credit through its Alcoa Corporation or ANHBV legal entities. Borrowings can be executed in U.S. dollars, and letter of credit issuances are limited to $750. Effective January 1, 2022, the Company agreed to suspend borrowings denominated in euros due to reference rate reform and the phase-out of LIBOR. This suspension of borrowing denominated in euros will not materially impact the Company or its ability to access capital, if necessary.

The Facility is secured by, subject to certain exceptions, a first priority security interest in substantially all assets of Alcoa Corporation, ANHBV, the material domestic wholly-owned subsidiaries of Alcoa Corporation, and the material foreign wholly-owned subsidiaries of Alcoa Corporation located in Australia, Brazil, Canada, Luxembourg, the Netherlands, Norway, and Switzerland. This includes equity interests of certain subsidiaries that directly hold equity interests in AWAC entities. However, no AWAC entity is a guarantor of any obligation under the Facility and no asset of any AWAC entity, or equity interests in any AWAC entity, will be pledged to secure the obligations under the Facility. As provided in the Facility, each of the mentioned companies shall be released from all obligations under the first priority security interest upon (i) Alcoa Corporation attaining at least a Baa3 rating from either Moody's Investor Service or BBB- rating from Standard and Poor's Global Ratings, in each case with a stable outlook or better, (ii) ANHBV delivering the required written notice, and (iii) no default or event of default, as defined in the Facility, has occurred or is continuing.

The Facility includes several customary affirmative and negative covenants (applicable to Alcoa Corporation and certain subsidiaries described as restricted), that, subject to certain exceptions, include limitations on (among other things): indebtedness, liens, investments, sales of assets, restricted payments, entering into restrictive agreements, a covenant prohibiting reductions in the ownership of AWAC entities, and certain other specified restricted subsidiaries of Alcoa Corporation, below an agreed level. The Facility also contains customary events of default, including a failure to make payments under the Facility, cross-default and cross-judgment default, and certain bankruptcy and insolvency events. In addition, the Facility contains two financial covenants, a leverage ratio and an interest expense coverage ratio, that impact availability of the $1,500 commitment and pricing.

As of December 31, 2021, the Company was in compliance with all covenants. The maximum additional borrowing capacity available to the Company to remain in compliance with the maximum leverage ratio covenant in the Facility was approximately $6,610. Therefore, the Company may access the entire amount of commitments under the Facility. There were no borrowings outstanding at December 31, 2021 and 2020, and no amounts were borrowed during 2021 and 2020 under the Facility.

On March 4, 2021, Alcoa Corporation and ANHBV, entered into an amendment (Amendment No. 4) to the Facility that provided additional flexibility to the Company by (i) increasing the maximum leverage ratio from 2.50 to 1.00 to 2.75 to 1.00, (ii) decreasing the minimum interest expense coverage ratio from 5.00 to 1.00 to 4.00 to 1.00, (iii) amending the definition of Total Indebtedness (as defined in the Facility) to permit the Company to exclude the principal amount of new senior notes issued during 2021 from indebtedness for purposes of the calculation of the leverage ratio in fiscal year 2021 (subject to adjustments based on pension obligations funded), and (iv) ending temporary restrictions on the Company's ability to make certain restricted payments or incur incremental loans under the Facility. Amendment No. 4 also (i) provided additional debt capacity to permit the Company to issue up to $750 in aggregate principal amount of new senior notes prior to the end of fiscal year 2021 and (ii) provided a corresponding increase in the maximum leverage ratio commensurate with the increase in leverage resulting from the issuance of such notes up to the amount of pension obligations funded after the issuance of such notes but prior to December 31, 2021, which increase shall in any event not be in excess of the principal amount of such notes. Such additional increase in the maximum leverage ratio will be available beginning March 31, 2022.

Alcoa's maximum additional borrowing capacity, discussed above, can be used through any combination of the Revolving Credit Facility or through additional indebtedness. The Company may draw on the facility periodically to ensure working capital needs are met. See Part II Item 8 of this Form 10-K in Note M to the Consolidated Financial Statements for additional information related to the Revolving Credit Facility.

Off-Balance Sheet Arrangements. Alcoa Corporation is party to certain contingent off-balance sheet arrangements including guarantees, letters of credit, and surety bonds. See Part II Item 8 of this Form 10-K in Note S to the Consolidated Financial Statements for additional information.

Debt. As of December 31, 2021, Alcoa Corporation had three outstanding Notes maturing at varying times. A summary of the Notes and other long-term debt is shown below. See Part II Item 8 of this Form 10-K in Note M to the Consolidated Financial Statements for additional information related to the Company's debt.

December 31,	2021	2020
6.75% Notes, due 2024	$ —	$ 750
7.00% Notes, due 2026	—	500
5.500% Notes, due 2027	750	750
6.125% Notes, due 2028	500	500
4.125% Notes, due 2029	500	—
Other	5	6
Unamortized discounts and deferred financing costs	(28)	(41)
Total	1,727	2,465
Less: amount due within one year	1	2
Long-term debt, less amount due within one year	$ 1,726	$ 2,463

Ratings. Alcoa Corporation's cost of borrowing and ability to access the capital markets are affected not only by market conditions but also by the short- and long-term debt ratings assigned to Alcoa Corporation's debt by the major credit rating agencies.

On December 9, 2021, Fitch Ratings (Fitch) upgraded its rating for Alcoa Corporation's long-term debt to BBB- from BB+. Additionally, Fitch affirmed the current outlook as stable.

On December 17, 2021, Standard and Poor's Global Ratings (S&P) affirmed the BB+ rating of Alcoa's long-term debt and revised the outlook to positive.

Dividend. On October 14, 2021, the Company announced the initiation of a quarterly cash dividend on its common stock. The Board of Directors declared the first quarterly cash dividend of $0.10 per share of the Company's common stock, paid on November 19, 2021 to stockholders of record as of the close of business on October 29, 2021. The details of any future cash dividend declaration, including the amount of such dividend and the timing and establishment of the record and payment dates, will be determined by the Board of Directors. The decision of whether to pay future cash dividends and the amount of any such dividends will be based on the Company's financial position, results of operations, cash flows, capital requirements, business conditions, the requirements of applicable law, and any other factors the Board of Directors may deem relevant.

Common Stock Repurchase Program. On October 17, 2018, Alcoa Corporation's Board of Directors approved a common stock repurchase program under which the Company may purchase shares of its outstanding common stock up to an aggregate transactional value of $200, depending on cash availability, market conditions, and other factors. On October 14, 2021, Alcoa Corporation's Board of Directors approved a new common stock repurchase program under which the Company may purchase shares of its outstanding common stock up to an aggregate transactional value of $500, depending on cash availability, market conditions, and other factors.

Repurchases under these programs may be made using a variety of methods, which may include open market purchases, privately negotiated transactions, or pursuant to a Rule 10b5-1 plan. These programs do not have predetermined expiration dates. Alcoa Corporation intends to retire repurchased shares of common stock.

In the fourth quarter of 2021, the Company repurchased 3,184,300 shares of its common stock for $150; the shares were immediately retired. These purchases exhausted the remaining dollar value of shares that were available for repurchase under the Board of Directors' October 17, 2018 authorization. The Company has remaining authorization to repurchase up to a total of $500, in the aggregate, of its outstanding shares of common stock, under the new share repurchase program approved in 2021.

Investing Activities

Cash provided from investing activities was $565 in 2021 compared with cash used for investing activities of $167 in 2020.

In 2021, the source of cash was primarily attributable to proceeds from the sale of assets of $966, primarily the Warrick Rolling Mill, Rockdale, and Eastalco site sales, partially offset by $390 in capital expenditures, composed of $356 in sustaining projects and $34 in return-seeking projects. In 2020, the use of cash was primarily attributable to capital expenditures of $353, composed of $318 in sustaining projects and $35 in return-seeking projects, partially offset by proceeds from the sale of assets of $198, primarily from the Gum Springs waste treatment facility.

In 2022, Alcoa expects capital expenditures to be approximately $450 related to sustaining capital projects and approximately $75 related to growth projects. The timing and amount of capital expenditures may fluctuate as a result of the Company's normal operations.

Material Cash Commitments

As discussed above, the Company relies primarily on operating cash flows to fund its cash commitments and management believes its operating cash flows, cash on hand, and liquidity options will be adequate to fund its cash needs. As of December 31, 2021, a summary of Alcoa Corporation's outstanding material cash commitments is as follows:

	Total	2022	2023-2024	2025-2026	Thereafter
Operating activities:					
Energy-related purchase obligations	$ 14,470	$ 1,946	$ 2,508	$ 2,278	$ 7,738
Raw material purchase obligations	7,143	1,653	793	931	3,766
Other purchase obligations	896	287	259	152	198
Interest related to total debt	602	93	185	185	139
Other postretirement benefit payments	480	60	110	100	210
Estimated minimum required pension funding	310	80	115	115	—
Operating leases	117	41	42	17	17
Layoff and other restructuring payments	93	50	43	—	—
Deferred revenue arrangements	44	8	16	16	4
Uncertain tax positions	6	—	—	—	6
Financing activities:					
Long-term debt and Short-term borrowings	1,830	76	2	1	1,751
Investing activities:					
Equity contributions	53	53	—	—	—
Totals	$ 26,044	$ 4,347	$ 4,073	$ 3,795	$ 13,829

Purchase obligations—Energy-related purchase obligations consist primarily of electricity and natural gas contracts with expiration dates ranging from 1 year to 26 years. Raw material obligations consist mostly of bauxite (relates to AWAC's bauxite mine interests in Guinea and Brazil), caustic soda, alumina, aluminum fluoride, calcined petroleum coke, and cathode blocks with expiration dates ranging from less than 1 year to 14 years. Other purchase obligations consist principally of freight for bauxite and alumina with expiration dates ranging from 1 to 11 years. Many of these purchase obligations contain variable pricing components, and, as a result, actual cash payments may differ from the estimates provided in the preceding table. In accordance with the terms of several of these supply contracts, obligations may be reduced as a result of an interruption to operations, such as a plant curtailment or a force majeure event.

Interest related to total debt—Interest is based on interest rates in effect as of December 31, 2021 and is calculated on debt with maturities that extend to 2029.

Pension and Other postretirement benefits—Estimated minimum required pension funding and other postretirement benefit payments are based on actuarial estimates using current assumptions for, among others, discount rates, long-term rate of return on plan assets, rate of compensation increases, and/or health care cost trend rates. Actual payments may differ based on changes in assumptions. Alcoa Corporation has determined that it is not practicable to present pension funding and other postretirement benefit payments beyond 2026 and 2031, respectively.

On April 1, 2021, the Company used the net proceeds from the issuance of the notes being offered, together with cash on hand, to contribute $500 to its U.S. defined benefit pension plans applicable to salaried and hourly employees.

The Company also adopted the relief provisions allowable under the law related to single-employer pensions enacted under the American Rescue Plan, which was signed into law on March 11, 2021. As a result of the American Rescue Plan and the $500 unscheduled contribution, Alcoa's minimum required contribution to defined benefit pension plans were significantly reduced.

The $500 U.S. pension contribution in April was added to the Company's pre-funding balance, the current balance of which is more than sufficient to cover the U.S. portion of the minimum obligations presented above. Under ERISA regulations, a plan sponsor that establishes a pre-funding balance by making discretionary contributions to a U.S. defined benefit pension plan may elect to apply all or a portion of this balance toward its minimum required contribution obligations to the related plan in future years. Management made such election related to the Company's U.S. plans for 2021 and intends to make similar elections for 2022 and future years. The contractual obligations above include the estimated minimum required pension funding for which those elections are expected to be made: 2022 $65; 2023-2024 $100; and, 2025-2026 $105.

Layoff and other restructuring—Layoff and other restructuring payments expected to be paid within one year primarily relate to employee and take-or-pay contractual obligations related to the curtailed San Ciprián smelter, take-or-pay contractual obligations, and severance related to closed and curtailed aluminum facilities in Washington. Layoff and other restructuring payments expected to be paid beyond one year primarily relate to employee and take-or-pay contractual obligations related to the curtailed San Ciprián smelter.

Deferred revenue arrangements—Deferred revenue arrangements require Alcoa Corporation to deliver alumina to a certain customer over the specified contract period (through 2027). While this obligation is not expected to result in cash payments, it is included in the preceding table as the Company would have such an obligation if the specified product deliveries could not be made.

Uncertain tax positions—Uncertain tax positions taken or expected to be taken on an income tax return may result in additional payments to tax authorities. The amount in the preceding table includes interest and penalties accrued related to such positions as of December 31, 2021. The total amount of uncertain tax positions is included in the Thereafter column as the Company is not able to reasonably estimate the timing of potential future payments. If a tax authority agrees with the tax position taken or expected to be taken or the applicable statute of limitations expires, then additional payments will not be necessary.

Long-term debt and Short-term borrowings—Total debt amounts in the preceding table represent the principal amounts of all outstanding long-term debt, which have maturities that extend to 2029.

Returns to stockholders—Alcoa Corporation's Board of Directors authorized common stock repurchase programs under which the Company may purchase shares of its outstanding common stock up to an aggregate transactional value of $700, depending on various factors. As of December 31, 2021, there is remaining authorization to repurchase up to a total of $500, in the aggregate, of its outstanding shares of common stock. The program does not have a predetermined expiration date. Accordingly, amounts have not been included in the preceding table. See Liquidity and Capital section for more information.

Equity-method investments—Equity contributions are related to the joint venture, ELYSIS™ Limited Partnership (ELYSIS™). The Company contributed $23 (C$30) toward its investment commitment in ELYSIS™ through December 31, 2021 and expects to contribute $53 (C$67) in 2022. See Part II Item 8 of this Form 10-K in Note H to the Consolidated Financial Statements for additional information.

Critical Accounting Policies and Estimates

The preparation of the Company's Consolidated Financial Statements in accordance with GAAP requires management to make certain estimates based on judgments and assumptions regarding uncertainties that affect the amounts reported in the Consolidated Financial Statements and disclosed in the Notes to the Consolidated Financial Statements. Areas that require such estimates include the review of properties, plants, and equipment and goodwill for impairment, and accounting for each of the following: asset retirement and environmental obligations; litigation matters; pension plans and other postretirement benefits obligations; derivatives and hedging activities; and income taxes.

Management uses historical experience and all available information to make these estimates; actual results may differ from those used to prepare the Company's Consolidated Financial Statements at any given time. Despite these inherent limitations, management believes that the amounts recorded in the financial statements related to these items are based on its best estimates and judgments using all relevant information available at the time.

A summary of the Company's significant accounting policies is included in Part II Item 8 of this Form 10-K in Note B to the Consolidated Financial Statements.

Properties, Plants, and Equipment. Properties, plants, and equipment are reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount of such assets (asset group) may not be recoverable, including in the period when assets have met the criteria to be classified as held for sale. The model used to determine recoverability of an asset or asset group would leverage the model that management uses for planning and strategic review of the entire business, including related inputs and assumptions. Management's impairment assessment process is described in Part II Item 8 of this Form 10-K in Note B to the Consolidated Financial Statements. Refer to Part II Item 8 of this Form 10-K in Note K to the Consolidated Financial Statements for more information regarding properties, plants, and equipment.

Goodwill. Goodwill is reviewed for impairment annually (in the fourth quarter) or more frequently if indicators of impairment exist or if a decision is made to sell or exit a business. A significant amount of judgment is involved in determining if an indicator of impairment has occurred. Such indicators may include, among others, deterioration in general economic conditions, negative developments in equity and credit markets, adverse changes in the markets in which an entity operates, increases in input costs that have a negative effect on earnings and cash flows, or a trend of negative or declining cash flows over multiple periods. The fair value that could be realized in an actual transaction may differ from that used to evaluate goodwill for impairment.

Under the qualitative impairment test, management considers a number of factors in its assessment, such as: general economic conditions, equity and credit markets, industry and market conditions, and earnings and cash flow trends.

Under the quantitative impairment test, management uses a discounted cash flow (DCF) model to estimate the current fair value of its reporting units. A number of significant assumptions and estimates are involved in the application of the DCF model to forecast operating cash flows, including markets and market share, sales volumes and prices, production costs, production capability, tax rates, capital spending, discount rate, and working capital changes. The model used for the goodwill impairment test leverages the model, including related inputs and assumptions, that management uses for planning and strategic review of the entire business.

Management will test goodwill on a qualitative or quantitative basis. Refer to Part II Item 8 of this Form 10-K in Note B to the Consolidated Financial Statements for more information regarding management's impairment assessment process.

Management performed a quantitative assessment for the Bauxite reporting unit in 2021. As a result of the assessment, the estimated fair value of the Bauxite reporting unit was substantially in excess of its carrying value, resulting in no impairment. The impact on the estimated fair value of an increase in the discount rate of 1% would not result in a change in the conclusions reached, the estimated fair value would remain substantially in excess of carrying value.

Additionally, management performed a qualitative assessment for the Alumina reporting unit in 2021 and determined that it was not more likely than not that the fair value of the reporting unit was less than its carrying value. Management last performed a quantitative impairment test for the Alumina reporting unit in 2019. At the time of the quantitative assessment, the estimated fair value of the Alumina reporting unit was substantially in excess of its carrying value, resulting in no impairment.

Further, in all years presented, there have been no triggering events that necessitated an impairment test for either the Bauxite or Alumina reporting units. Refer to Part II Item 8 of this Form 10-K in Note L to the Consolidated Financial Statements for more information regarding goodwill.

Asset Retirement and Environmental Obligations. Estimates are used to record environmental remediation and asset retirement obligation (ARO) reserves based on the best available information at the time of recognition. Several assumptions are used to estimate the costs required to demolish, environmentally remediate, or reclaim the site, including:

- Engineering estimates and benchmarks to other similar projects;
- Mining area to be reclaimed and estimated restoration costs;
- Volume of regulated materials to be removed (asbestos, PCB fluids, spent potlining);
- Disposition of materials;
- Extent of contamination based on available data;
- Scope of remediation to mitigate human health or environmental risks and/or to meet likely regulatory requirements; and,
- Commercial availability and pricing for off-site treatment or disposal applications.

As the site is demolished, remediated, or reclaimed, the assumptions and estimates used to record the reserve may change to account for:

- Actual site conditions that require more or less remediation or reclamation;
- Legislation that becomes more or less stringent;
- Regulative authorities requiring updates to final design prior to completion;
- Alternative disposal methods for waste;
- Technological changes which allow remediation to be more efficient;
- Market factors; and,
- Variances in work that is atypical from prior work experience.

Changes to the estimates may result in material changes to the reserve that may require an increase to or a reversal of a previously recorded reserve. Historically, the Company has not had material changes in established reserves. Refer to Part II Item 8 of this Form 10-K in Note R and Note S to the Consolidated Financial Statements for more information regarding current reserves.

Litigation Matters. For asserted claims and assessments, liabilities are recorded when an unfavorable outcome of a matter is deemed to be probable and the loss is reasonably estimable. Management determines the likelihood of an unfavorable outcome based on many factors such as, among others, the nature of the matter, available defenses and case strategy, progress of the matter, views and opinions of legal counsel and other advisors, applicability and success of appeals processes, and the outcome of similar historical matters. Once an unfavorable outcome is deemed probable, management weighs the probability of estimated losses, and the most reasonable loss estimate is recorded. If an unfavorable outcome of a matter is deemed to be reasonably possible, then the matter is disclosed, and no liability is recorded. With respect to unasserted claims or assessments, management must first determine that the probability that an assertion will be made is likely, then, a determination as to the likelihood of an unfavorable outcome and the ability to reasonably estimate the potential loss is made. Legal matters are reviewed on a continuous basis to determine if there has been a change in management's judgment regarding the likelihood of an unfavorable outcome or the estimate of a potential loss. Refer to Part II Item 8 of this Form 10-K in Note B to the Consolidated Financial Statements for more information regarding management's litigation matters policy.

Pension and Other Postretirement Benefits. Liabilities and expenses for pension and other postretirement benefits are determined using actuarial methodologies and incorporate significant assumptions, including the interest rate used to discount the future estimated liability, the expected long-term rate of return on plan assets, and several assumptions relating to the employee workforce (salary increases, health care cost trend rates, retirement age, and mortality).

The yield curve model used to develop the discount rate parallels the plans' projected cash flows and has a weighted average duration of 12 years. The underlying cash flows of the high-quality corporate bonds included in the model exceed the cash flows needed to satisfy the Company's plan obligations multiple times. If a deep market of high-quality corporate bonds does not exist in a country, then the yield on government bonds plus a corporate bond yield spread is used. The impact on the combined pension and other postretirement liabilities of a change in the weighted average discount rate of ¼ of 1% would be approximately $147 and either a charge or credit of approximately $1 to pretax earnings in the following year.

The expected long-term rate of return on plan assets is generally applied to a five-year market-related value of plan assets (a four-year average or the fair value at the plan measurement date is used for certain non-U.S. plans). The process used by management to develop this assumption is one that relies on forward-looking investment returns by asset class. Management incorporates expected future investment returns on current and planned asset allocations using information from various external investment managers and consultants, as well as management's own judgment. A change in the assumption for the weighted average expected long-term rate of return on plan assets of ¼ of 1% would impact pretax earnings by approximately $9 for 2022.

Mortality rate assumptions are based on mortality tables and future improvement scales published by third parties, such as the Society of Actuaries, and consider other available information including historical data as well as studies and publications from reputable sources.

Refer to Part II Item 8 of this Form 10-K in Note O to the Consolidated Financial Statements for more information regarding pension and other postretirement benefits including accounting impacts of current year actions.

Derivatives and Hedging. To calculate the fair value of certain derivatives, management uses discounted cash flow (DCF) and other simulation models that consider the following inputs and assumptions: quoted market prices (e.g., aluminum prices on the 10-year London Metal Exchange (LME) forward curve and energy prices), information concerning time premiums and volatilities for certain option type embedded derivatives and regional premiums for aluminum contracts, aluminum and energy prices beyond those quoted in the market, and the estimated credit spread between Alcoa and the counterparty. The quoted market prices used in the valuation models are dependent on market fundamentals, the relationship between supply and demand at any point in time, seasonal conditions, inventories, and interest rates. For periods beyond the term of quoted market prices, management estimates the price of aluminum by extrapolating the 10-year LME forward curve and estimates the Midwest premium based on recent transactions.

Changes in estimates can have a material impact on the derivative valuations. Refer to Part II Item 8 of this Form 10-K in Note P to the Consolidated Financial Statements for more information regarding derivatives and hedging and related activity during the period.

Income Taxes. Valuation allowances are recorded to reduce deferred tax assets when it is more likely than not (greater than 50%) that a tax benefit will not be realized. In evaluating the need for a valuation allowance, management applies judgment in assessing all available positive and negative evidence and considers all potential sources of taxable income, including income available in carryback periods, future reversals of taxable temporary differences, projections of taxable income, and income from tax planning strategies. Positive evidence includes factors such as a history of profitable operations, projections of future profitability within the carryforward period, including from tax planning strategies, and Alcoa Corporation's experience with similar operations. Existing favorable contracts and the ability to sell products into established markets are additional positive evidence. Negative evidence includes items such as cumulative losses, projections of future losses, or carryforward periods that are not long enough to allow for the utilization of a deferred tax asset based on existing projections of income. In certain jurisdictions, deferred tax assets related to cumulative losses exist without a valuation allowance where in management's judgment the weight of the positive evidence more than offsets the negative evidence of the cumulative losses. Upon changes in facts and circumstances, management may conclude that deferred tax assets for which no valuation allowance is currently recorded may not be realized, resulting in a future charge to establish a valuation allowance. Financial information utilized in this analysis leverages the same financial information, including related inputs and assumptions, that management uses for planning and strategic review of the entire business.

Tax benefits related to uncertain tax positions taken or expected to be taken on a tax return are recorded when such benefits meet a more likely than not threshold. Otherwise, these tax benefits are recorded when a tax position has been effectively settled, which means that the statute of limitations has expired, or the appropriate taxing authority has completed their examination even though the statute of limitations remains open.

Changes in estimates can have a material impact on the deferred taxes and uncertain tax positions. Refer to Part II Item 8 of this Form 10-K in Note Q to the Consolidated Financial Statements for more information regarding income taxes and deferred tax assets and related activity during the period.

Related Party Transactions

Alcoa Corporation buys products from and sells products to various related companies, consisting of entities in which Alcoa Corporation retains a 50% or less equity interest, at negotiated prices between the two parties. These transactions were not material to the financial position or results of operations of Alcoa Corporation for all periods presented.

Recently Adopted Accounting Guidance

See Part II Item 8 of this Form 10-K in Note B to the Consolidated Financial Statements under caption Recently Adopted Accounting Guidance.

Recently Issued Accounting Guidance

See Part II Item 8 of this Form 10-K in Note B to the Consolidated Financial Statements under caption Recently Issued Accounting Guidance.

Item 7A. Quantitative and Qualitative Disclosures About Market Risk.

See Part II Item 8 of this Form 10-K in Note P to the Consolidated Financial Statements under caption Derivatives.

Item 8. Financial Statements and Supplementary Data.

Management's Reports to Alcoa Corporation Stockholders

Management's Report on Financial Statements and Practices

The accompanying Consolidated Financial Statements of Alcoa Corporation and its subsidiaries (the Company) were prepared by management, which is responsible for their integrity and objectivity, in accordance with accounting principles generally accepted in the United States of America (GAAP) and include amounts that are based on management's best judgments and estimates. The other financial information included in the Company's Annual Report on Form 10-K for the year ended December 31, 2021 is consistent with that in the Consolidated Financial Statements.

Management recognizes its responsibility for conducting the Company's affairs according to the highest standards of personal and corporate conduct. This responsibility is characterized and reflected in key policy statements issued from time to time regarding, among other things, conduct of its business activities within the laws of the host countries in which the Company operates and potentially conflicting outside business interests of its employees. The Company maintains a systematic program to assess compliance with these policies.

Management's Report on Internal Control over Financial Reporting

Management is responsible for establishing and maintaining adequate internal control over financial reporting, as defined in Rules 13a-15(f) and 15d-15(f) of the U.S. Securities Exchange Act of 1934 (as amended), for the Company. The Company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with GAAP. The Company's internal control over financial reporting includes those policies and procedures that (i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the Company, (ii) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with GAAP, and that receipts and expenditures of the Company are being made only in accordance with authorizations of management and directors of the Company, and (iii) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the Company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

Management conducted an assessment to evaluate the effectiveness of the Company's internal control over financial reporting as of December 31, 2021 using the criteria in *Internal Control—Integrated Framework* (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission. Based on this assessment, management concluded that the Company maintained effective internal control over financial reporting as of December 31, 2021.

PricewaterhouseCoopers LLP, the independent registered public accounting firm that audited the Company's financial statements included in this Annual Report on Form 10-K for the year ended December 31, 2021, has audited the Company's internal control over financial reporting as of December 31, 2021 and has issued an attestation report, which is included herein.

/s/ Roy C. Harvey
Roy C. Harvey
President and
Chief Executive Officer

/s/ William F. Oplinger
William F. Oplinger
Executive Vice President and
Chief Financial Officer

February 24, 2022

Report of Independent Registered Public Accounting Firm

To the Shareholders and Board of Directors of Alcoa Corporation

Opinions on the Financial Statements and Internal Control over Financial Reporting

We have audited the accompanying consolidated balance sheet of Alcoa Corporation and its subsidiaries (the "Company") as of December 31, 2021 and 2020, and the related consolidated statements of operations, comprehensive income, changes in consolidated equity and cash flows for each of the three years in the period ended December 31, 2021, including the related notes (collectively referred to as the "consolidated financial statements"). We also have audited the Company's internal control over financial reporting as of December 31, 2021, based on criteria established in *Internal Control—Integrated Framework* (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of the Company as of December 31, 2021 and 2020, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2021 in conformity with accounting principles generally accepted in the United States of America. Also in our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2021, based on criteria established in *Internal Control—Integrated Framework* (2013) issued by the COSO.

Basis for Opinions

The Company's management is responsible for these consolidated financial statements, for maintaining effective internal control over financial reporting, and for its assessment of the effectiveness of internal control over financial reporting, included in the accompanying Management's Report on Internal Control over Financial Reporting. Our responsibility is to express opinions on the Company's consolidated financial statements and on the Company's internal control over financial reporting based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audits to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud, and whether effective internal control over financial reporting was maintained in all material respects.

Our audits of the consolidated financial statements included performing procedures to assess the risks of material misstatement of the consolidated financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the consolidated financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements. Our audit of internal control over financial reporting included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of internal control based on the assessed risk. Our audits also included performing such other procedures as we considered necessary in the circumstances. We believe that our audits provide a reasonable basis for our opinions.

Definition and Limitations of Internal Control over Financial Reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (ii) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (iii) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

Critical Audit Matters

The critical audit matter communicated below is a matter arising from the current period audit of the consolidated financial statements that was communicated or required to be communicated to the audit committee and that (i) relates to accounts or disclosures that are material to the consolidated financial statements and (ii) involved our especially challenging, subjective, or complex judgments. The communication of critical audit matters does not alter in any way our opinion on the consolidated financial statements, taken as a whole,

and we are not, by communicating the critical audit matter below, providing a separate opinion on the critical audit matter or on the accounts or disclosures to which it relates.

U.S. Pension Annuitizations

As described in Notes B and O to the consolidated financial statements, the Company had a projected benefit obligation related to its defined pension plans of $4,594 million as of December 31, 2021, including $2,712 million of benefit obligations in the U.S. In the fourth quarter of 2021, the Company purchased group annuity contracts to transfer the obligation to pay remaining retirement benefits of certain retirees and beneficiaries from its U.S. defined benefit pension plans and transferred approximately $1,540 million in both benefit obligations and plan assets. As a result, the Company remeasured its U.S. defined benefit pension plans and recorded an $848 million settlement charge. As disclosed by management, the remeasurement of its U.S. defined benefit pension plans was performed using actuarial methodologies and incorporated significant assumptions, including the discount rate, expected long-term rate of return on plan assets, and several assumptions relating to the employee workforce (salary increases, retirement age, and mortality rate).

The principal considerations for our determination that performing procedures relating to the U.S. pension annuitizations is a critical audit matter are (i) the significant judgment by management in determining the valuation of the U.S. pension annuitizations, as well as their consideration of the accounting for the non-recurring nature of the U.S. pension annuitizations; (ii) a high degree of auditor judgment, subjectivity, and effort in performing procedures and evaluating audit evidence relating to the accounting for the U.S. pension annuitizations, participants transferred, and significant assumptions related to the discount rate, expected long-term rate of return on plan assets, and mortality rate used in determining the valuation of the U.S. pension annuitizations; and (iii) the audit effort involved the use of professionals with specialized skill and knowledge.

Addressing the matter involved performing procedures and evaluating audit evidence in connection with forming our overall opinion on the consolidated financial statements. These procedures included testing the effectiveness of controls relating to management's accounting for and valuation of the U.S. pension annuitizations, including controls over management's methodology and significant assumptions. These procedures also included, among others, (i) testing management's process for determining the valuation of the U.S. pension annuitizations; (ii) testing the participants transferred, the settlement charge recorded, and the completeness and accuracy of the underlying data used in the valuation of the U.S. pension annuitizations; and (iii) the involvement of professionals with specialized skill and knowledge to assist in (a) evaluating the appropriateness of the actuarial methodology used by management; and (b) evaluating the reasonableness of the discount rate, expected long-term rate of return on plan assets, and mortality rate assumptions.

/s/ PricewaterhouseCoopers LLP

PricewaterhouseCoopers LLP
Pittsburgh, Pennsylvania, United States
February 24, 2022

We have served as the Company's auditor since 2015.

Alcoa Corporation and Subsidiaries
Statement of Consolidated Operations
(in millions, except per-share amounts)

For the year ended December 31,	2021	2020	2019
Sales (E)	$ 12,152	$ 9,286	$ 10,433
Cost of goods sold (exclusive of expenses below)	9,153	7,969	8,537
Selling, general administrative, and other expenses	227	206	280
Research and development expenses	31	27	27
Provision for depreciation, depletion, and amortization	664	653	713
Restructuring and other charges, net (D)	1,128	104	1,031
Interest expense (U)	195	146	121
Other (income) expenses, net (U)	(445)	8	162
Total costs and expenses	10,953	9,113	10,871
Income (loss) before income taxes	1,199	173	(438)
Provision for income taxes (Q)	629	187	415
Net income (loss)	570	(14)	(853)
Less: Net income attributable to noncontrolling interest	141	156	272
Net income (loss) attributable to Alcoa Corporation	429	(170)	(1,125)
Earnings per share attributable to Alcoa Corporation common shareholders (F):			
Basic	$ 2.30	$ (0.91)	$ (6.07)
Diluted	$ 2.26	$ (0.91)	$ (6.07)

The accompanying notes are an integral part of the consolidated financial statements.

Alcoa Corporation and Subsidiaries
Statement of Consolidated Comprehensive Income
(in millions)

	Alcoa Corporation			Noncontrolling interest			Total		
For the year ended December 31,	**2021**	**2020**	**2019**	**2021**	**2020**	**2019**	**2021**	**2020**	**2019**
Net income (loss)	$ 429	$ (170)	$ (1,125)	$ 141	$ 156	$ 272	$ 570	$ (14)	$ (853)
Other comprehensive income (loss), net of tax (G):									
Change in unrecognized net actuarial loss and prior service cost/benefit related to pension and other postretirement benefits	1,654	(254)	1	54	(11)	(10)	1,708	(265)	(9)
Foreign currency translation adjustments	(229)	(225)	(89)	(93)	(10)	(24)	(322)	(235)	(113)
Net change in unrecognized gains/losses on cash flow hedges	(388)	(176)	(321)	—	(21)	(11)	(388)	(197)	(332)
Total Other comprehensive income (loss), net of tax	1,037	(655)	(409)	(39)	(42)	(45)	998	(697)	(454)
Comprehensive income (loss)	$ 1,466	$ (825)	$ (1,534)	$ 102	$ 114	$ 227	$ 1,568	$ (711)	$ (1,307)

The accompanying notes are an integral part of the consolidated financial statements.

Alcoa Corporation and Subsidiaries
Consolidated Balance Sheet
(in millions)

December 31,	2021	2020
Assets		
Current assets:		
Cash and cash equivalents (P)	$ 1,814	$ 1,607
Receivables from customers	757	471
Other receivables	127	85
Inventories (J)	1,956	1,398
Fair value of derivative instruments (P)	14	21
Assets held for sale (C)	—	648
Prepaid expenses and other current assets	358	290
Total current assets	5,026	4,520
Properties, plants, and equipment, net (K)	6,623	7,190
Investments (H)	1,199	1,051
Deferred income taxes (Q)	506	655
Fair value of derivative instruments (P)	7	—
Other noncurrent assets (U)	1,664	1,444
Total Assets	$ 15,025	$ 14,860
Liabilities		
Current liabilities:		
Accounts payable, trade	$ 1,674	$ 1,403
Accrued compensation and retirement costs	383	395
Taxes, including income taxes	374	91
Fair value of derivative instruments (P)	274	103
Liabilities held for sale (C)	—	242
Other current liabilities	517	525
Long-term debt due within one year (M & P)	1	2
Total current liabilities	3,223	2,761
Long-term debt, less amount due within one year (M & P)	1,726	2,463
Accrued pension benefits (O)	417	1,492
Accrued other postretirement benefits (O)	650	744
Asset retirement obligations (R)	622	625
Environmental remediation (S)	265	293
Fair value of derivative instruments (P)	1,048	742
Noncurrent income taxes (Q)	191	209
Other noncurrent liabilities and deferred credits (U)	599	515
Total liabilities	8,741	9,844
Contingencies and commitments (S)		
Equity		
Alcoa Corporation shareholders' equity:		
Common stock (N)	2	2
Additional capital	9,577	9,663
Accumulated deficit	(315)	(725)
Accumulated other comprehensive loss (G)	(4,592)	(5,629)
Total Alcoa Corporation shareholders' equity	4,672	3,311
Noncontrolling interest (A)	1,612	1,705
Total equity	6,284	5,016
Total Liabilities and Equity	$ 15,025	$ 14,860

The accompanying notes are an integral part of the consolidated financial statements.

Alcoa Corporation and Subsidiaries
Statement of Consolidated Cash Flows
(in millions)

For the year ended December 31,	2021	2020	2019
Cash from Operations			
Net income (loss)	$ 570	$ (14)	$ (853)
Adjustments to reconcile net income (loss) to cash from operations:			
Depreciation, depletion, and amortization	664	653	713
Deferred income taxes (Q)	147	(26)	15
Equity earnings, net of dividends (H)	(138)	20	21
Restructuring and other charges, net (D)	1,128	104	1,031
Net gain from investing activities—asset sales (U)	(354)	(173)	(3)
Net periodic pension benefit cost (O)	47	138	119
Stock-based compensation (N)	39	25	30
Provision for bad debt expense	1	2	21
Premium paid on early redemption of debt	43	—	—
Other	24	32	30
Changes in assets and liabilities, excluding effects of divestitures and foreign currency translation adjustments:			
(Increase) decrease in receivables	(414)	16	283
(Increase) decrease in inventories (J)	(639)	122	137
(Increase) decrease in prepaid expenses and other current assets	(41)	17	27
Increase (decrease) in accounts payable, trade	354	25	(153)
(Decrease) in accrued expenses	(38)	(153)	(175)
Increase (decrease) in taxes, including income taxes	301	119	(330)
Pension contributions (O)	(579)	(343)	(173)
(Increase) in noncurrent assets	(160)	(82)	(24)
(Decrease) in noncurrent liabilities	(35)	(88)	(30)
Cash provided from operations	920	394	686
Financing Activities			
Additions to debt (original maturities greater than three months) (M)	495	739	—
Payments on debt (original maturities greater than three months) (M)	(1,294)	(1)	(7)
Proceeds from the exercise of employee stock options (N)	25	1	2
Repurchase of common stock (N)	(150)	—	—
Dividends paid on Alcoa common stock (N)	(19)	—	—
Financial contributions for the divestiture of businesses (C)	(17)	(38)	(12)
Contributions from noncontrolling interest (A)	21	24	51
Distributions to noncontrolling interest	(215)	(207)	(472)
Other	(4)	(4)	(6)
Cash (used for) provided from financing activities	(1,158)	514	(444)
Investing Activities			
Capital expenditures	(390)	(353)	(379)
Proceeds from the sale of assets and businesses (C)	966	198	23
Additions to investments (H)	(11)	(12)	(112)
Cash provided from (used for) investing activities	565	(167)	(468)
Effect of exchange rate changes on cash and cash equivalents and restricted cash	(13)	(14)	(7)
Net change in cash and cash equivalents and restricted cash	314	727	(233)
Cash and cash equivalents and restricted cash at beginning of year	1,610	883	1,116
Cash and cash equivalents and restricted cash at end of year	$ 1,924	$ 1,610	$ 883

The accompanying notes are an integral part of the consolidated financial statements.

Alcoa Corporation and Subsidiaries
Statement of Changes in Consolidated Equity
(in millions)

	Alcoa Corporation shareholders					
	Common stock	Additional capital	Retained earnings (deficit)	Accumulated other compre-hensive loss	Noncontrolling interest	Total equity
Balance at December 31, 2018	$ 2	$ 9,611	$ 570	$ (4,565)	$ 1,970	$ 7,588
Net (loss) income	—	—	(1,125)	—	272	(853)
Other comprehensive loss (G)	—	—	—	(409)	(45)	(454)
Stock-based compensation (N)	—	30	—	—	—	30
Common stock issued: Compensation plans (N)	—	2	—	—	—	2
Contributions	—	—	—	—	51	51
Distributions	—	—	—	—	(472)	(472)
Other	—	(4)	—	—	(2)	(6)
Balance at December 31, 2019	2	9,639	(555)	(4,974)	1,774	5,886
Net (loss) income	—	—	(170)	—	156	(14)
Other comprehensive loss (G)	—	—	—	(655)	(42)	(697)
Stock-based compensation (N)	—	25	—	—	—	25
Common stock issued: Compensation plans (N)	—	1	—	—	—	1
Contributions	—	—	—	—	24	24
Distributions	—	—	—	—	(207)	(207)
Other	—	(2)	—	—	—	(2)
Balance at December 31, 2020	2	9,663	(725)	(5,629)	1,705	5,016
Net income	—	—	429	—	141	570
Other comprehensive loss (G)	—	—	—	1,037	(39)	998
Stock-based compensation (N)	—	39	—	—	—	39
Common stock issued: Compensation plans (N)	—	25	—	—	—	25
Repurchase of common stock (N)	—	(150)	—	—	—	(150)
Dividends paid on Alcoa common stock (N)	—	—	(19)	—	—	(19)
Contributions	—	—	—	—	21	21
Distributions	—	—		—	(215)	(215)
Other	—	—	—	—	(1)	(1)
Balance at December 31, 2021	$ 2	$ 9,577	$ (315)	$ (4,592)	$ 1,612	$ 6,284

The accompanying notes are an integral part of the consolidated financial statements.

A. Basis of Presentation

Alcoa Corporation (or the Company) is a vertically integrated aluminum company comprised of bauxite mining, alumina refining, aluminum production (smelting and casting), and energy generation. Through direct and indirect ownership, the Company has 28 operating locations in nine countries around the world, situated primarily in Australia, Brazil, Canada, Iceland, Norway, Spain, and the United States.

References in these Notes to "ParentCo" refer to Alcoa Inc., a Pennsylvania corporation, and its consolidated subsidiaries through October 31, 2016, at which time it was renamed Arconic Inc. (Arconic) and since has been subsequently renamed Howmet Aerospace Inc.

Separation Transaction. On November 1, 2016 (the Separation Date), ParentCo separated into two standalone, publicly-traded companies, Alcoa Corporation and ParentCo, effective at 12:01 a.m. Eastern Time (the Separation Transaction). Regular-way trading of Alcoa Corporation's common stock began with the opening of the New York Stock Exchange on November 1, 2016 under the ticker symbol "AA." The Company's common stock has a par value of $0.01 per share.

In connection with the Separation Transaction, Alcoa Corporation and ParentCo entered into certain agreements to implement the legal and structural separation between the two companies, govern the relationship between the Company and ParentCo after the completion of the Separation Transaction, and allocate between Alcoa Corporation and ParentCo various assets, liabilities, and obligations.

Basis of Presentation. The Consolidated Financial Statements of Alcoa Corporation are prepared in conformity with accounting principles generally accepted in the United States of America (GAAP). In accordance with GAAP, certain situations require management to make estimates based on judgments and assumptions, which may affect the reported amounts of assets and liabilities and the disclosure of contingent assets and liabilities at the date of the financial statements. They also may affect the reported amounts of revenues and expenses during the reporting periods. Management uses historical experience and all available information to make these estimates. Management regularly evaluates the judgments and assumptions used in its estimates, and results could differ from those estimates upon future events and their effects or new information.

Principles of Consolidation. The Consolidated Financial Statements of the Company include the accounts of Alcoa Corporation and companies in which Alcoa Corporation has a controlling interest, including those that comprise the Alcoa World Alumina & Chemicals (AWAC) joint venture (see below). Intercompany transactions have been eliminated. The equity method of accounting is used for investments in affiliates and other joint ventures over which the Company has significant influence but does not have effective control. Investments in affiliates in which Alcoa Corporation cannot exercise significant influence are accounted for using the cost method.

AWAC is an unincorporated global joint venture between Alcoa Corporation and Alumina Limited and consists of several affiliated operating entities, which own, have an interest in, or operate the bauxite mines and alumina refineries within the Company's Bauxite and Alumina segments (except for the Poços de Caldas mine and refinery, portions of the São Luís refinery and investment in Mineração Rio do Norte S.A., all in Brazil) and a portion (55%) of the Portland smelter (Australia) within the Company's Aluminum segment. Alcoa Corporation owns 60% and Alumina Limited owns 40% of these individual entities, which are consolidated by the Company for financial reporting purposes and include Alcoa of Australia Limited (AofA), Alcoa World Alumina LLC (AWA), Alcoa World Alumina Brasil Ltda. (AWAB), and Alúmina Española, S.A. (Española). Alumina Limited's interest in the equity of such entities is reflected as Noncontrolling interest on the accompanying Consolidated Balance Sheet.

Management evaluates whether an Alcoa Corporation entity or interest is a variable interest entity and whether the Company is the primary beneficiary. Consolidation is required if both of these criteria are met. Alcoa Corporation does not have any variable interest entities requiring consolidation.

Related Party Transactions. Alcoa Corporation buys products from and sells products to various related companies, consisting of entities in which the Company retains a 50% or less equity interest, at negotiated prices between the two parties. These transactions were not material to the financial position or results of operations of Alcoa Corporation for all periods presented.

B. Summary of Significant Accounting Policies

Cash Equivalents. Cash equivalents are highly liquid investments purchased with an original maturity of three months or less.

Restricted Cash. Restricted cash is included with Cash and cash equivalents when reconciling the Cash and cash equivalents and restricted cash at beginning of year and Cash and cash equivalents and restricted cash at end of year on the accompanying Statement of Consolidated Cash Flows (see Note U for a reconciliation Cash and cash equivalents and restricted cash).

Inventory Valuation. Inventories are carried at the lower of cost or net realizable value, with the cost of inventories principally determined under the average cost method.

Properties, Plants, and Equipment. Properties, plants, and equipment are recorded at cost. Interest related to the construction of qualifying assets is capitalized as part of the construction costs. Depreciation is recorded principally on the straight-line method over the estimated useful lives of the assets. Depreciation is recorded on temporarily idled facilities until such time management approves a permanent closure. The following table details the weighted average useful lives of structures and machinery and equipment by type of operation (numbers in years):

	Structures	Machinery and equipment
Bauxite mining	33	17
Alumina refining	28	29
Aluminum smelting and casting	37	23
Energy generation	33	24

Repairs and maintenance are charged to expense as incurred while costs for significant improvements that add productive capacity or that extend the useful life are capitalized. Gains or losses from the sale of assets are generally recorded in Other (income) expenses, net.

Properties, plants, and equipment are reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount of such assets (asset group) may not be recoverable. Recoverability of assets is determined by comparing the estimated undiscounted net cash flows of the operations related to the assets (asset group) to their carrying amount. An impairment loss would be recognized when the carrying amount of the assets (asset group) exceeds the fair value. The amount of the impairment loss to be recorded is calculated as the excess of the carrying value of the assets (asset group) over their fair value, with fair value determined using the best information available, which generally is a discounted cash flow (DCF) model. The determination of what constitutes an asset group, the associated estimated undiscounted net cash flows, and the estimated useful lives of assets also require significant judgments.

Assets held for sale. Upon determining that a long-lived asset or disposal group meets the criteria to be classified as held for sale, the Company ceases depreciation and reports long-lived assets and/or the assets and liabilities of the disposal group, if material, in the line items Assets held for sale and Liabilities held for sale, respectively, in the Consolidated Balance Sheet. Current or noncurrent classification is determined based on the planned use of the proceeds and timing of transaction. The Company will measure a long-lived asset or disposal group that is classified as held for sale at the lower of its carrying value or fair value less any costs to sell. Any loss resulting from this measurement is recognized in the period in which the fair value less any costs to sell is less than the carrying value of a long-lived asset or disposal group. Conversely, gains are not recognized on the sale of a long-lived asset or disposal group until the date of sale (see Note C).

Leases. The Company determines whether an arrangement is a lease at the inception of the arrangement based on the terms and conditions in the contract. A contract contains a lease if there is an identified asset which the Company has the right to control. Both operating and financing lease right-of-use (ROU) assets are included in Properties, plants, and equipment with the corresponding operating lease liabilities included within Other current liabilities and Other noncurrent liabilities and deferred credits, while financing lease liabilities are included in Long-term debt due within one year and Long-term debt, less amount due within one year on the Consolidated Balance Sheet.

Operating lease ROU assets and liabilities are recognized at the commencement date based on the present value of lease payments over the lease term. The Company uses its incremental borrowing rate at the commencement date in determining the present value of lease payments unless a rate is implicit in the lease. Lease terms include options to extend the lease when it is reasonably certain that those options will be exercised. Leases with an initial term of 12 months or less, including anticipated renewals, are not recorded on the balance sheet.

The Company made a policy election not to record any non-lease components of a lease agreement in the lease liability. Variable lease payments are not presented as part of the ROU asset or liability recorded at the inception of a contract. Lease expense for operating lease payments is recognized on a straight-line basis over the lease term. For finance leases, interest expense is recognized on the lease liability and the ROU asset is amortized over the lease term.

Equity Investments. Alcoa invests in a number of privately-held companies, primarily through joint ventures and consortia, which are accounted for using the equity method. The equity method is applied in situations where the Company has the ability to exercise

significant influence, but not control, over the investee. Management reviews equity investments for impairment whenever certain indicators are present suggesting that the carrying value of an investment is not recoverable.

Deferred Mining Costs. Alcoa recognizes deferred mining costs during the development stage of a mine life cycle. Such costs include the construction of access and haul roads, detailed drilling and geological analysis to further define the grade and quality of the known bauxite, and overburden removal costs. These costs relate to sections of the related mines where the Company is currently extracting bauxite or preparing for production in the near term. These sections are outlined and planned incrementally and generally are mined over periods ranging from one to five years, depending on mine specifics. The amount of geological drilling and testing necessary to determine the economic viability of the bauxite deposit being mined is such that the reserves are considered to be proven, and the mining costs are amortized based on this level of reserves. Deferred mining costs are included in Other noncurrent assets on the accompanying Consolidated Balance Sheet.

Goodwill and Other Intangible Assets. Goodwill is not amortized but is reviewed for impairment annually (in the fourth quarter) or more frequently if indicators of impairment exist or if a decision is made to sell or exit a business.

Goodwill is allocated among and evaluated for impairment at the reporting unit level, which is defined as an operating segment or one level below an operating segment. The Company has four reporting units, of which two are included in the Aluminum segment (smelting/casting and energy generation). The remaining two reporting units are the Bauxite and Alumina segments. Of these four reporting units, only Bauxite and Alumina contain goodwill (see Note L).

Goodwill is tested for impairment by assessing qualitative factors to determine whether it is more likely than not (greater than 50%) that the fair value of the reporting unit is less than its carrying amount or performing a quantitative assessment using a discounted cash flow model. If the qualitative assessment indicates a possible impairment, then a quantitative impairment test is performed to determine the fair value of the reporting unit using a discounted cash flow method. Otherwise, no further analysis is required.

Under the quantitative assessment, the evaluation of impairment involves comparing the current fair value of each reporting unit to its carrying value, including goodwill. In the event the estimated fair value of a reporting unit is less than the carrying value, an impairment loss equal to the excess of the reporting unit's carrying value over its fair value not to exceed the total amount of goodwill applicable to that reporting unit would be recognized.

Alcoa's policy for its annual review of goodwill is to perform the quantitative impairment test for each of its two reporting units that contain goodwill at least once during every three-year period.

Intangible assets with finite useful lives are amortized generally on a straight-line basis over the periods benefited. The following table details the weighted average useful lives of software and other intangible assets by type of operation (numbers in years):

	Software	Other intangible assets
Bauxite mining	3	—
Alumina refining	6	3
Aluminum smelting and casting	3	40
Energy generation	3	29

Asset Retirement Obligations. Alcoa recognizes asset retirement obligations (AROs) related to legal obligations associated with the standard operation of bauxite mines, alumina refineries, and aluminum smelters. These AROs consist primarily of costs associated with mine reclamation, closure of bauxite residue areas, spent pot lining and regulated waste materials disposal, and landfill closure. Additionally, costs are recorded as AROs upon management's decision to permanently close and demolish certain structures and for any significant lease restoration obligations. The fair values of these AROs are recorded on a discounted basis at the time the obligation is incurred and accreted over time for the change in present value; related accretion is recorded as a component of Cost of goods sold. Additionally, the Company capitalizes asset retirement costs by increasing the carrying amount of the related long-lived assets and depreciating these assets over their remaining useful life. Certain conditional asset retirement obligations related to alumina refineries, aluminum smelters, and energy generation facilities have not been recorded in the Consolidated Financial Statements due to uncertainties surrounding the ultimate settlement date. The fair value of these asset retirement obligations will be recorded when a reasonable estimate of the ultimate settlement date can be made. Subsequent adjustments to estimates of previously established AROs for current operations are capitalized by increasing the carrying amount of the related long-lived assets and depreciating these assets over their remaining useful life. Adjustments to estimates of AROs for closed locations are charged to Restructuring and other charges, net on the accompanying Statement of Consolidated Operations.

Environmental Matters. Environmental related expenditures for current operations are expensed as a component of Cost of goods sold or capitalized, as appropriate. Expenditures relating to existing conditions caused by past operations, generally for closed locations which will not contribute to future revenues, are charged to Restructuring and other charges, net. Liabilities are recorded when remediation costs are probable and can be reasonably estimated. In instances where the Company has ongoing monitoring and maintenance responsibilities, it is Alcoa's policy to maintain a reserve equal to five years of expected costs. The liability is

continuously reviewed and adjusted to reflect current remediation progress, rate and pricing changes, actual volumes of material requiring management, changes to the original assumptions regarding how the site was to be remediated, and other factors that may be relevant, including changes in technology or regulations. The estimates may also include costs related to other potentially responsible parties to the extent that Alcoa has reason to believe such parties will not fully pay their proportionate share.

Litigation Matters. For asserted claims and assessments, liabilities are recorded when an unfavorable outcome of a matter is deemed to be probable and the loss is reasonably estimable. With respect to unasserted claims or assessments, liabilities are recorded when the probability that an assertion will be made is likely, an unfavorable outcome of the matter is deemed to be probable, and the loss is reasonably estimable. Legal matters are reviewed on a continuous basis to determine if there has been a change in management's judgment regarding the likelihood of an unfavorable outcome or the estimate of a potential loss. Legal costs, which are primarily for general litigation, environmental compliance, tax disputes, and general corporate matters, are expensed as incurred.

Revenue Recognition. The Company recognizes revenue when it satisfies a performance obligation(s) in accordance with the provisions of a customer order or contract. This is achieved when control of the product has been transferred to the customer, which is generally determined when title, ownership, and risk of loss pass to the customer, all of which occurs upon shipment or delivery of the product. The shipping terms vary across all businesses and depend on the product, the country of origin, and the type of transportation. Accordingly, the sale of Alcoa's products to its customers represent single performance obligations for which revenue is recognized at a point in time. Revenue is based on the consideration the Company expects to receive in exchange for its products. Returns and other adjustments have not been material. Based on the foregoing, no significant judgment is required to determine when control of a product has been transferred to a customer.

The Company considers shipping and handling activities as costs to fulfill the promise to transfer the related products. As a result, customer payments of shipping and handling costs are recorded as a component of revenue. Taxes collected (e.g., sales, use, value-added, excise) from its customers related to the sale of its products are remitted to governmental authorities and excluded from revenue.

Cost of goods sold. The Company includes the following in Cost of goods sold: operating costs of our three segments, excluding depreciation, depletion, and amortization, but including all production related costs: raw materials consumed; purchases of metal for consumption or trade; conversion costs, such as labor, materials, and utilities; equity earnings of certain investments integral to the Company's supply chain; and plant administrative expenses. Also included in Cost of goods sold are: costs related to the Transformation function, which focuses on the management of expenses and obligations of previously closed operations; pension and other postretirement benefit service cost for employees maintaining closed locations; and other costs not included in the operating costs of the segments.

Selling, general administrative, and other expenses. The Company includes the costs of corporate-wide functional support in Selling, general administrative, and other expenses. Such costs include: executive; sales; marketing; strategy; operations administration; finance; information technology; legal; human resources; and government affairs and communications.

Stock-Based Compensation. Compensation expense for employee equity grants is recognized using the non-substantive vesting period approach, in which the expense is recognized ratably over the requisite service period based on the grant date fair value. The fair value of stock options is estimated on the date of grant using a lattice pricing model. The fair value of performance stock units containing a market condition is valued using a Monte Carlo valuation model. Determining the fair value at the grant date requires judgment, including estimates for the average risk-free interest rate, dividend yield, volatility, annual forfeiture rate, and exercise behavior. These assumptions may differ significantly between grant dates because of changes in the actual results of these inputs that occur over time.

Refer to Note N for more information regarding stock-based compensation.

Pension and Other Postretirement Benefits. Alcoa sponsors several defined benefit pension plans, and health care and life insurance postretirement benefit plans. The Company recognizes on a plan-by-plan basis the net funded status of these pension and postretirement benefit plans as either an asset or a liability on its Consolidated Balance Sheet. The net funded status represents the difference between the fair value of each plan's assets and the benefit obligation of the respective plan. The benefit obligation represents the present value of the estimated future benefits the Company currently expects to pay to plan participants based on past service. Unrecognized gains and losses related to the plans are deferred in Accumulated other comprehensive loss on the Consolidated Balance Sheet until amortized into net income.

The plan assets and benefit obligations are measured at the end of each year or more frequently, upon the occurrence of certain events such as a significant plan amendment, settlement, or curtailment. For interim plan remeasurements, it is the Company's policy to record the related accounting impacts within the same quarter as the triggering event.

The amounts Alcoa records are measured using actuarial methodologies and incorporate significant assumptions, as described in Part II Item 7 of this Form 10-K in Critical Accounting Policies and Estimates. A change in one or a combination of these assumptions, or the effects of actual results differing from assumptions, could have a material impact on Alcoa's projected benefit obligation. These changes or differences are recorded in Accumulated other comprehensive loss and are amortized into net income as a component of

the net periodic benefit cost (income) over the average future working lifetime or average remaining life expectancy, as appropriate, of the plan's participants.

One-time accounting impacts, such as curtailment and settlement charges (gains), are recognized immediately and are reclassified from Accumulated other comprehensive loss to Restructuring and other charges, net on the accompanying Statement of Consolidated Operations.

Refer to Note O for more information regarding pension and other postretirement benefits including accounting impacts of current year actions.

Derivatives and Hedging. Derivatives are held for purposes other than trading and are part of a formally documented risk management program.

Alcoa accounts for hedges of firm customer commitments for aluminum as fair value hedges. The fair values of the derivatives and changes in the fair values of the underlying hedged items are reported as assets and liabilities in the Consolidated Balance Sheet. Changes in the fair values of these derivatives and underlying hedged items generally offset and are recorded each period in Sales, consistent with the underlying hedged item.

The Company accounts for hedges of foreign currency exposures and certain forecasted transactions as cash flow hedges. The fair values of the derivatives are recorded as assets and liabilities in the Consolidated Balance Sheet. The changes in the fair values of these derivatives are recorded in Other comprehensive income (loss) and are reclassified to Sales, Cost of goods sold, or Other (income) expenses, net in the period in which earnings are impacted by the hedged items or in the period that the transaction no longer qualifies as a cash flow hedge. These contracts cover the same periods as known or expected exposures, generally not exceeding five years.

If no hedging relationship is designated, the derivative is marked to market through Other (income) expenses, net.

Cash flows from derivatives are recognized in the Statement of Consolidated Cash Flows in a manner consistent with the underlying transactions.

Income Taxes. The provision for income taxes is determined using the asset and liability approach of accounting for income taxes. Under this approach, the provision for income taxes represents income taxes paid or payable (or received or receivable) for the current year plus the change in deferred taxes during the year. Deferred taxes represent the future tax consequences expected to occur when the reported amounts of assets and liabilities are recovered or paid, result from differences between the financial and tax bases of Alcoa's assets and liabilities and are adjusted for changes in tax rates and tax laws when enacted.

Valuation allowances are recorded to reduce deferred tax assets when it is more likely than not (greater than 50%) that a tax benefit will not be realized. In evaluating the need for a valuation allowance, management applies judgement in assessing all available positive and negative evidence and considers all potential sources of taxable income. Deferred tax assets for which no valuation allowance is recorded may not be realized upon changes in facts and circumstances, resulting in a future charge to establish a valuation allowance. Existing valuation allowances are re-examined under the same standards of positive and negative evidence. If it is determined that it is more likely than not that a deferred tax asset will be realized, the appropriate amount of the valuation allowance, if any, is released. Deferred tax assets and liabilities are also re-measured to reflect changes in underlying tax rates due to law changes and the granting and lapse of tax holidays.

Tax benefits related to uncertain tax positions taken or expected to be taken on a tax return are recorded when such benefits meet a more likely than not threshold. Otherwise, these tax benefits are recorded when a tax position has been effectively settled, which means that the statute of limitation has expired or the appropriate taxing authority has completed their examination even though the statute of limitations remains open. Interest and penalties related to uncertain tax positions are recognized as part of the provision for income taxes and are accrued in the period that such interest and penalties would be applicable under relevant tax law until such time that the related tax benefits are recognized.

Foreign Currency. The local currency is the functional currency for Alcoa's significant operations outside the United States, except for certain operations in Canada and Iceland, and a holding and trading company in the Netherlands, where the U.S. dollar is used as the functional currency. The determination of the functional currency for Alcoa's operations is made based on the appropriate economic and management indicators. Where local currency is the functional currency, assets and liabilities are translated into U.S. dollars using year-end exchange rates and income and expenses are translated using the average exchange rates for the reporting period. Unrealized foreign currency translation gains and losses are deferred in Accumulated other comprehensive loss on the Consolidated Balance Sheet.

Recently Adopted Accounting Guidance. On January 1, 2021, the Company adopted ASU 2019-12, Income Taxes (Topic 740); the adoption did not have a material impact on the Company's Consolidated Financial Statements.

Recently Issued Accounting Guidance. In March 2020 and January 2021, the FASB issued ASU No. 2020-04 and ASU No. 2021-01, respectively. Together, the ASUs provide temporary optional expedients and exceptions to the U.S. GAAP guidance on contract modifications and hedge accounting to ease the financial reporting burdens related to the expected market transition from the London Interbank Offered Rate (LIBOR) and other interbank offered rates to alternative reference rates. The Company is working to transition from LIBOR to alternative reference rates. Management has identified a total company inventory of affected financial instruments and contracts, has taken action to transition certain legacy contracts linked to LIBOR to alternative reference rates, and intends to utilize alternative reference rates for new contracts after 2021. The transition from LIBOR will not have a material impact to Alcoa.

C. Divestitures and Held for Sale

Divestitures.

Rockdale Site

During the fourth quarter of 2021, the Company completed the sale of land and industrial assets at the previously closed Rockdale smelter site in the state of Texas in a transaction valued at $240. Upon closing of the transaction, the Company received $230 in cash and recorded a net gain of $202 in Other (income) expenses, net (pre- and after-tax; see Note U) on the Statement of Consolidated Operations.

Eastalco Site

During the second quarter of 2021, the Company completed the sale of land at the previously closed Eastalco smelter site in the state of Maryland in a transaction valued at $100. Upon closing of the transaction, the Company received $94 in cash and recorded a gain of $90 in Other (income) expenses, net ($90 pre- and $89 after-tax; see Note U) on the Statement of Consolidated Operations.

Gum Springs Waste Treatment Business

During the first quarter of 2020, the Company sold Elemental Environmental Solutions LLC (EES), a wholly-owned Alcoa subsidiary that operated the waste processing facility in Gum Springs, Arkansas, to a global environmental firm in a transaction valued at $250. Related to this transaction, the Company received $200 in cash and recorded a gain of $181 (pre- and after-tax; see Note U). Further, an additional $50 is held in escrow to be paid to Alcoa if certain post-closing conditions are satisfied, which would result in additional gain being recorded.

Avilés and La Coruña Aluminum Facilities

In February 2019, the smelters at Avilés and La Coruña (Spain) were curtailed and in July 2019, Alcoa completed the divestiture of the Avilés and La Coruña aluminum facilities to PARTER Capital Group AG (PARTER) in a sale process endorsed by the Spanish government and supported by the workers' representatives. In 2020, PARTER sold its majority stake in the facilities to an unrelated party. The Company had no knowledge of the subsequent transaction prior to its announcement and has filed a lawsuit claiming that the sale was in breach of the sale agreement between Alcoa and PARTER.

Charges related to the divestiture, curtailment, and employee dismissal process totaled $253 for the year ended December 31, 2019.

Related to the curtailment and employee dismissal process, the Company recorded Restructuring and other charges, net for asset impairments ($80), severance and employee related costs ($20), and contract termination costs ($8); Cost of goods sold primarily for the write down of remaining inventories to their net realizable value ($16); and, Selling, general administrative, and other expenses for miscellaneous charges ($2).

Related to the divestiture, the Company recorded Restructuring and other charges, net, of $127, resulting from financial contributions of up to $95 to the divested entities per the agreement and a net charge of $32 to meet a working capital commitment and write-off the remaining net book value of the facilities' net assets. See Note D for additional detail.

Ma'aden Rolling Company

In December 2009, Alcoa invested in a joint venture related to the ownership and operation of an integrated aluminum complex (bauxite mine, alumina refinery, aluminum smelter, and rolling mill) in Saudi Arabia. The joint venture is owned 74.9% by the Saudi Arabian Mining Company (Ma'aden) and 25.1% by Alcoa, and originally consisted of three separate companies as follows: the Ma'aden Bauxite and Alumina Company (MBAC; the bauxite mine and alumina refinery), the Ma'aden Aluminium Company (MAC; the aluminum smelter and casthouse), and the Ma'aden Rolling Company (MRC; the rolling mill).

In June 2019, Alcoa and Ma'aden amended the joint venture agreement that governs the operations of each of the three companies that comprise the joint venture. The amendment, among other items, transferred Alcoa's 25.1% interest in MRC to Ma'aden and, as a

result, Alcoa has no further direct or indirect equity interest in MRC. Prior to the amendment, both partners contributed $100 to MRC to meet current cash requirements. As a result of the divestiture, Alcoa recorded Restructuring and other charges, net of $319 for the write-off of the investment in MRC ($161), the cash contributions described above ($100), the write-off of the Company's share of MRC's delinquent payables due to MAC ($59) that were forgiven as part of this transaction, partially offset by a gain resulting from the write-off of the fair value of debt guarantee ($1). See Note D for additional detail.

Held for Sale.

Warrick Rolling Mill

In November 2020, Alcoa entered into an agreement to sell its rolling mill located at Warrick Operations (Warrick Rolling Mill), an integrated aluminum manufacturing site near Evansville, Indiana (Warrick Operations), to Kaiser Aluminum Corporation (Kaiser).

In March 2021, Alcoa completed the sale for total consideration of approximately $670, which included the assumption of $69 in other postretirement benefit liabilities. The Company recorded a net gain of $30 in Other (income) expenses, net (pre- and after-tax, see Note U) on the Statement of Consolidated Operations. Upon closure, the Company recorded estimated liabilities for future site separation commitments and remaining transaction costs associated with the sales agreement. At December 31, 2021, the remaining reserve was approximately $70, over half of the expected cash outlay is to be spent within the next 12 months, with the remainder to be spent through 2023.

In connection with the transaction, Alcoa and Kaiser entered into a market-based metal supply agreement and a ground lease agreement for the Warrick Rolling Mill property, which Alcoa continues to own. Approximately 1,150 employees at the Warrick Rolling Mill, which includes the casthouse, hot mill, cold mills, and coating and slitting lines, became employees of Kaiser as a result of the transaction. Alcoa continues to own and operate the site's 269,000 metric ton per year aluminum smelter and the power plant, which together employ approximately 670 people. The remaining Warrick Operations results are included within the Aluminum segment.

At December 31, 2020, the Company had assets and liabilities held for sale of $648 and $242, respectively, related to the transaction, which consisted of the following:

		December 31, 2020
Assets		
Receivables from customers	$	86
Other receivables		6
Inventories		164
Total current assets		256
Properties, plants, and equipment		1,423
Accumulated depreciation		(1,031)
Properties, plants, and equipment, net		392
Total Assets held for sale	$	648
Liabilities		
Accounts payable, trade	$	121
Accrued compensation and retirement costs		5
Other current liabilities		25
Total current liabilities		151
Accrued other postretirement benefits		83
Other noncurrent liabilities		8
Total Liabilities held for sale	$	242

D. Restructuring and Other Charges, Net

Restructuring and other charges, net were comprised of the following:

	2021	2020	2019
Settlements and/or curtailments related to retirement benefits (O)	$ 977	$ 58	$ 119
Severance and employee termination costs	1	16	51
Asset impairments	75	2	225
Asset retirement obligations (R)	23	2	75
Environmental remediation (S)	15	1	69
Loss on divestitures	—	—	446
Other	82	36	52
Reversals of previously recorded layoff and other costs	(45)	(11)	(6)
Restructuring and other charges, net	$ 1,128	$ 104	$ 1,031

Severance and employee termination costs were recorded based on approved detailed action plans submitted by the operating locations that specified positions to be eliminated, benefits to be paid under existing severance plans, union contracts or statutory requirements, and the expected timetable for completion of the plans.

2021 Actions. In 2021 Alcoa Corporation recorded Restructuring and other charges, net, of $1,128 which were comprised of the following components**:**

- Non-cash settlement charges related to pension and certain other postretirement benefits (see Note O):
  - $858 related to the purchase of group annuity contracts to transfer approximately $1,500 of pension obligations and assets associated with defined benefit pension plans for approximately 14,000 United States retirees and beneficiaries, as well as lump sum settlements;
  - $63 related to the purchase of a group annuity contract to transfer approximately $55 of pension obligations and assets associated with a Suriname pension plan for approximately 800 retirees and beneficiaries;
  - $47 related to certain defined benefit pension benefits;
  - Net $9 related to the settlement and curtailment of certain other postretirement benefits resulting from the sale of the Warrick Rolling Mill;
- Charges related to portfolio actions taken as part of the Company's ongoing strategic review (see details below):
  - $80 related to the closure of the previously curtailed aluminum smelter facility in Wenatchee (Washington);
  - $62 related to the agreement reached with the workers at the San Ciprián (Spain) aluminum smelter to curtail smelting capacity;
  - $27 related to the closure of the previously curtailed anode facility in Lake Charles (Louisiana);
- Other charges:
  - $13 for additional take-or-pay contract costs related to the curtailed Wenatchee (Washington) and Intalco (Washington) smelters;
  - $11 to record additional environmental and asset retirement related reserves (see Note R and Note S);
  - $3 for several other insignificant items;
- Reversals:
  - $6 for a take-or-pay energy-related obligation at the Alumar smelter no longer required due to the announced restart;
  - $17 related to the divestiture of the Avilés and La Coruña entities (see below); and,
  - $22 due to lower costs for demolition and remediation related to previously established reserves (see Note R and Note S).

In December 2021, the Company announced the two-year curtailment of 228 kmt of smelting capacity at the San Ciprián (Spain) aluminum smelter. The temporary curtailment, which began at the end of January 2022, is the result of an agreement reached with the workers at the site to suspend production due to exorbitant energy prices in Spain. Under the terms of the agreement, the Company is responsible for certain employee and contractual obligations during the curtailment period. As a result, the Company recorded charges of $62 in the fourth quarter of 2021 in Restructuring and other charges, net on the Statement of Consolidated Operations. Additionally, in connection with the agreement, the Company committed to restart the smelter beginning in January of 2024 and has restricted cash of $103 to be made available in the future to cover $68 in capital improvements at the site and $35 in smelter restart costs. Restricted cash is included in Other noncurrent assets on the Consolidated Balance Sheet (see Note U). The San Ciprián smelter will continue to incur operating costs for the casthouse as well as resources to maintain and improve the smelter for restart.

During the fourth quarter of 2021, as part of the Company's ongoing strategic portfolio review, the Company announced the permanent closure of the Wenatchee (Washington) aluminum smelter. The smelter has been fully curtailed since 2015. Charges related to the closure totaled $90 in the fourth quarter of 2021 and included a charge of $10 for the write down of remaining inventories to net realizable value recorded in Cost of goods sold on the Statement of Consolidated Operations and a charge of $80 recorded in Restructuring and other charges, net on the Statement of Consolidated Operations. The restructuring charges were comprised of: $30 to write-off the remaining net book value of various assets; $23 of asset impairments; $21 to establish reserves related to environmental and demolition obligations; $5 related to take-or-pay contractual obligations; and $1 of severance and employee termination costs from the separation of approximately 10 employees. Cash outlays related to demolition and environmental related activities are expected to be spread over approximately 5 years.

During the third quarter of 2021, as part of the Company's ongoing strategic portfolio review, the Company announced the decision to permanently close the previously curtailed anode facility in Lake Charles (Louisiana). The anode facility within the Lake Charles site has been fully curtailed since 2015. The Company recorded charges of $27 in the third quarter of 2021, which were recorded in Restructuring and other charges, net on the Statement of Consolidated Operations, comprised of asset impairments of $22 and cash-based charges for closure and asset retirement obligations of $5. Cash outlays related to demolition and environmental related activities are expected within the next year. The Company's petroleum coke calciner located at the same site in Lake Charles will remain in operation, unaffected by the closure of the anode facility.

2020 Actions. In 2020, Alcoa Corporation recorded Restructuring and other charges, net, of $104 which were comprised of the following components: $59 related to settlements and curtailments of certain pension and other postretirement benefits (see Note O); $28 (net) for costs related to the curtailment of the Intalco (Washington) smelter; $20 for additional contract costs related to the curtailed Wenatchee (Washington) smelter; and several other insignificant items.

In April 2020, as part of the Company's portfolio review, Alcoa Corporation announced the curtailment of the remaining 230 kmt of uncompetitive smelting capacity at the Intalco (Washington) smelter amid declining market conditions. The full curtailment, which included 49 kmt of earlier-curtailed capacity, was completed during the third quarter of 2020. The $28 net restructuring charge recorded during 2020 was comprised of $13 for severance and employee termination costs from the separation of approximately 685 employees, $16 for contract termination costs, and a net curtailment gain of $1 related to the U.S. hourly defined benefit pension and retiree life plans (see Note O). At December 31, 2020, the separation of employees and related severance and employee termination cost payments associated with this program were essentially complete with approximately $11 of payments made against the severance and employee termination cost reserve. Payments related to the contract termination costs were $5 during 2020. Additional contract termination costs related to take-or-pay agreements may recur during the curtailment period.

2019 Actions. In 2019, Alcoa Corporation recorded Restructuring and other charges, net, of $1,031 which were comprised of the following components: $319 related to the divestiture of Alcoa Corporation's interest in the Ma'aden Rolling Company (see below); $274 for exits costs related to a decision to permanently close and demolish the Point Comfort alumina refinery (see below); $235 for costs related to the smelter curtailment and subsequent divestiture of the Avilés and La Coruña aluminum facilities in Spain (see below); $119 related to the settlement and/or curtailment of certain pension and other postretirement benefits; $37 for employee termination and severance costs related to the implementation of the new operating model (see below); $9 for closure costs related to a coal mine; and $38 for net charges related to various other items.

In December 2019, Alcoa Corporation announced the permanent closure of the Point Comfort (Texas) alumina refinery. Restructuring charges recorded in 2019 related to the closure included asset impairments of $129, asset retirement obligations of $72, environmental remediation costs of $69, and severance costs of $4 for the layoff of approximately 40 employees. Additionally, a charge of $2 for the write down of remaining inventories to their net realizable value was recorded in Cost of goods sold on the accompanying Statement of Consolidated Operations. Changes in the severance reserve during 2020 included a reduction from cash payments of $2 and a reversal of $1 resulting from changes in employee severance benefit elections. At December 31, 2020, the separations associated with this program were essentially complete.

In September 2019, Alcoa Corporation announced the implementation of a new operating model that resulted in a leaner, more integrated, operator-centric organization. Effective November 1, 2019, the new operating model eliminated the business unit structure, consolidated sales, procurement, and other commercial capabilities at an enterprise level, and streamlined the Executive Team. The new structure reduced overhead with the intention of promoting operational and commercial excellence and increasing connectivity between the Company's plants and leadership. As a result of the new operating model, Alcoa Corporation recorded a charge of $37 related to employee termination and severance costs for approximately 260 employees company-wide. A Severance and employee termination cost reserve of $27 remained at December 31, 2019. In addition to the employees separated under the program, the Company eliminated 60 positions as open roles or retirements were not replaced. At December 31, 2020, the separations associated with this program were essentially complete and related cash payments of $25 were made during 2020.

In January 2019, Alcoa Corporation reached an agreement with the workers' representatives at the Avilés and La Coruña (Spain) aluminum facilities as part of the collective dismissal process announced in October 2018 and curtailed the smelters at these two locations, with a combined remaining operating capacity of 124 kmt, in February 2019. In July 2019, Alcoa completed the divestiture of the Avilés and La Coruña aluminum facilities to PARTER (see Note C).

Restructuring and other charges, net, related to the curtailment and collective dismissal process of the Spanish facilities included asset impairments of $80, severance and employee-related costs of $20, and contract termination costs of $8. Additional charges included $16 recorded in Cost of goods sold, primarily for the write down of remaining inventories to their net realizable value, and $2 in

miscellaneous charges recorded in Selling, general administrative, and other expenses on the accompanying Statement of Consolidated Operations.

Restructuring and other charges, net related to the divestiture of the Avilés and La Coruña entities totaled $127 for the year ended December 31, 2019, for financial contributions of up to $95 to the divested entities per the agreement, a net charge of $32 to meet a working capital commitment and write-off the remaining net book value of the entities' assets. For the year ended December 31, 2019, net cash outflows related to the transaction were $47. During 2020, financial contributions of $38 were made to the divested entities with a restructuring reserve of $30 remaining at December 31, 2020. During 2021, further financial contributions of $13 were made to the divested entities and the Company reversed the remaining reserve of $17, in accordance with the terms of the agreement, as the period for which the divested entities could incur qualifying capital expenditures had lapsed. Financial contributions made to the divested entities have been classified as Cash used for financing activities on the Company's Statement of Consolidated Cash Flows.

In December 2009, Alcoa Corporation invested in a joint venture related to the ownership and operation of an integrated aluminum complex (bauxite mine, alumina refinery, aluminum smelter, and rolling mill) in Saudi Arabia. The joint venture is owned 74.9% by Ma'aden and 25.1% by Alcoa Corporation, and originally consisted of three separate companies as follows: MBAC, MAC, and MRC. Alcoa Corporation accounts for its investment in the joint venture under the equity method as one integrated investment asset, consistent with the terms of the joint venture agreement.

In June 2019, Alcoa Corporation and Ma'aden amended the joint venture agreement that governs the operations of each of the three companies that comprise the joint venture. Under the terms of the amended agreement:

- Alcoa Corporation made a contribution to MRC in the amount of $100, along with Ma'aden's earlier capital contribution of $100, to meet current MRC cash requirements, including paying certain amounts owed by MRC to MAC and Alcoa Corporation;
- Alcoa Corporation and Ma'aden consented to the write-off of $235 of MRC's delinquent payables to MAC;
- Alcoa Corporation transferred its 25.1% interest in MRC to Ma'aden and, as a result, has no further direct or indirect equity interest in MRC;
- Alcoa Corporation is released from all future MRC obligations, including Alcoa Corporation's sponsor support of $296 of MRC debt (see Note S) and its share of any future MRC cash requirements; and,
- Alcoa Corporation and Ma'aden further defined MBAC and MAC shareholder rights, including the timing and determination of the amount of dividend payments of excess cash to the joint venture partners following required distributions to the commercial lenders of MBAC and MAC; among other matters.

The amendment also defines October 1, 2021 as the date after which Alcoa Corporation is permitted to sell all of its shares in both MBAC and MAC collectively, for which Ma'aden has a right of first refusal. The agreement further outlines that Alcoa Corporation's call option and Ma'aden's put option, relating to additional interests in the joint venture, are exercisable for a period of six-months after October 1, 2021. To date, neither partner has exercised their respective put or call options.

The parties maintain their commercial relationship and as part of the agreement, Alcoa Corporation provided sales, logistics, and customer technical services support for MRC products for the North American can sheet market through December 2020. The Company will retain its 25.1% minority interest in MBAC and MAC, and Ma'aden will continue to own a 74.9% interest.

The $319 restructuring charge resulting from the MRC divestiture included the write-off of Alcoa Corporation's investment in MRC of $161, the cash contributions described above of $100, and the write-off of Alcoa Corporation's share of MRC's delinquent payables due to MAC of $59 that were forgiven as part of this transaction, which were partially offset by a gain of $1 from the write-off of the fair value of debt guarantee.

Alcoa Corporation does not include Restructuring and other charges, net in the results of its reportable segments. The impact of allocating such charges to segment results would have been as follows:

	2021	2020	2019
Bauxite	$ —	$ 1	$ 5
Alumina	1	5	272
Aluminum	184	53	611
Segment total	185	59	888
Corporate	943	45	143
Total Restructuring and other charges, net	$ 1,128	$ 104	$ 1,031

Activity and reserve balances for restructuring charges were as follows:

	Severance and employee termination costs	Other costs	Total
Balances at December 31, 2018	$ 5	$ 42	$ 47
Restructuring charges, net	51	161	212
Cash payments	(19)	(99)	(118)
Reversals and other	(2)	(2)	(4)
Balances at December 31, 2019	35	102	137
Restructuring charges, net	16	36	52
Cash payments	(41)	(79)	(120)
Reversals and other	(4)	(2)	(6)
Balances at December 31, 2020	6	57	63
Restructuring charges, net	1	80	81
Cash payments	(4)	(25)	(29)
Reversals and other	—	(22)	(22)
Balances at December 31, 2021	$ 3	$ 90	$ 93

The activity and reserve balances include only Restructuring and other charges, net that impact the reserves for Severance and employee termination costs and Other costs. Restructuring and other charges, net that affected other liability accounts such as environmental obligations (see Note S), asset retirement obligations (see Note R), and pension and other postretirement reserves (see Note O) are excluded from the above activity and balances. Reversals and other include reversals of previously recorded liabilities and foreign currency translation impacts.

The current portion of the reserve balance is reflected in Other current liabilities on the Consolidated Balance Sheet and the noncurrent portion of the reserve balance is reflect in Other noncurrent liabilities and deferred credits on the Consolidated Balance Sheet. The noncurrent portion of the reserve was $43 and $1 at December 31, 2021 and 2020, respectively.

E. Segment and Related Information

Segment Information

Alcoa Corporation is a producer of bauxite, alumina, and aluminum products. The Company has three operating and reportable segments, which are organized by product on a global basis: Bauxite, Alumina, and Aluminum. Segment performance under Alcoa Corporation's management reporting system is evaluated based on a number of factors; however, the primary measure of performance is the Adjusted EBITDA (Earnings before interest, taxes, depreciation, and amortization) of each segment. The Company calculates Segment Adjusted EBITDA as Total sales (third-party and intersegment) minus the following items: Cost of goods sold; Selling, general administrative, and other expenses; and Research and development expenses. Alcoa Corporation believes that the presentation of Adjusted EBITDA is useful to investors because such measure provides both additional information about the operating performance of Alcoa Corporation and insight on the ability of Alcoa Corporation to meet its financial obligations. The presentation of Adjusted EBITDA is not intended to be a substitute for, and should not be considered in isolation from, the financial measures reported in accordance with GAAP. Alcoa Corporation's Adjusted EBITDA may not be comparable to similarly titled measures of other companies. The chief operating decision maker function regularly reviews the financial information, including Sales and Adjusted EBITDA, of these three operating segments to assess performance and allocate resources.

Segment assets include, among others, customer receivables (third-party and intersegment), inventories, properties, plants, and equipment, and equity investments. The accounting policies of the segments are the same as those described in the Summary of Significant Accounting Policies (see Note B). Transactions among segments are established based on negotiation among the parties. Differences between segment totals and Alcoa Corporation's consolidated totals for line items not reconciled are in Corporate.

The following are detailed descriptions of Alcoa Corporation's reportable segments:

Bauxite. This segment represents the Company's global bauxite mining operations. A portion of this segment's production represents the offtake from equity method investments in Brazil and Guinea, as well as AWAC's share of bauxite production related to an equity investment in Saudi Arabia. The bauxite mined by this segment is sold primarily to internal customers within the Alumina segment; a portion of the bauxite is sold to external customers. Bauxite mined by this segment and used internally is transferred to the Alumina segment at negotiated terms that are intended to approximate market prices; sales to third-parties are conducted on a contract basis. Generally, this segment's sales are transacted in U.S. dollars while costs and expenses are transacted in the local currency of the

respective operations, which are the Australian dollar and the Brazilian real. Most of the operations that comprise the Bauxite segment are part of AWAC (see Principles of Consolidation in Note A).

Alumina. This segment represents the Company's worldwide refining system, which processes bauxite into alumina. The alumina produced by this segment is sold primarily to internal and external aluminum smelter customers; a portion of the alumina is sold to external customers who process it into industrial chemical products. Approximately two-thirds of Alumina's production is sold under supply contracts to third parties worldwide, while the remainder is used internally by the Aluminum segment. Alumina produced by this segment and used internally is transferred to the Aluminum segment at prevailing market prices. A portion of this segment's third-party sales are completed through the use of alumina traders. Generally, this segment's sales are transacted in U.S. dollars while costs and expenses are transacted in the local currency of the respective operations, which are the Australian dollar, the Brazilian real, and the euro. Most of the operations that comprise the Alumina segment are part of AWAC (see Principles of Consolidation in Note A). This segment also includes AWAC's 25.1% ownership interest in a mining and refining joint venture company in Saudi Arabia (see Note H).

Aluminum. This segment consists of the Company's (i) worldwide smelting and casthouse system, which processes alumina into primary aluminum, and (ii) portfolio of energy assets in Brazil, Canada, and the United States.

Aluminum's combined smelting and casting operations produce primary aluminum products, nearly all of which are sold to external customers and traders. The smelting operations produce molten primary aluminum, which is then formed by the casting operations into either common alloy ingot (e.g., t-bar, sow, standard ingot) or into value-add ingot products (e.g., foundry, billet, rod, and slab). A variety of external customers purchase the primary aluminum products for use in fabrication operations, which produce products primarily for the transportation, building and construction, packaging, wire, and other industrial markets. Results from the sale of aluminum powder and scrap are also included in this segment, as well as the impacts of embedded aluminum derivatives (see Note P) related to energy supply contracts.

The energy assets supply power to external customers in Brazil and the United States, as well as internal customers in the Aluminum segment (Canadian smelters and Warrick (Indiana) smelter) and, to a lesser extent, the Alumina segment (Brazilian refineries).

On March 31, 2021, Alcoa completed the sale of its rolling mill located at Warrick Operations (Warrick Rolling Mill) an integrated aluminum manufacturing site near Evansville, Indiana (Warrick Operations), to Kaiser Aluminum Corporation (Kaiser) (see Note C). Results from the Warrick Rolling Mill are included in this segment through the first quarter of 2021. Alcoa continues to own and operate the site's 269,000 metric ton per year aluminum smelter and the power plant, which together employ approximately 670 people. Results from the remaining Warrick Operations site continue to be included within this segment.

Generally, this segment's aluminum sales are transacted in U.S. dollars while costs and expenses of this segment are transacted in the local currency of the respective operations, which are the U.S. dollar, the euro, the Norwegian krone, the Icelandic króna, the Canadian dollar, the Brazilian real, and the Australian dollar.

This segment also includes Alcoa Corporation's 25.1% ownership interest in both a smelting (through full year 2021) and rolling mill (through the second quarter of 2019) joint venture company in Saudi Arabia (see Note H).

The operating results, capital expenditures, and assets of Alcoa Corporation's reportable segments were as follows:

	Bauxite	Alumina	Aluminum	Total
2021				
Sales:				
Third-party sales	$ 236	$ 3,139	$ 8,766	$ 12,141
Intersegment sales	711	1,586	18	2,315
Total sales	$ 947	$ 4,725	$ 8,784	$ 14,456
Segment Adjusted EBITDA	$ 172	$ 1,002	$ 1,879	$ 3,053
Supplemental information:				
Depreciation, depletion, and amortization	$ 153	$ 198	$ 289	$ 640
Equity income	—	4	116	120
2020				
Sales:				
Third-party sales	$ 272	$ 2,627	$ 6,365	$ 9,264
Intersegment sales	941	1,268	12	2,221
Total sales	$ 1,213	$ 3,895	$ 6,377	$ 11,485
Segment Adjusted EBITDA	$ 495	$ 497	$ 325	$ 1,317
Supplemental information:				
Depreciation, depletion, and amortization	$ 135	$ 172	$ 322	$ 629
Equity loss	—	(23)	(7)	(30)
2019				
Sales:				
Third-party sales	$ 297	$ 3,250	$ 6,803	$ 10,350
Intersegment sales	979	1,561	17	2,557
Total sales	$ 1,276	$ 4,811	$ 6,820	$ 12,907
Segment Adjusted EBITDA	$ 504	$ 1,097	$ 25	$ 1,626
Supplemental information:				
Depreciation, depletion, and amortization	$ 120	$ 214	$ 346	$ 680
Equity income (loss)	—	6	(49)	(43)

	Bauxite	Alumina	Aluminum	Total
2021				
Assets:				
Capital expenditures	$ 95	$ 178	$ 107	$ 380
Equity investments	234	270	678	1,182
Total assets	1,430	4,385	6,251	12,066
2020				
Assets:				
Capital expenditures	$ 127	$ 103	$ 111	$ 341
Equity investments	222	264	546	1,032
Total assets	1,468	4,333	6,214	12,015

The following tables reconcile certain segment information to consolidated totals:

	2021	2020	2019
Sales:			
Total segment sales	$ 14,456	$ 11,485	$ 12,907
Elimination of intersegment sales	(2,315)	(2,221)	(2,557)
Other	11	22	83
Consolidated sales	$ 12,152	$ 9,286	$ 10,433

	2021	2020	2019
Net income (loss) attributable to Alcoa Corporation:			
Total Segment Adjusted EBITDA	$ 3,053	$ 1,317	$ 1,626
Unallocated amounts:			
Transformation[1]	(44)	(45)	(7)
Intersegment eliminations	(101)	(8)	150
Corporate expenses[2]	(129)	(102)	(101)
Provision for depreciation, depletion, and amortization	(664)	(653)	(713)
Restructuring and other charges, net (D)	(1,128)	(104)	(1,031)
Interest expense (U)	(195)	(146)	(121)
Other income (expenses), net (U)	445	(8)	(162)
Other[3]	(38)	(78)	(79)
Consolidated income (loss) before income taxes	1,199	173	(438)
Provision for income taxes (Q)	(629)	(187)	(415)
Net income attributable to noncontrolling interest	(141)	(156)	(272)
Consolidated net income (loss) attributable to Alcoa Corporation	$ 429	$ (170)	$ (1,125)

(1) Transformation includes, among other items, the Adjusted EBITDA of previously closed operations.

(2) Corporate expenses are composed of general administrative and other expenses of operating the corporate headquarters and other global administrative facilities, as well as research and development expenses of the corporate technical center.

(3) Other includes certain items that impact Cost of goods sold and other expenses on Alcoa Corporation's Statement of Consolidated Operations that are not included in the Adjusted EBITDA of the reportable segments.

December 31,	2021	2020
Assets:		
Total segment assets	$ 12,066	$ 12,015
Elimination of intersegment receivables	(261)	(193)
Unallocated amounts:		
Cash and cash equivalents	1,814	1,607
Corporate fixed assets, net	374	453
Corporate goodwill	140	141
Deferred income taxes	506	655
Pension assets	164	—
Other	222	182
Consolidated assets	$ 15,025	$ 14,860

Product Information

Alcoa Corporation has four product divisions and one divested product division as follows:

Bauxite—Bauxite is a reddish clay rock that is mined from the surface of the earth's terrain. This ore is the basic raw material used to produce alumina and is the primary source of aluminum.

Alumina—Alumina is an oxide that is extracted from bauxite and is the basic raw material used to produce primary aluminum. This product can also be consumed for non-metallurgical purposes, such as industrial chemical products.

Primary aluminum—Primary aluminum is metal in the form of a common alloy ingot or a value-add ingot (e.g., foundry, billet, rod, and slab). These products are sold primarily to customers, that produce products for the transportation, building and construction, packaging, wire, and other industrial markets, and traders.

Energy—Energy is the generation of electricity, which is sold in the wholesale market to traders, large industrial consumers, distribution companies, and other generation companies.

Flat-rolled aluminum—Flat-rolled aluminum is metal in the form of sheet, which is sold primarily to customers that produce beverage and food cans, including body, tab, and end stock. As noted above, the Company sold the Warrick Rolling Mill in the first quarter of 2021 which represented the Company's only Flat-rolled aluminum asset. The results of the Warrick Rolling Mill are included in this product division through the first quarter of 2021.

The following table represents the general commercial profile of the Company's Bauxite, Alumina, and Primary aluminum product divisions (see text below table for Energy):

Product division	Pricing components	Shipping terms(3)	Payment terms(4)
Bauxite	Negotiated	FOB/CIF	LC Sight
Alumina:			
Smelter-grade	API(1)/spot/fixed	FOB/CIF	LC Sight/CAD/Net 30 days
Non-metallurgical	Negotiated	FOB/CIF	Net 30 days
Primary aluminum:			
Common alloy ingot	LME + Regional premium(2)	DAP/CIF	Net 30 to 45 days/CAD
Value-add ingot	LME + Regional premium + Product premium(2)	DAP/CIF	Net 30 to 45 days

(1) API (Alumina Price Index) is a pricing mechanism that is calculated by the Company based on the weighted average of a prior month's daily spot prices published by the following three indices: CRU Metallurgical Grade Alumina Price, Platts Metals Daily Alumina PAX Price, and FastMarkets Metal Bulletin Non-Ferrous Metals Alumina Index.

(2) LME (London Metal Exchange) is a globally recognized exchange for commodity trading, including aluminum. The LME pricing component represents the underlying base metal component, based on quoted prices for aluminum on the exchange. The regional premium represents the incremental price over the base LME component that is associated with the physical delivery of metal to a particular region (e.g., the Midwest premium for metal sold in the United States). The product premium represents the incremental price for receiving physical metal in a particular shape or alloy.

(3) CIF (cost, insurance, and freight) means that the Company pays for these items until the product reaches the buyer's designated destination point related to transportation by vessel. DAP (delivered at place) means the same as CIF related to all methods of transportation. FOB (free on board) means that the Company pays for costs, insurance, and freight until the product reaches the seller's designated shipping point.

(4) The net number of days means that the customer is required to remit payment to the Company for the invoice amount within the designated number of days. LC Sight is a letter of credit that is payable immediately (usually within five to ten business days) after a seller meets the requirements of the letter of credit (i.e. shipping documents that evidence the seller performed its obligations as agreed to with a buyer). CAD (cash against documents) is a payment arrangement in which a seller instructs a bank to provide shipping and title documents to the buyer at the time the buyer pays in full the accompanying bill of exchange.

For the Company's Energy product division, sales of electricity are based on current market prices. Electricity is provided to customers on demand through a national or regional power grid; the customer simultaneously receives and consumes the electricity. Payment terms are generally within 10 days related to the previous 30 days of electricity consumption.

The following table details Alcoa Corporation's Third-party sales by product division:

	2021	2020	2019
Sales:			
Primary aluminum	$ 8,420	$ 5,190	$ 5,426
Alumina	3,125	2,624	3,246
Flat-rolled aluminum[1]	320	1,115	1,220
Energy	286	141	290
Bauxite	207	238	276
Other[2]	(206)	(22)	(25)
	$ 12,152	$ 9,286	$ 10,433

(1) Flat-rolled aluminum represented sales of the Warrick Rolling Mill through the sale of the facility on March 31, 2021 (see Note C).

(2) Other includes realized gains and losses related to embedded derivative instruments designated as cash flow hedges of forward sales of aluminum (see Note P).

Geographic Area Information

Geographic information for Third-party sales was as follows (based upon the country where the point of sale originated):

	2021	2020	2019
Sales:			
United States[1]	$ 5,290	$ 4,246	$ 4,606
Netherlands[2]	2,644	—	—
Australia	2,092	1,884	2,249
Spain[3]	1,465	2,766	3,077
Brazil	610	346	428
Canada	11	31	5
Other	40	13	68
	$ 12,152	$ 9,286	$ 10,433

(1) Sales of a portion of the alumina from refineries in Australia and Brazil and most of the aluminum from smelters in Canada occurred in the United States. Additionally, sales of aluminum off-take related to an interest in the Saudi Arabia joint venture (see Note H) occurred in the United States beginning at the end of the third quarter of 2021.

(2) Sales of the aluminum produced from smelters in Iceland and Norway occurred in the Netherlands beginning at the end of the first quarter of 2021.

(3) Sales of the aluminum produced from smelters in Iceland and Norway occurred in Spain through most of the first quarter of 2021 and in the Netherlands thereafter. Sales of aluminum off-take related to an interest in the Saudi Arabia joint venture (see Note H), occurred in Spain through most of the third quarter of 2021 and in the United States thereafter.

Geographic information for long-lived assets was as follows (based upon the physical location of the assets):

December 31,	2021	2020
Long-lived assets:		
Australia	$ 2,091	$ 2,282
Brazil	1,118	1,215
Iceland	1,048	1,102
Canada	958	1,002
United States	874	1,009
Norway	338	357
Spain	193	218
Other	3	5
	$ 6,623	$ 7,190

F. Earnings Per Share

Basic earnings per share (EPS) amounts are computed by dividing Net income (loss) attributable to Alcoa Corporation by the average number of common shares outstanding. Diluted EPS amounts assume the issuance of common stock for all potentially dilutive share equivalents outstanding.

The share information used to compute basic and diluted EPS attributable to Alcoa Corporation common shareholders was as follows (shares in millions):

	2021	2020	2019
Average shares outstanding—basic	186	186	185
Effect of dilutive securities:			
Stock options	—	—	—
Stock units	4	—	—
Average shares outstanding—diluted	190	186	185

Options to purchase less than two hundred thousand shares of common stock outstanding as of December 31, 2021 at a weighted average exercise price of $38.67 per share were not included in the computation of diluted EPS because the exercise prices of these options were greater than the annual average market price of Alcoa Corporation's common stock.

In 2020, basic average shares outstanding and diluted average shares outstanding were the same because the effect of potential shares of common stock was anti-dilutive. Had Alcoa generated net income in 2020, one million common share equivalents related to five million outstanding stock units and stock options combined would have been included in diluted average shares outstanding for the respective period. Options to purchase two million shares of common stock outstanding at December 31, 2020 had a weighted average exercise price of $26.85 per share which was greater than the annual average market price per share of Alcoa Corporation's common stock.

In 2019, basic average shares outstanding and diluted average shares outstanding were the same because the effect of potential shares of common stock was anti-dilutive. Had Alcoa generated net income in 2019, one million common share equivalents related to four million outstanding stock units and stock options combined would have been included in diluted average shares outstanding for the respective period. Options to purchase two million shares of common stock outstanding at December 31, 2019 had a weighted average exercise price of $32.66 per share which was greater than the annual average market price per share of Alcoa Corporation's common stock.

G. Accumulated Other Comprehensive Loss

The following table details the activity of the three components that comprise Accumulated other comprehensive loss for both Alcoa Corporation's shareholders and noncontrolling interest:

	Alcoa Corporation			Noncontrolling interest		
	2021	2020	2019	2021	2020	2019
Pension and other postretirement benefits (O)						
Balance at beginning of period	$ (2,536)	$ (2,282)	$ (2,283)	$ (67)	$ (56)	$ (46)
Other comprehensive income (loss):						
Unrecognized net actuarial gain (loss) and prior service cost/benefit	550	(545)	(309)	30	(19)	(14)
Tax (expense) benefit	(37)	31	28	(6)	3	—
Total Other comprehensive income (loss) before reclassifications, net of tax	513	(514)	(281)	24	(16)	(14)
Amortization of net actuarial loss and prior service cost/benefit[1]	1,144	269	299	30	6	5
Tax expense[2]	(3)	(9)	(17)	—	(1)	(1)
Total amount reclassified from Accumulated other comprehensive loss, net of tax[6]	1,141	260	282	30	5	4
Total Other comprehensive income (loss)	1,654	(254)	1	54	(11)	(10)
Balance at end of period	$ (882)	$ (2,536)	$ (2,282)	$ (13)	$ (67)	$ (56)
Foreign currency translation						
Balance at beginning of period	$ (2,385)	$ (2,160)	$ (2,071)	$ (844)	$ (834)	$ (810)
Other comprehensive loss	(229)	(225)	(89)	(93)	(10)	(24)
Balance at end of period	$ (2,614)	$ (2,385)	$ (2,160)	$ (937)	$ (844)	$ (834)
Cash flow hedges (P)						
Balance at beginning of period	$ (708)	$ (532)	$ (211)	$ (1)	$ 20	$ 31
Other comprehensive loss:						
Net change from periodic revaluations	(782)	(345)	(437)	(2)	(36)	20
Tax benefit (expense)	140	74	83	1	10	(6)
Total Other comprehensive (loss) income before reclassifications, net of tax	(642)	(271)	(354)	(1)	(26)	14
Net amount reclassified to earnings:						
Aluminum contracts[3]	288	66	44	—	—	—
Financial contracts[4]	2	15	(43)	1	6	(35)
Foreign exchange contracts[3]	(3)	20	18	—	—	—
Interest rate contracts[5]	8	5	4	1	—	—
Sub-total	295	106	23	2	6	(35)
Tax (expense) benefit[2]	(41)	(11)	10	(1)	(1)	10
Total amount reclassified from Accumulated other comprehensive loss, net of tax[6]	254	95	33	1	5	(25)
Total Other comprehensive loss	(388)	(176)	(321)	—	(21)	(11)
Balance at end of period	$ (1,096)	$ (708)	$ (532)	$ (1)	$ (1)	$ 20
Total Accumulated other comprehensive loss	$ (4,592)	$ (5,629)	$ (4,974)	$ (951)	$ (912)	$ (870)

(1) These amounts were included in the computation of net periodic benefit cost for pension and other postretirement benefits. The amounts related to settlements and/or curtailments of certain pension and other postretirement benefits for Alcoa Corporation include $952, $55, and $116 for the years ended December 31, 2021, 2020, and 2019, respectively. The amounts related to settlements and/or curtailments of certain pension and other postretirement benefits for Noncontrolling interest include $25, $3, and $3 for the years ended December 31, 2021, 2020, and 2019, respectively (see Note O).

(2) These amounts were reported in Provision for income taxes on the accompanying Statement of Consolidated Operations.

(3) These amounts were reported in Sales on the accompanying Statement of Consolidated Operations.

(4) These amounts were reported in Cost of goods sold on the accompanying Statement of Consolidated Operations.

(5) These amounts were included in Other (income) expenses, net on the accompanying Statement of Consolidated Operations.

(6) A positive amount indicates a corresponding charge to earnings and a negative amount indicates a corresponding benefit to earnings.

H. Investments

December 31,	2021	2020
Equity investments	$ 1,189	$ 1,041
Other investments	10	10
	$ 1,199	$ 1,051

Equity Investments. The following table summarizes information of Alcoa Corporation's equity investments as of December 31, 2021 and 2020. In 2021, 2020, and 2019, Alcoa Corporation received $50, $44, and $39, respectively, in dividends from these equity investments. Each of the investees either owns the facility listed or has an ownership interest in an entity that owns the facility listed:

Investee	Country	Nature of investment	Income Statement Location of Equity Earnings	Ownership interest
Ma'aden Aluminum Company	Saudi Arabia	Aluminum smelter and casthouse	Other (income) expenses, net	25.1%
Ma'aden Bauxite and Alumina Company	Saudi Arabia	Bauxite mine and alumina refinery	Other (income) expenses, net	25.1%
Halco Mining, Inc.	Guinea	Bauxite mine	Cost of goods sold	45%
Energética Barra Grande S.A.	Brazil	Hydroelectric generation facility	Cost of goods sold	42.18%
Pechiney Reynolds Quebec, Inc.	Canada	Aluminum smelter	Cost of goods sold	50%
Consorcio Serra do Facão	Brazil	Hydroelectric generation facility	Cost of goods sold	34.97%
Mineração Rio do Norte S.A.	Brazil	Bauxite mine	Cost of goods sold	18.2%
Manicouagan Power Limited Partnership	Canada	Hydroelectric generation facility	Cost of goods sold	40%
ELYSIS™ Limited Partnership	Canada	Aluminum smelting technology	Other (income) expenses, net	48.235%

Saudi Arabia Joint Venture—Alcoa Corporation and Ma'aden have a 30-year (from December 2009) joint venture shareholders agreement (automatic extension for an additional 20 years, unless the parties agree otherwise or unless earlier terminated) setting forth the terms for the development, construction, ownership, and operation of an integrated aluminum complex in Saudi Arabia. The project developed by the joint venture consists of a bauxite mine from the Al Ba'itha bauxite deposit in the northern part of Saudi Arabia, an alumina refinery, a primary aluminum smelter, and an aluminum rolling mill.

The joint venture is owned 74.9% by Ma'aden and 25.1% by Alcoa Corporation and originally consisted of three separate companies as follows: the bauxite mine and alumina refinery (MBAC), the smelter (MAC), and the rolling mill (MRC). In June 2019, Alcoa Corporation and Ma'aden amended the joint venture agreement that governs the operations of each of the three companies that comprise the joint venture. Under the terms of the agreement, Alcoa Corporation transferred its 25.1% interest in MRC to Ma'aden and, as a result, has no further direct or indirect equity interest in MRC. Refer to Note D for additional information related to the agreement amendment.

A number of Alcoa Corporation employees perform various types of services for the smelting and mining and refining companies as part of the operation of the fully integrated aluminum complex. At December 31, 2021 and 2020, the Company had an aggregate outstanding receivable of $2 and $5, respectively, from the smelting, rolling mill, and mining and refining companies for labor and other employee-related expenses.

As of December 31, 2021 and 2020, the carrying value of Alcoa's investment in this joint venture was $687 and $559, respectively.

ELYSIS™ Limited Partnership—In June 2018, Alcoa Corporation, Rio Tinto Alcan Inc. (Rio Tinto), and Investissement Québec, a company wholly-owned by the Government of Québec, Canada, launched a new joint venture, ELYSIS™ Limited Partnership (ELYSIS™). The purpose of this partnership is to advance larger scale development and commercialization of its patent-protected technology that produces oxygen and eliminates all direct greenhouse gas emissions from the traditional aluminum smelting process. Alcoa and Rio Tinto plc, as general partners, each own a 48.235% stake in ELYSIS™, and the Québec provincial government, as a limited partner, owns a 3.53% stake. The federal government of Canada and Apple Inc., as well as the Québec provincial government, are providing initial financing to the partnership.

The total planned combined investment (equity and debt) of the five participants in the joint venture was updated in the fourth quarter of 2021 to $289 (C$369). Alcoa and Rio Tinto plc will each invest $76 (C$97) in the joint venture, as well as contribute and license certain intellectual property and patents to ELYSIS™. Through December 31, 2021, the Company has contributed $23 (C$30) toward its investment commitment in ELYSIS™. In addition to cash contributions, Alcoa is contributing approximately $3 annually to cover overhead expenses incurred by Alcoa and charged to the joint venture. The Company's basis in the investment has been reduced to zero for its share of losses incurred to date. As a result, the Company has $55 in unrecognized losses as of December 31, 2021 that will be recognized upon additional contributions into the partnership.

The following table summarizes the profit and loss data for the respective periods ended December 31, as it relates to Alcoa Corporation's equity investments. Information shown for the Saudi Arabia Joint Venture for 2021 and 2020 includes the combined balances for MAC and MBAC. For 2019, the information shown for the Saudi Arabia Joint Venture includes the full period for both MAC and MBAC, and the data for MRC through the divestiture date. The investments are grouped based on the nature of the

investment. The Mining investments are part of the Bauxite segment, while the Energy and Other investments are primarily part of the Aluminum segment.

	Saudi Arabia Joint Venture	Mining	Energy	Other
2021				
Sales	$ 3,127	$ 794	$ 264	$ 404
Cost of goods sold	2,083	571	135	365
Net (loss) income	495	30	114	(42)
Equity in net income (loss) of affiliated companies, before reconciling adjustments	124	18	45	(20)
Other	(8)	5	(1)	25
Alcoa Corporation's equity in net (loss) income of affiliated companies	116	23	44	5
2020				
Sales	$ 2,279	$ 841	$ 238	$ 316
Cost of goods sold	1,829	543	107	283
Net (loss) income	(108)	46	74	(24)
Equity in net (loss) income of affiliated companies, before reconciling adjustments	(27)	23	31	(11)
Other	(7)	(1)	2	14
Alcoa Corporation's equity in net (loss) income of affiliated companies	(34)	22	33	3
2019				
Sales	$ 3,185	$ 846	$ 269	$ 159
Cost of goods sold	2,722	580	143	151
Net (loss) income	(198)	35	107	(28)
Equity in net (loss) income of affiliated companies, before reconciling adjustments	(50)	16	42	(13)
Other	3	5	1	16
Alcoa Corporation's equity in net (loss) income of affiliated companies	(47)	21	43	3

The following table summarizes the balance sheet data for Alcoa Corporation's equity investments.

	Saudi Arabia Joint Venture	Mining	Energy	Other
2021				
Current assets	$ 1,748	$ 142	$ 96	$ 246
Noncurrent assets	7,330	852	316	755
Current liabilities	956	158	17	95
Noncurrent liabilities	5,018	331	27	73
2020				
Current assets	$ 1,099	$ 143	$ 119	$ 219
Noncurrent assets	7,648	828	401	757
Current liabilities	794	206	27	66
Noncurrent liabilities	5,347	331	113	62

I. Receivables

On October 25, 2019, a wholly-owned subsidiary of the Company entered into a $120 three-year revolving credit facility agreement secured by certain customer receivables. Alcoa Corporation guaranteed the performance obligations of the wholly-owned subsidiary under the facility; however no assets (other than the receivables) were pledged as collateral.

On April 20, 2020, the Company amended this agreement converting it to a Receivables Purchase Agreement to sell up to $120 of the receivables previously secured by the credit facility without recourse on a revolving basis. The unsold portion of the specified receivable pool is pledged as collateral to the purchasing bank to secure the sold receivables.

On November 8, 2021, the Company terminated the Receivables Purchase Agreement. No receivables were sold under this agreement.

J. Inventories

December 31,	2021	2020
Finished goods	$ 538	$ 321
Work-in-process	85	112
Bauxite and alumina	539	412
Purchased raw materials	619	377
Operating supplies	175	176
	$ 1,956	$ 1,398

Inventories related to the Warrick Rolling Mill were excluded from the December 31, 2020 balances in the above table due to the sale of the rolling mill and were reclassified to Assets held for sale (see Note C).

K. Properties, Plants, and Equipment, Net

December 31,	2021	2020
Land and land rights, including mines	$ 264	$ 320
Structures (by type of operation):		
Bauxite mining	1,148	1,119
Alumina refining	2,400	2,474
Aluminum smelting and casting	3,298	3,447
Energy generation	339	360
Other	340	350
	7,525	7,750
Machinery and equipment (by type of operation):		
Bauxite mining	565	517
Alumina refining	3,946	4,180
Aluminum smelting and casting	5,877	6,111
Energy generation	836	844
Other	452	465
	11,676	12,117
	19,465	20,187
Less: accumulated depreciation, depletion, and amortization	13,130	13,332
	6,335	6,855
Construction work-in-progress	288	335
	$ 6,623	$ 7,190

Properties, plants, and equipment, net related to the Warrick Rolling Mill were excluded from the December 31, 2020 balances in the above table due to the sale of the rolling mill and were reclassified to Assets held for sale (see Note C).

L. Goodwill and Other Intangible Assets

Goodwill, which is included in Other noncurrent assets on the accompanying Consolidated Balance Sheet, was as follows:

December 31,	2021	2020
Bauxite	$ 2	$ 2
Alumina	2	2
Aluminum	—	—
Corporate[1]	140	141
	$ 144	$ 145

(1) The carrying value of Corporate's goodwill is net of accumulated impairment losses of $742 as of both December 31, 2021 and 2020. As of December 31, 2021, the $140 of goodwill reflected in Corporate is allocated to two of Alcoa Corporation's three reportable segments ($46 to Bauxite and $94 to Alumina) for purposes of impairment testing (see Note B). This goodwill is reflected in Corporate for segment reporting purposes because it is not included in management's assessment of performance by the two reportable segments.

Management performed a quantitative assessment for the Bauxite reporting unit in 2021. As a result of the assessment, the estimated fair value of the Bauxite reporting unit was substantially in excess of carrying value, resulting in no impairment.

Additionally, Management performed a qualitative assessment for the Alumina reporting unit in 2021 and determined that it was not more likely than not that the fair value of the reporting unit was less than carrying value. Management last performed a quantitative impairment test for the Alumina reporting unit in 2019. At the time of the quantitative assessment, the estimated fair value of the Alumina reporting unit was substantially in excess of carrying value, resulting in no impairment.

Other intangible assets, which are included in Other noncurrent assets on the accompanying Consolidated Balance Sheet, were as follows:

	2021			2020		
December 31,	Gross carrying amount	Accumulated amortization	Net carrying amount	Gross carrying amount	Accumulated amortization	Net carrying amount
Computer software	$ 214	$ (204)	$ 10	$ 236	$ (218)	$ 18
Patents and licenses	25	(9)	16	25	(8)	17
Other intangibles	19	(10)	9	20	(10)	10
Total other intangible assets	$ 258	$ (223)	$ 35	$ 281	$ (236)	$ 45

Computer software consists primarily of software costs associated with the enterprise business solution within Alcoa to drive common systems among all businesses.

Amortization expense related to the intangible assets in the tables above for the years ended December 31, 2021, 2020, and 2019 was $11, $9, and $19, respectively, and is expected to be approximately $10 annually from 2022 to 2026.

M. Debt

Short-term borrowings.

December 31,	2021	2020
Short-term borrowings	$ 75	$ 77

Short-term borrowings are reported in Other current liabilities on the accompanying Consolidated Balance Sheet.

Long-Term Debt.

December 31,	2021	2020
6.75% Notes, due 2024	$ —	$ 750
7.00% Notes, due 2026	—	500
5.500% Notes, due 2027	750	750
6.125% Notes, due 2028	500	500
4.125% Notes, due 2029	500	—
Other	5	6
Unamortized discounts and deferred financing costs	(28)	(41)
Total	1,727	2,465
Less: amount due within one year	1	2
Long-term debt, less amount due within one year	$ 1,726	$ 2,463

The principal amount of long-term debt maturing in each of the next five years is: $1 in each of 2022, 2023, 2024, and 2025, $0 in 2026.

144A Debt.

2029 Notes. In March 2021, Alcoa Nederland Holding B.V. (ANHBV), a wholly-owned subsidiary of Alcoa Corporation, completed a Rule 144A (U.S. Securities Act of 1933, as amended) debt issuance for $500 aggregate principal amount of 4.125% Senior Notes due 2029 (the 2029 Notes) with the following terms:

- Net proceeds were approximately $493, reflecting a discount to the initial purchasers as well as issuance costs. The discount, as well as costs to complete the financing, were deferred and are being amortized to interest expense over the term.
- Interest is paid semi-annually in March and September, which commenced September 30, 2021.

- Indenture contains customary affirmative and negative covenants, see below.
- Option to redeem on at least 10 days, but not more than 60 days, prior notice to the holders under multiple scenarios, including, in whole or in part, at any time, or from time to time after March 31, 2024, at a redemption price up to 102.063% of the principal amount, plus any accrued and unpaid interest.
- Subject to repurchase upon the occurrence of a change in control repurchase event (as defined in the indenture) at a repurchase price in cash equal to 101% of the aggregate principal amount of the notes repurchased, plus any accrued and unpaid interest.

The Company used the net proceeds of the 2029 Notes, together with cash on hand, to contribute $500 to its U.S. defined benefit pension plans applicable to salaried and hourly employees on April 1, 2021 (see Note O), to redeem in full $750 aggregate principal amount of the Company's outstanding 6.75% Senior Notes due 2024 (the 2024 Notes) on April 7, 2021, and to pay transaction-related fees and expenses.

2027 Notes. In July 2020, ANHBV completed a Rule 144A debt issuance for $750 aggregate principal amount of 5.500% Senior Notes due 2027 (the 2027 Notes) with the following terms:

- Net proceeds were approximately $736, reflecting a discount to the initial purchasers as well as issuance costs. The discount, as well as costs to complete the financing, were deferred and are being amortized to interest expense over the term.
- Interest is paid semi-annually in June and December, which commenced on December 15, 2020.

- Indenture contains customary affirmative and negative covenants, see below.
- Option to redeem on at least 15 days, but not more than 60 days, prior notice to the holders under multiple scenarios, including, in whole or in part, at any time, or from time to time after June 15, 2023, at a redemption price up to 102.750% of the principal amount, plus any accrued and unpaid interest.
- Subject to repurchase upon the occurrence of a change in control repurchase event (as defined in the indenture) at a repurchase price in cash equal to 101% of the aggregate principal amount of the notes repurchased, plus any accrued and unpaid interest.

The Company used the net proceeds of the 2027 Notes for general corporate purposes, including adding cash to its balance sheet.

2028 Notes. In May 2018, ANHBV completed a Rule 144A debt issuance for $500 aggregate principal amount of 6.125% Senior Notes due 2028 (the 2028 Notes) with the following terms:

- Net proceeds were approximately $492, reflecting a discount to the initial purchasers as well as issuance costs. The discount, as well as costs to complete the financing, were deferred and are being amortized to interest expense over the term.
- Interest is paid semi-annually in November and May, which commenced November 15, 2018.

- Indenture contains customary affirmative and negative covenants, see below.
- Option to redeem on at least 30 days, but not more than 60 days, prior notice to the holders under multiple scenarios, including, in whole or in part, at any time, or from time to time after May 2023, at a redemption price up to 103.063% of the principal amount, plus any accrued and unpaid interest.
- Subject to repurchase upon the occurrence of a change in control repurchase event (as defined in the indenture) at a repurchase price in cash equal to 101% of the aggregate principal amount of the notes repurchased, plus any accrued and unpaid interest.

The Company used the net proceeds of the 2028 Notes, together with cash on hand, to make discretionary contributions to certain U.S. defined benefit pension plans.

The indentures of the 2027 Notes, 2028 Notes, and 2029 Notes contain customary affirmative and negative covenants, such as limitations on liens, limitations on sale and leaseback transactions, and a prohibition on a reduction in the ownership of AWAC entities below an agreed level. The negative covenants in the indentures are less extensive than those in the Facility (see below). For example, the indentures do not include a limitation on restricted payments, such as repurchases of common stock and shareholder dividends.

The 2027 Notes, the 2028 Notes, and the 2029 Notes are senior unsecured obligations of ANHBV and do not entitle the holders to any registration rights pursuant to a registration rights agreement. ANHBV does not intend to file a registration statement with respect to resales of or an exchange offer for the notes. The notes are guaranteed on a senior unsecured basis by Alcoa Corporation and its subsidiaries that are guarantors under the Facility (the "subsidiary guarantors" and, together with Alcoa Corporation, the "guarantors"). Each of the subsidiary guarantors will be released from their guarantees upon the occurrence of certain events, including the release of such guarantor from its obligations as a guarantor under the Facility.

The 2027 Notes, the 2028 Notes, and the 2029 Notes rank equally in right of payment with each other and with all of ANHBV'S existing and future senior unsecured indebtedness; rank senior in right of payment to any future subordinated obligations of ANHBV; and are effectively subordinated to ANHBV's existing and future secured indebtedness, including under the Facility, to the extent of the value of property and assets securing such indebtedness. The guarantees of the notes rank equally in right of payment with each other and with all the guarantors' existing and future senior unsecured indebtedness; rank senior in right of payment to any future subordinated obligations of the guarantors; and are effectively subordinated to the guarantors' existing and future secured indebtedness, including under the Facility, to the extent of the value of property and assets securing such indebtedness.

Redemption events. On April 7, 2021, the Company redeemed in full $750 aggregate principal amount notes due in 2024 at a redemption price equal to 103.375% of the principal amount, plus accrued and unpaid interest. The issuance of the 2029 Notes and this redemption were determined to be an issuance of new debt and an extinguishment of existing debt. As a result, the Company recorded a loss of $32 on the extinguishment of debt in the second quarter of 2021 in Interest expense, which was comprised of the redemption premium and the write-off of deferred financing fees and unamortized debt issuance costs. The cash flows related to the transaction were classified as financing cash flows.

On September 30, 2021, the Company redeemed in full $500 aggregate principal amount notes due in 2026 at a redemption price equal to 103.5% of the principal amount, plus accrued and unpaid interest. As a result, the Company recorded a loss of $22 on the extinguishment of debt in the third quarter of 2021 in Interest expense, which was comprised of the redemption premium and the write-off of deferred financing fees and unamortized debt issuance costs. The cash flows related to the transaction were classified as financing cash flows.

Credit Facilities.

Alcoa Norway ANS

On October 2, 2019, Alcoa Norway ANS, a wholly-owned subsidiary of Alcoa Corporation, entered into a one-year, multicurrency revolving credit facility agreement for NOK 1.3 billion (approximately $149) which was fully and unconditionally guaranteed on an unsecured basis by Alcoa Corporation. The maturity date of the facility was subsequently extended by one year.

On April 8, 2020, Alcoa Norway ANS drew $100 against this facility. Repayment of the drawn amount, including interest accrued at 2.93%, occurred upon maturity on June 29, 2020.

In September 2021, Alcoa Norway ANS made the decision not to extend the maturity of the facility allowing it to expire, effective October 4, 2021. During 2021, no amounts were drawn related to this credit facility. In all periods, Alcoa Norway ANS was in compliance with related covenants.

Revolving Credit Facility

The Company has a senior secured $1,500 revolving credit and letter of credit facility in place for working capital and/or other general corporate purposes (the Facility). The Facility was established on September 16, 2016, was amended in each of 2017, 2018, 2019, 2020, and 2021, and is scheduled to mature on November 21, 2023. Subject to the terms and conditions under the Facility, the Company may borrow funds or issue letters of credit through its Alcoa Corporation or ANHBV legal entities. Borrowings can be executed in U.S. dollar, and letter of credit issuances are limited to $750. Effective January 1, 2022, the Company agreed to suspend borrowings denominated in euros due to reference rate reform and the phase-out of LIBOR. This suspension of borrowing denominated in euros will not materially impact the Company or its ability to access capital, if necessary.

The Facility is secured by, subject to certain exceptions, a first priority security interest in substantially all assets of Alcoa Corporation, ANHBV, the material domestic wholly-owned subsidiaries of Alcoa Corporation, and the material foreign wholly-owned subsidiaries of Alcoa Corporation located in Australia, Brazil, Canada, Luxembourg, the Netherlands, Norway, and Switzerland. This includes equity interests of certain subsidiaries that directly hold equity interests in AWAC entities. However, no AWAC entity is a guarantor of any obligation under the Facility and no asset of any AWAC entity, or equity interests in any AWAC entity, will be pledged to secure the obligations under the Facility. As provided in the Facility, each of the mentioned companies shall be released from all obligations under the first priority security interest upon (i) Alcoa Corporation attaining at least a Baa3 rating from either Moody's Investor Service or BBB- rating from Standard and Poor's Global Ratings, in each case with a stable outlook or better, (ii) ANHBV delivering the required written notice, and (iii) no default or event of default, as defined in the Facility, has occurred or is continuing.

The Facility includes several customary affirmative and negative covenants (applicable to Alcoa Corporation and certain subsidiaries described as restricted), that, subject to certain exceptions, include limitations on (among other things): indebtedness, liens, investments, sales of assets, restricted payments, entering into restrictive agreements, a covenant prohibiting reductions in the ownership of AWAC entities, and certain other specified restricted subsidiaries of Alcoa Corporation, below an agreed level. The Facility also contains customary events of default, including failure to make payments under the Facility, cross-default and cross-judgment default, and certain bankruptcy and insolvency events. In addition, the Facility contains two financial covenants, a leverage ratio and an interest expense coverage ratio, that impact availability of the $1,500 commitment and pricing.

As of December 31, 2021, the Company was in compliance with all covenants. The maximum additional borrowing capacity available to the Company to remain in compliance with the maximum leverage ratio covenant in the Facility was approximately $6,610. Therefore, the Company may access the entire amount of commitments under the Facility. There were no borrowings outstanding at December 31, 2021 and 2020, and no amounts were borrowed during 2021 and 2020 under the Facility.

On March 4, 2021, Alcoa Corporation and ANHBV, entered into an amendment (Amendment No. 4) to the Facility that provided additional flexibility to the Company by (i) increasing the maximum leverage ratio from 2.50 to 1.00 to 2.75 to 1.00, (ii) decreasing the minimum interest expense coverage ratio from 5.00 to 1.00 to 4.00 to 1.00, (iii) amending the definition of Total Indebtedness (as defined in the Facility) to permit the Company to exclude the principal amount of new senior notes issued during 2021 from indebtedness for purposes of the calculation of the leverage ratio in fiscal year 2021 (subject to adjustments based on pension obligations funded), and (iv) ending temporary restrictions on the Company's ability to make certain restricted payments or incur incremental loans under the Facility. Amendment No. 4 also (i) provided additional debt capacity to permit the Company to issue up to $750 in aggregate principal amount of new senior notes prior to the end of fiscal year 2021 and (ii) provided a corresponding increase in the maximum leverage ratio commensurate with the increase in leverage resulting from the issuance of such notes up to the amount of pension obligations funded after the issuance of such notes but prior to December 31, 2021, which increase shall in any event not be in excess of the principal amount of such notes. Such additional increase in the maximum leverage ratio will be available beginning March 31, 2022.

N. Preferred and Common Stock

Preferred Stock. Alcoa Corporation is authorized to issue 100,000,000 shares of preferred stock at a par value of $0.01 per share. At December 31, 2021 and 2020, the Company had no issued preferred stock.

Common Stock. Alcoa Corporation is authorized to issue 750,000,000 shares of common stock at a par value of $0.01 per share. As of December 31, 2021 and 2020, Alcoa Corporation had 184,099,748 and 185,978,069, respectively, issued and outstanding shares of common stock.

Under its employee stock-based compensation plan, the Company issued shares of 1,305,979 in 2021, 397,903 in 2020, and 809,917 in 2019. The Company issues new shares to satisfy the exercise of stock options and the conversion of stock units. As of December 31, 2021, 23,463,347 shares of common stock were available for issuance.

Share Repurchase

In October 2018, Alcoa Corporation's Board of Directors approved a common stock repurchase program under which the Company may purchase shares of its outstanding common stock up to an aggregate transactional value of $200, depending on cash availability, market conditions, and other factors.

In October 2021, Alcoa Corporation's Board of Directors approved a new common stock repurchase program under which the Company may purchase shares of its outstanding common stock up to an aggregate transactional value of $500, depending on cash availability, market conditions, and other factors.

Repurchases under these programs may be made using a variety of methods, which may include open market purchases, privately negotiated transactions, or pursuant to a Rule 10b5-1 plan. These programs do not have predetermined expiration dates. Alcoa Corporation intends to retire repurchased shares of common stock.

In the fourth quarter of 2021, the Company repurchased 3,184,300 shares of its common stock for $150; the shares were immediately retired. These purchases exhausted the remaining dollar value of shares that were available for repurchase under the Board of Directors' October 2018 authorization. No shares were repurchased in 2020 or 2019.

The Company has remaining authorization to repurchase up to a total of $500, in the aggregate, of its outstanding shares of common stock, under the new share repurchase program approved in 2021.

Dividend

Dividends on common stock are subject to authorization by Alcoa Corporation's Board of Directors.

On October 14, 2021, the Company announced the initiation of a quarterly cash dividend on its common stock. The Board of Directors declared the first quarterly cash dividend of $0.10 per share of the Company's common stock, paid on November 19, 2021 to stockholders of record as of the close of business on October 29, 2021.

The Company did not declare any dividends in 2020 or 2019.

Stock-based Compensation

Stock options and restricted stock units are generally granted in either January or February each calendar year to eligible employees (the Company's Board of Directors also receive certain stock units; however, these amounts are not material). Stock options were historically granted at the closing market price of Alcoa Corporation's common stock on the date of grant and grade vest over a three-year service period (1/3 each year) with a ten-year contractual term. As of January 1, 2021, the Company no longer grants new stock options. Time-based restricted stock units (RSUs) generally cliff vest on the third anniversary of the award grant date. The Company also grants performance restricted stock units (PRSUs), which are subject to performance conditions.

The final number of PRSUs earned is dependent on Alcoa Corporation's achievement of certain targets over a three-year measurement period for grants. For PRSUs granted in 2019, the award was earned at the end of the measurement period of January 1, 2019 through December 31, 2021 based on performance against two measures: (1) the Company's total shareholder return measured against the total shareholder return of the Standard & Poor's 500® Index; and (2) a pre-established return-on-capital target. For PRSUs granted in 2020, the award will be earned at the end of the measurement period of January 1, 2020 through December 31, 2022 based on performance against four measures: (1) the Company's total shareholder return measured against the ranked total shareholder return of the Standard & Poor's Metals and Mining Select Industry Index components; (2) a pre-established return-on-equity target; (3) an improvement in proportional net debt; and (4) a reduction in carbon intensity in both refining (through reduced carbon dioxide emissions) and smelting (through increased production from renewable energy) operations. For PRSUs granted in 2021, the award will be earned at the end of the measurement period of January 1, 2021 through December 31, 2023 based on performance against four measures: (1) the Company's total shareholder return measured against the ranked total shareholder return of the Standard & Poor's Metals and Mining Select Industry Index components; (2) a pre-established return-on-equity target; (3) an improvement in proportional net debt; and (4) a reduction in carbon intensity in both refining (through reduced carbon dioxide emissions) and smelting (through increased production from renewable energy) operations.

In 2021, 2020, and 2019, Alcoa Corporation recognized stock-based compensation expense of $39, $25, and $30, respectively, of which approximately 85% to 95% was related to stock units in each period. There was no stock-based compensation expense capitalized in 2021, 2020, or 2019.

Stock-based compensation expense is based on the grant date fair value of the applicable equity grant. For both RSUs and PRSUs, the fair value was equivalent to the closing market price of Alcoa Corporation's common stock on the date of grant in the respective periods. For stock units with a market condition, the fair value was estimated on the date of grant using a Monte Carlo simulation model, which generated a result of $39.88, $21.43, and $35.70 per unit in 2021, 2020, and 2019, respectively. The Monte Carlo simulation model uses certain assumptions to estimate the fair value of a market-based stock unit, including volatility (60.19%, 41.65%, and 42.04% in 2021, 2020, and 2019, respectively, for the Company) and a risk-free interest rate (0.22%, 1.38%, and 2.57%

in 2021, 2020, and 2019, respectively), to estimate the probability of satisfying market conditions. For stock options, the fair value was estimated on the date of grant using a lattice pricing model, which generated a result of $6.12, and $10.86 per option in 2020, and 2019, respectively. There were no stock options granted in 2021. The lattice pricing model uses several assumptions to estimate the fair value of a stock option, including an average risk-free interest rate, dividend yield, volatility, annual forfeiture rate, exercise behavior, and contractual life.

The activity for stock options and stock units during 2021 was as follows:

	Stock options		Stock units	
	Number of options	Weighted average exercise price	Number of units	Weighted average FMV per unit
Outstanding, January 1, 2021	2,036,625	$ 26.85	3,290,679	$ 24.19
Granted	—	—	1,736,527	23.34
Exercised	(1,032,864)	23.69	—	—
Converted	—	—	(371,300)	50.77
Expired or forfeited	(93,341)	34.80	(109,703)	18.92
Performance share adjustment	—	—	156,343	34.22
Outstanding, December 31, 2021	910,420	29.61	4,702,546	22.23

The number of Converted units includes 74,610 shares withheld to meet the Company's statutory tax withholding requirements related to the income earned by the employees as a result of vesting in the units.

As of December 31, 2021, the 910,420 outstanding stock options had a weighted average remaining contractual life of 5.45 years and a total intrinsic value of $27. Additionally, 585,774 of the total outstanding stock options were fully vested and exercisable and had a weighted average remaining contractual life of 4.67 years, a weighted average exercise price of $34.20, and a total intrinsic value of $15 as of December 31, 2021. Cash received from stock option exercises was $25, $1, and $2 in 2021, 2020, and 2019, respectively, and the total intrinsic value of stock options exercised during 2021, 2020, and 2019 was $17, $0, and $1, respectively.

At December 31, 2021, there was $30 (pretax) of combined unrecognized compensation expense related to non-vested grants of both stock options and stock units. This expense is expected to be recognized over a weighted average period of 1.72 years.

O. Pension and Other Postretirement Benefits

Defined Benefit Plans

Alcoa sponsors several defined benefit pension plans covering certain employees in the U.S. and foreign locations. Pension benefits generally depend on length of service, job grade, and remuneration. Substantially all benefits are paid through pension trusts that are sufficiently funded to ensure that all plans can pay benefits to retirees as they become due. Most salaried and non-bargaining hourly U.S. employees hired after March 1, 2006 participate in a defined contribution plan instead of a defined benefit plan.

The Company also maintains health care and life insurance postretirement benefit plans covering certain eligible U.S. retired employees and certain retirees from foreign locations. Generally, the medical plans are unfunded and pay a percentage of medical expenses, reduced by deductibles and other coverage. Life benefits are generally provided by insurance contracts. The Company retains the right, subject to existing agreements, to change or eliminate these benefits. All salaried and certain non-bargaining hourly U.S. employees hired after January 1, 2002 and certain bargaining hourly U.S. employees hired after July 1, 2010 are not eligible for postretirement health care benefits. All salaried and certain hourly U.S. employees that retire on or after April 1, 2008 are not eligible for postretirement life insurance benefits.

As of January 1, 2021, the pension benefit plans and the other postretirement benefit plans covered an aggregate of approximately 37,000 and approximately 24,000 participants, respectively.

2021 Plan Actions. In 2021, management initiated the following actions to certain pension and other postretirement benefit plans:

Action #1 – On March 31, 2021, Alcoa completed the sale of the Warrick Rolling Mill to Kaiser Aluminum Corporation for total consideration of $670, which included the assumption of $69 in other postretirement benefit liabilities. Approximately 1,150 employees at the rolling operations, which includes the casthouse, hot mill, cold mills, and coating and slitting lines, became employees of Kaiser. As a result, the affected plan was remeasured, including an update to the discount rate used to determine the benefit obligation of the plan. Accrued other postretirement benefits reflects a decrease of $40 related to the remeasurement in addition to the $69 assumed by Kaiser. Further, Alcoa recognized a curtailment gain of $17 and a settlement charge of $26.

Action #2 – In the second quarter of 2021, settlement accounting and a related plan remeasurement was triggered within Alcoa's U.S. salaried pension plan as a result of a high number of participants electing lump sum payments. This includes former employees of the

Warrick Rolling Mill, as well as other Alcoa employees making this election at retirement. Alcoa recorded a $90 decrease to Accrued pension benefits related to this remeasurement and recognized a settlement charge of $39.

Action #3 – In the third quarter of 2021, settlement accounting and a related plan remeasurement was triggered within Alcoa's U.S. salaried pension plan as a result of participants electing lump sum payments. Alcoa recorded a $7 increase to Accrued pension benefits related to this remeasurement and recognized a settlement charge of $7.

Action #4 – In the third quarter of 2021, settlement accounting and a related plan remeasurement was triggered within Alcoa's Australian pension plan as a result of participants electing lump sum payments. Alcoa recorded a $38 decrease to Accrued pension benefits related to this remeasurement and recognized a settlement charge of $1.

Action #5 – In the fourth quarter of 2021, the Company purchased a group annuity contract to transfer the obligation to pay the remaining retirement benefits of approximately 800 retirees and deferred vested participants from one of its Suriname pension plans to an insurance company. The transfer of $55 in both plan obligations and plan assets were completed on October 19, 2021. As a result, the Company recorded a settlement loss of $63 in Restructuring and other charges, net on the Statement of Consolidated Operations in the fourth quarter of 2021.

Action #6 – In the fourth quarter of 2021, settlement accounting and related plan remeasurements were triggered within Alcoa's U.S. pension plans as a result of the Company purchasing group annuity contracts to transfer the obligation to pay remaining retirement benefits of approximately 14,000 retirees and beneficiaries from its U.S. defined benefit pension plans and transferred approximately $1,540 in both plan obligations and plan assets. The transfers were completed on November 23, 2021 and December 16, 2021. As a result, the Company recorded a $84 decrease to Accrued pension benefits related to this remeasurement and recognized a non-cash settlement loss of $848 (pre- and after-tax) in Restructuring and other charges, net on the Statement of Consolidated Operations in the fourth quarter of 2021.

Action #7 – In the fourth quarter of 2021, settlement accounting and related plan remeasurements were triggered within Alcoa's U.S. pension plans as a result of participants electing lump sum payments (and the group annuity contracts discussed in Action 6 above). Alcoa recorded a $1 decrease to Accrued pension benefits related to this remeasurement and recognized a settlement charge of $10**.**

The following table presents certain information and the financial impacts of these actions on the accompanying Consolidated Financial Statements:

Action #	Number of affected plan participants	Weighted average discount rate as of prior plan remeasurement date	Plan remeasurement date	Weighted average discount rate as of plan remeasurement date	Increase (decrease) to accrued pension benefits liability	Decrease to accrued other postretirement benefits liability	Curtailment gain[(1)]	Settlement charge[(1)]
1	~840	2.45%	March 31, 2021	3.06%	$ —	$ (106)	$ (17)	$ 26
2	~120	2.38%	June 30, 2021	2.71%	(90)	—	—	39
3	~20	2.71%	September 30, 2021	2.74%	7	—	—	7
4	~20	1.34%	September 30, 2021	1.53%	(38)	—	—	1
5	~800	N/A	N/A	N/A	N/A	—	—	63
6	~14,000	2.59%	November 30, 2021	2.79%	(84)	—	—	848
7	~60	2.59%	November 30, 2021	2.79%	(1)	—	—	10
					$ (206)	$ (106)	$ (17)	$ 994

(1) These amounts primarily represent the accelerated amortization of a portion of the existing prior service benefit for curtailments and net actuarial loss for settlements and were reclassified from Accumulated other comprehensive loss to Restructuring and other charges, net (see Note D) on the accompanying Statement of Consolidated Operations.

2020 Plan Actions. In 2020, management initiated the following actions to certain pension and other postretirement benefit plans:

Action #1 – In February 2020, the Company entered into a new, six-year collective bargaining agreement with the Union of Professional and Office Workers of the Alcoa Smelter of Baie-Comeau in Canada. Under the agreement, all unionized office employees that are participants in one of the Company's defined benefit pension plans ceased accruing retirement benefits for future service effective January 1, 2021. This change affected approximately 20 employees, who were transitioned to a target benefit plan, where the funding risk is assumed by the employees. The Company will contribute approximately 12% of these participants' eligible earnings to the new plan on an annual basis. Participants already collecting benefits or who terminated with a vested benefit under the defined benefit pension plan were not affected by these changes**.**

Action #2 – In February 2020, the Company notified all non-unionized hourly employees of Aluminerie de Deschambault, who are participants in one of the Company's defined benefit pension plans, that they will cease accruing retirement benefits for future service effective January 1, 2021. This change affected approximately 430 employees, who were transitioned to a to a member-funded pension plan, where the funding risk is assumed by the employees. The Company will contribute approximately 12% of these participants' eligible earnings to the new plan on an annual basis. Participants already collecting benefits or who terminated with a vested benefit under the defined benefit pension plan were not affected by these changes.

Action #3 – In April 2020**,** as part of the Company's portfolio review, Alcoa announced that it will curtail the remaining capacity at its Intalco smelter in Ferndale, Washington amid declining market conditions. The full curtailment was completed during the third quarter of 2020, and the workforce was reduced by approximately 685 people. As a result, curtailment accounting was triggered in the U.S. hourly defined benefit pension and retiree life plans (3a and 3b in the below table, respectively).

Action #4 – In September 2020, the Company and the United Steelworkers jointly notified certain U.S. retirees that their medical and prescription drug coverage will be provided through an insured group Medicare Advantage and Prescription Drug plan and will include an increase to participant contributions, effective January 1, 2021. These changes affected approximately 8,600 participants. Although the plan change and related remeasurement increased the other postretirement benefit liability by $74, the plan change lowered the Company's expected cash requirements for the program over the next five years.

Action #5 – In October 2020, the Company offered lump sum buyouts to specific participants in its U.S. defined benefit pension plans. As a result, the Company paid approximately $33 from plan assets on December 31, 2020 to approximately 430 participants, was relieved of the corresponding pension obligation of $35, and recognized a settlement charge of $44.

Action #6 – On November 30, 2020, Alcoa announced an agreement to sell the Warrick Rolling Mill to Kaiser. The sale closed on March 31, 2021. Approximately 1,170 employees at the rolling operations, which includes the casthouse, hot mill, cold mills, and coating and slitting lines, will become employees of Kaiser once the transaction is complete. As a result, Alcoa recognized a pension curtailment charge of $5 in the fourth quarter of 2020.

The following table presents certain information and the financial impacts of these actions on the accompanying Consolidated Financial Statements:

Action #	Number of affected plan participants	Weighted average discount rate as of December 31, 2019	Plan remeasurement date	Weighted average discount rate as of plan remeasurement date	Increase (decrease) to accrued pension benefits liability[1]	Increase to accrued other postretirement benefits liability[1]	Curtailment charge (gain)[2]	Settlement charge[2]
1	~20	3.15%	January 31, 2020	2.75%	$ 18	$ —	$ 1	$ —
2	~430	3.20%	January 31, 2020	2.75%	28	—	2	—
3a	~300	3.25%	April 30, 2020	2.92%	156	—	1	—
3b	~600	3.75%	April 30, 2020	3.44%	—	—	(2)	—
4	~8,600	3.11%	August 31, 2020	2.65%	—	74	—	—
5	~430	N/A	December 31, 2020	N/A	(2)	—	—	44
6	~900	N/A	December 31, 2020	N/A	5	—	5	—
	~11,280				$ 205	$ 74	$ 7	$ 44

(1) Actions 1-4 caused interim plan remeasurements, including an update to the discount rates used to determine the benefit obligations of the affected plans. These amounts include the impacts due to the interim plan remeasurements.

(2) These amounts primarily represent the accelerated amortization of a portion of the existing prior service cost or benefit for curtailments and net actuarial loss for settlements and were reclassified from Accumulated other comprehensive loss to Restructuring and other charges, net (see Note D) on the accompanying Statement of Consolidated Operations.

Obligations and Funded Status

December 31,	Pension benefits 2021	Pension benefits 2020	Other postretirement benefits 2021	Other postretirement benefits 2020
Change in benefit obligation				
Benefit obligation at beginning of year	$ 6,904	$ 6,532	$ 892	$ 848
Service cost	22	56	4	5
Interest cost	120	168	15	19
Amendments	—	1	—	(19)
Actuarial losses (gains)	(305)	578	(78)	133
Settlements	(1,763)	(127)	—	—
Curtailments	—	6	—	(1)
Benefits paid, net of participants' contributions	(362)	(381)	(56)	(100)
Medicare Part D subsidy receipts	—	—	2	7
Divestitures	—	(2)	(69)	—
Foreign currency translation impact	(22)	73	—	—
Benefit obligation at end of year	$ 4,594	$ 6,904	$ 710	$ 892
Change in plan assets				
Fair value of plan assets at beginning of year	$ 5,356	$ 5,015	$ —	$ —
Actual return on plan assets	513	455	—	—
Employer contributions	581	347	—	—
Participant contributions	5	10	—	—
Benefits paid	(356)	(379)	—	—
Administrative expenses	(4)	(24)	—	—
Settlements	(1,763)	(127)	—	—
Divestitures	—	(2)	—	—
Foreign currency translation impact	(26)	61	—	—
Fair value of plan assets at end of year	$ 4,306	$ 5,356	$ —	$ —
Funded status	$ (288)	$ (1,548)	$ (710)	$ (892)
Less: Amounts attributed to joint venture partners	(25)	(45)	—	—
Net funded status	$ (263)	$ (1,503)	$ (710)	$ (892)
Amounts recognized in the Consolidated Balance Sheet consist of:				
Noncurrent assets	$ 164	$ —	$ —	$ —
Current liabilities	(10)	(11)	(60)	(65)
Noncurrent liabilities	(417)	(1,492)	(650)	(744)
Liabilities held for sale	—	—	—	(83)
Net amount recognized	$ (263)	$ (1,503)	$ (710)	$ (892)
Amounts recognized in Accumulated Other Comprehensive Loss consist of:				
Net actuarial loss	$ 1,877	$ 3,563	$ 253	$ 374
Prior service cost (benefit)	2	2	(125)	(156)
Total, before tax effect	1,879	3,565	128	218
Less: Amounts attributed to joint venture partners	38	57	—	—
Net amount recognized, before tax effect	$ 1,841	$ 3,508	$ 128	$ 218
Other Changes in Plan Assets and Benefit Obligations Recognized in Other Comprehensive Income (Loss) consist of:				
Net actuarial loss (benefit)	$ (527)	$ 462	$ (74)	$ 133
Amortization of accumulated net actuarial loss	(1,159)	(263)	(47)	(20)
Prior service cost (benefit)	—	1	—	(19)
Amortization of prior service (cost) benefit	—	(4)	31	17
Total, before tax effect	(1,686)	196	(90)	111
Less: Amounts attributed to joint venture partners	(19)	15	—	—
Net amount recognized, before tax effect	$ (1,667)	$ 181	$ (90)	$ 111

At December 31, 2021, the benefit obligation, fair value of plan assets, and funded status for U.S. pension plans were $2,712, $2,681, and $(31), respectively. At December 31, 2020, the benefit obligation, fair value of plan assets, and funded status for U.S. pension plans were $4,695, $3,676, and $(1,019), respectively.

Pension Plan Benefit Obligations

	Pension benefits	
	2021	2020
The aggregate projected benefit obligation and accumulated benefit obligation for all defined benefit pension plans was as follows:		
Projected benefit obligation	$ 4,594	$ 6,904
Accumulated benefit obligation	4,438	6,702
The aggregate projected benefit obligation and fair value of plan assets for pension plans with projected benefit obligations in excess of plan assets was as follows:		
Projected benefit obligation	3,031	6,813
Fair value of plan assets	2,579	5,267
The aggregate accumulated benefit obligation and fair value of plan assets for pension plans with accumulated benefit obligations in excess of plan assets was as follows:		
Accumulated benefit obligation	2,918	6,210
Fair value of plan assets	2,579	4,805

Components of Net Periodic Benefit Cost

	Pension benefits[1]			Other postretirement benefits		
	2021	2020	2019	2021	2020	2019
Service cost	$ 22	$ 54	$ 48	$ 4	$ 5	$ 4
Interest cost[2]	116	164	221	15	19	36
Expected return on plan assets[2]	(281)	(292)	(325)	—	—	—
Recognized net actuarial loss[2]	190	212	171	21	20	10
Amortization of prior service cost (benefit)[2]	—	—	4	(14)	(15)	—
Settlements[3]	968	51	73	26	—	8
Curtailments[4]	—	9	38	(17)	(2)	—
Net periodic benefit cost[5]	$ 1,015	$ 198	$ 230	$ 35	$ 27	$ 58

(1) In 2021, 2020, and 2019, net periodic benefit cost for U.S pension plans was $962, $154, and $155, respectively.

(2) These amounts were reported in Other (income) expenses, net on the accompanying Statement of Consolidated Operations.

(3) These amounts were reported in Restructuring and other charges, net on the accompanying Statement of Consolidated Operations (see Note D). In 2021, settlements were due to management actions (see Plan Actions above). In 2020, settlements were due to management actions (see Plan Actions above) ($44) and payment of additional lump sum benefits ($7). In 2019, settlements were due to management actions (see Plan Actions above) ($74) and payment of additional lump sum benefits ($7).

(4) These amounts were reported in Restructuring and other charges, net on the accompanying Statement of Consolidated Operations (see Note D). In 2021, 2020, and 2019, curtailments were due to management actions (see Plan Actions above).

(5) Amounts attributed to joint venture partners are not included.

Assumptions. Weighted average assumptions used to determine benefit obligations for pension and other postretirement benefit plans were as follows:

December 31,	2021	2020
Discount rate—pension plans	2.99%	2.41%
Discount rate—other postretirement benefit plans	2.82	2.41
Rate of compensation increase—pension plans	3.11	2.58

The yield curve model used to develop the discount rate parallels the plans' projected cash flows and has a weighted average duration of 12 years. The underlying cash flows of the high-quality corporate bonds included in the model exceed the cash flows needed to satisfy the Company's plan obligations multiple times. If a deep market of high-quality corporate bonds does not exist in a country, then the yield on government bonds plus a corporate bond yield spread is used.

Weighted average assumptions used to determine net periodic benefit cost for pension and other postretirement benefit plans were as follows:

	2021	2020	2019
Discount rate—pension plans	1.91%	3.02%	3.89%
Discount rate—other postretirement benefit plans	1.99	2.84	3.94
Expected long-term rate of return on plan assets—pension plans	5.66	6.28	6.59
Rate of compensation increase—pension plans	2.58	3.25	3.26

For 2021, 2020, and 2019, the expected long-term rate of return used by management was based on the prevailing and planned strategic asset allocations, as well as estimates of future returns by asset class. For 2022, management anticipates that 4.94% will be the weighted average expected long-term rate of return.

In October 2019, the Society of Actuaries (SOA) issued updated base mortality tables (Pri-2012) and their annual update to the mortality improvement scale (MP-2019). These were both considered in developing the Company's updated mortality assumptions for U.S. pension and postretirement benefit obligations recorded at December 31, 2019, in connection with an experience study performed approximately every five years. The study resulted in the use of Pri-2012 base tables with an adjustment to reflect Alcoa's experience and a modified version of the MP-2019 improvement scales.

Assumed health care cost trend rates for U.S. other postretirement benefit plans were as follows (non-U.S. plans are not material):

	2021	2020	2019
Health care cost trend rate assumed for next year	5.5%	5.5%	5.5%
Rate to which the cost trend rate gradually declines	4.5%	4.5%	4.5%
Year that the rate reaches the rate at which it is assumed to remain	2026	2026	2023

The assumed health care cost trend rate is used to measure the expected cost of gross eligible charges covered by the Company's other postretirement benefit plans. For 2022, a 5.5% trend rate will be used, reflecting management's best estimate of the change in future health care costs covered by the plans.

Plan Assets. Alcoa's pension plan weighted average target and actual asset allocations at December 31, 2021 and 2020, by asset class, were as follows:

	Target asset allocation		Plan assets at December 31,	
Asset class	**2021**	**2020**	**2021**	**2020**
Equities	25%	30%	28%	39%
Fixed income	65	50	64	50
Other investments	10	20	8	11
Total	100%	100%	100%	100%

The principal objectives underlying the investment of the pension plan assets are to ensure that the Company can properly fund benefit obligations as they become due under a broad range of potential economic and financial scenarios, maximize the long-term investment return with an acceptable level of risk based on such obligations, and broadly diversify investments across and within various asset classes to protect asset values against adverse movements. Investment risk is controlled by rebalancing to target allocations on a periodic basis and ongoing monitoring of investment manager performance.

The portfolio includes an allocation to investments in long-duration corporate credit and government debt, public and private market equities, intermediate duration corporate credit and government debt, global-listed infrastructure, high-yield bonds and bank loans, real estate, and securitized credit.

Investment practices comply with the requirements of applicable laws and regulations in the respective jurisdictions, including the Employee Retirement Income Security Act of 1974 (ERISA) in the United States.

The following section describes the valuation methodologies used by the trustees to measure the fair value of pension plan assets. For plan assets measured at net asset value, this refers to the net asset value of the investment on a per share basis (or its equivalent) as a practical expedient. Otherwise, an indication of the level in the fair value hierarchy in which each type of asset is generally classified is provided (see Note P for the definition of fair value and a description of the fair value hierarchy).

Equities—These securities consist of: (i) direct investments in the stock of publicly traded U.S. and non-U.S. companies and are valued based on the closing price reported in an active market on which the individual securities are traded (generally classified in Level 1); (ii) the plans' share of commingled funds that are invested in the stock of publicly traded companies and are valued at net

asset value; and (iii) direct investments in long/short equity hedge funds and private equity (limited partnerships and venture capital partnerships) and are valued at net asset value.

Fixed income—These securities consist of: (i) U.S. government debt and are generally valued using quoted prices (included in Level 1); (ii) cash and cash equivalents invested in publicly-traded funds and are valued based on the closing price reported in an active market on which the individual securities are traded (generally classified in Level 1); (iii) publicly traded U.S. and non-U.S. fixed interest obligations (principally corporate bonds and debentures) and are valued through consultation and evaluation with brokers in the institutional market using quoted prices and other observable market data (included in Level 2); and (iv) cash and cash equivalents invested in institutional funds and are valued at net asset value.

Other investments—These investments include, among others: (i) real estate investment trusts valued based on the closing price reported in an active market on which the investments are traded (included in Level 1); (ii) the plans' share of commingled funds that are invested in real estate partnerships and are valued at net asset value; (iii) direct investments in private real estate (includes limited partnerships) and are valued at net asset value; and (iv) absolute return strategy funds and are valued at net asset value.

The fair value methods described above may not be indicative of net realizable value or reflective of future fair values. Additionally, while Alcoa believes the valuation methods used by the plans' trustees are appropriate and consistent with other market participants, the use of different methodologies or assumptions to determine the fair value of certain financial instruments could result in a different fair value measurement at the reporting date.

The following table presents the fair value of pension plan assets classified under either the appropriate level of the fair value hierarchy or net asset value:

December 31, 2021	Level 1	Level 2	Level 3	Net Asset Value	Total
Equities:					
Equity securities	$ 210	$ —	$ —	$ 671	$ 881
Long/short equity hedge funds	—	—	—	4	4
Private equity	—	—	—	281	281
	$ 210	$ —	$ —	$ 956	$ 1,166
Fixed income:					
Intermediate and long-duration government/credit	$ 827	$ 1,027	$ —	$ 651	$ 2,505
Cash and cash equivalent funds	64	—	—	172	236
Other	—	—	—	—	-
	$ 891	$ 1,027	$ —	$ 823	$ 2,741
Other investments:					
Real estate	$ 63	$ —	$ —	$ 263	$ 326
Other	—	—	—	31	31
	$ 63	$ —	$ —	$ 294	$ 357
Total[1]	$ 1,164	$ 1,027	$ —	$ 2,073	$ 4,264

December 31, 2020	Level 1	Level 2	Level 3	Net Asset Value	Total
Equities:					
Equity securities	$ 379	$ —	$ —	$ 1,469	$ 1,848
Long/short equity hedge funds	—	—	—	5	5
Private equity	—	—	—	207	207
	$ 379	$ —	$ —	$ 1,681	$ 2,060
Fixed income:					
Intermediate and long-duration government/credit	$ 925	$ 794	$ —	$ 619	$ 2,338
Cash and cash equivalent funds	165	—	—	189	354
Other	—	2	—	—	2
	$ 1,090	$ 796	$ —	$ 808	$ 2,694
Other investments:					
Real estate	$ 284	$ —	$ —	$ 273	$ 557
Other	—	—	—	37	37
	$ 284	$ —	$ —	$ 310	$ 594
Total[2]	$ 1,753	$ 796	$ —	$ 2,799	$ 5,348

(1) As of December 31, 2021, the total fair value of pension plan assets excludes a net receivable of $42, which represents securities not yet settled plus interest and dividends earned on various investments.

(2) As of December 31, 2020, the total fair value of pension plan assets excludes a net receivable of $8, which represents securities not yet settled plus interest and dividends earned on various investments.

Funding and Cash Flows. It is Alcoa's policy to fund amounts for defined benefit pension plans sufficient to meet the minimum requirements set forth in applicable country benefits laws and tax laws, including ERISA for U.S. plans. From time to time, the Company contributes additional amounts as deemed appropriate. In 2021, 2020, and 2019, cash contributions to Alcoa's defined benefit pension plans were $579, $343, and $173.

During 2020, the Company initially deferred approximately $200 in pension contributions under provisions in the U.S. Government's Coronavirus Aid, Relief, and Economic Security (CARES) Act. With ample cash on hand and having achieved its objective to hold cash during uncertain times in 2020, the Company made a $250 pension contribution to its U.S. pension plans in late December to cover both the deferred contributions due on January 4, 2021 and a discretionary prepayment. During 2021, Alcoa made $500 in unscheduled contributions to certain U.S. defined benefit pension plans. The additional contributions were discretionary in nature and were funded with net proceeds from a March 2021 debt issuance (see Note M) plus available cash on hand.

Alcoa's minimum required contribution to defined benefit pension plans in 2022 is estimated to be $80, of which approximately $65 is for U.S. plans. Under ERISA regulations, a plan sponsor that establishes a pre-funding balance by making discretionary contributions to a U.S. defined benefit pension plan may elect to apply all or a portion of this balance toward its minimum required contribution obligations to the related plan in future years. In 2022, management intends to make such election related to the Company's U.S. plans.

Benefit payments expected to be paid to pension and other postretirement benefit plan participants are as follows:

Year ending December 31,	Pension benefits	Other postretirement benefits
2022	$ 285	$ 60
2023	280	55
2024	285	55
2025	285	50
2026	285	50
2027 through 2031	1,365	215
	$ 2,785	$ 485

Defined Contribution Plans

The Company sponsors savings and investment plans in several countries, primarily in Australia and the United States. In the United States, employees may contribute a portion of their compensation to the plans, and Alcoa matches a specified percentage of these contributions in equivalent form of the investments elected by the employee. Also, the Company makes contributions to a retirement savings account based on a percentage of eligible compensation for certain U.S. employees hired after March 1, 2006 that are not able to participate in Alcoa's defined benefit pension plans. The Company's expenses related to all defined contribution plans were $72 in 2021, $73 in 2020, and $68 in 2019.

Member-funded Pension Plans

The Company contributes to member-funded pension plans for the employees of Aluminerie de Bécancour Inc. and Aluminerie de Deschambault in Canada. Alcoa makes contributions to the plans based on a percentage of the employees' eligible compensation. The Company's expenses related to the member-funded pension plans were $17 in 2021 and $10 in 2020.

Target Benefit Plan

The Company contributes to a target benefit plan for the employees of Baie-Comeau in Canada. Alcoa makes contributions to the plan based on a percentage of the employees' eligible compensation. The Company's expenses related to the target benefit plan were $9 in 2021.

P. Derivatives and Other Financial Instruments

Fair Value. The Company follows a fair value hierarchy to measure its assets and liabilities. As of December 31, 2021 and 2020, respectively, the assets and liabilities measured at fair value on a recurring basis were primarily derivative instruments. In addition, the Company measures its pension plan assets at fair value (see Note O). Fair value is defined as the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. The fair value hierarchy distinguishes between (i) market participant assumptions developed based on market data obtained from independent sources (observable inputs) and (ii) an entity's own assumptions about market participant assumptions developed based on the best information available in the circumstances (unobservable inputs). The fair value hierarchy consists of three broad levels, which gives the highest priority to unadjusted quoted prices in active markets for identical assets or liabilities (Level 1) and the lowest priority to unobservable inputs (Level 3). The three levels of the fair value hierarchy are described below:

- Level 1—Unadjusted quoted prices in active markets that are accessible at the measurement date for identical, unrestricted assets or liabilities.
- Level 2—Inputs other than quoted prices included within Level 1 that are observable for the asset or liability, either directly or indirectly, including quoted prices for similar assets or liabilities in active markets; quoted prices for identical or similar assets or liabilities in markets that are not active; inputs other than quoted prices that are observable for the asset or liability (e.g., interest rates); and inputs that are derived principally from or corroborated by observable market data by correlation or other means.
- Level 3—Inputs that are both significant to the fair value measurement and unobservable.

Derivatives. Alcoa Corporation is exposed to certain risks relating to its ongoing business operations, including the risks of changing commodity prices, foreign currency exchange rates and interest rates. Alcoa Corporation's commodity and derivative activities include aluminum, energy, foreign exchange, and interest rate contracts, which are held for purposes other than trading. They are used to mitigate uncertainty and volatility, and to cover underlying exposures. While Alcoa does not generally enter into derivative contracts to mitigate the risk associated with changes in aluminum price, the Company may do so in isolated cases to address discrete commercial or operational conditions. Alcoa is not involved in trading activities for energy, weather derivatives, or other nonexchange commodities.

Alcoa Corporation's commodity and derivative activities are subject to the management, direction, and control of the Strategic Risk Management Committee (SRMC), which consists of at least three members, including the chief executive officer, the chief financial officer, and the chief commercial officer. The remaining member(s) are other officers and/or employees of the Company as the chief executive officer may designate from time to time. As of December 31, 2021, the other member of the SRMC is Alcoa Corporation's treasurer. The SRMC meets on a periodic basis to review derivative positions and strategy and reports to the Audit Committee of Alcoa Corporation's Board of Directors on the scope of its activities.

Alcoa Corporation's aluminum, energy, and foreign exchange contracts are predominately classified as Level 1 under the fair value hierarchy. All of the Level 1 contracts are designated as either fair value or cash flow hedging instruments. Alcoa Corporation also has several derivative instruments classified as Level 3 under the fair value hierarchy, which are either designated as cash flow hedges or undesignated. Alcoa includes the changes in its equity method investee's Level 2 derivatives in Accumulated other comprehensive (loss) income.

The following tables present the detail for Level 1, 2 and 3 derivatives (see additional Level 3 information in further tables below):

	2021		2020	
Balance at December 31,	**Assets**	**Liabilities**	**Assets**	**Liabilities**
Level 1 derivative instruments	$ 19	$ 29	$ 21	$ 7
Level 3 derivative instruments	2	1,293	-	838
Total	$ 21	$ 1,322	$ 21	$ 845
Less: Current	14	274	21	103
Noncurrent	$ 7	$ 1,048	$ -	$ 742

	2021		2020	
Year ended December 31,	**Unrealized loss recognized in Other comprehensive (loss) income**	**Realized loss reclassed from Other comprehensive (loss) income to earnings**	**Unrealized loss recognized in Other comprehensive (loss) income**	**Realized loss reclassed from Other comprehensive (loss) income to earnings**
Level 1 derivative instruments	$ (28)	$ (10)	$ 8	$ (19)
Level 3 derivative instruments	(759)	(279)	(374)	(88)
Noncontrolling and equity interest (Level 2)	5	(6)	21	1
Total	$ (782)	$ (295)	$ (345)	$ (106)

The 2021 realized loss of $10 on Level 1 cash flow hedges was comprised of a $7 loss recognized in Sales and a $3 loss recognized in Cost of goods sold. The 2020 realized loss of $19 on Level 1 cash flow hedges was comprised of a $9 loss recognized in Sales and a $10 loss recognized in Cost of goods sold.

During 2019, Alcoa recognized a realized loss of $26 on Level 1 cash flow hedges comprised of an $18 loss recognized in Sales and an $8 loss recognized in Cost of goods sold.

Derivative instruments classified as Level 3 in the fair value hierarchy represent those in which management has used at least one significant unobservable input in the valuation model. Alcoa Corporation uses a discounted cash flow model to fair value all Level 3 derivative instruments. Inputs in the valuation models for Level 3 derivative instruments are composed of the following: (i) quoted market prices (e.g., aluminum prices on the 10-year LME forward curve and energy prices), (ii) significant other observable inputs (e.g., information concerning time premiums and volatilities for certain option type embedded derivatives and regional premiums for aluminum contracts), and (iii) unobservable inputs (e.g., aluminum and energy prices beyond those quoted in the market, and estimated credit spread between Alcoa and the counterparty). For periods beyond the term of quoted market prices for aluminum, Alcoa Corporation estimates the price of aluminum by extrapolating the 10-year LME forward curve. For periods beyond the term of quoted market prices for the Midwest premium, management estimates the Midwest premium based on recent transactions. Where appropriate, valuations are adjusted for various factors such as liquidity, bid/offer spreads, and credit considerations. Such adjustments are generally based on available market evidence (Level 2). In the absence of such evidence, management's best estimate is used (Level 3). If a significant input that is unobservable in one period becomes observable in a subsequent period, the related asset or liability would be transferred to the appropriate classification (Level 1 or 2) in the period of such change (there were no such transfers in the periods presented). There were no purchases, sales, or settlements of Level 3 derivative instruments in the periods presented.

Level 3 derivative instruments outstanding as of December 31, 2021 are described in the table below:

Description	Designation	Contract Termination	Unobservable Inputs Impacting Valuation	Sensitivity to Inputs
Power contracts				
Embedded derivative that indexes the price of power to the LME price of aluminum plus the Midwest premium	Cash flow hedge of forward sales of aluminum	March 2026 December 2029 February 2036	LME price, Midwest premium and MWh per year	Increase in LME price and/or the Midwest premium results in a higher cost of power and an increase to the derivative liability
Embedded derivative that indexes the price of power to the LME price of aluminum	Cash flow hedge of forward sales of aluminum	September 2027	LME price and MWh per year	Increase in LME price results in a higher cost of power and an increase to the derivative liability
Embedded derivative that indexes the price of power to the credit spread between the Company and the counterparty	Not designated	October 2028	Estimated credit spread	Wider credit spread results in a higher cost of power and increase in the derivative liability
Financial contract				
Hedge power prices	Not designated	June 2026	LME price and power price	Lower prices in the power market or higher LME prices result in an increase in the derivative liability

In addition to the instruments presented above, Alcoa had a financial contract that expired in July 2021 that hedged the anticipated power requirements at one of its smelters and was designated as a cash flow hedge of future purchases of electricity. In March 2021, Alcoa entered into four new financial contracts (Financial contracts (undesignated), below) with three counterparties to hedge the anticipated power requirements at this smelter for the period from August 1, 2021 through June 30, 2026. A fifth financial contract (undesignated) was entered into in November 2021; its effective date is dependent on power consumption associated with the restart of capacity at the smelter, will be effective during the period from July 1, 2022 through November 1, 2022, and expires June 30, 2026. Two of these financial contracts include LME-linked pricing components and do not qualify for hedge accounting treatment. Management elected not to apply hedge accounting treatment for the other three financial contracts as the value of these contracts is not significant. Unrealized and realized gains and losses on these financial contracts are included in Other (income) expenses, net on the accompanying Statement of Consolidated Operations.

At December 31, 2021, the outstanding Level 3 instruments are associated with seven smelters. At December 31, 2021 and 2020, the power contracts with embedded derivatives designated as cash flow hedges hedge forecasted aluminum sales of 1,905 kmt and 2,130 kmt, respectively.

The following table presents quantitative information related to the significant unobservable inputs described above for Level 3 derivative instruments (megawatt hours in MWh):

	December 31, 2021	Unobservable Input	Unobservable Input Range	
Asset Derivatives				
Financial contracts (undesignated)	$ 2	Interrelationship of forward energy price, LME forward price and the Consumer Price Index	Electricity (per MWh)	2022: $41.30 2022: $47.44
			LME (per mt)	2022: $2,803 2022: $2,803
Power contract	—	MWh of energy needed to produce the forecasted mt of aluminum	LME	2022: $2,803 2022: $2,808
			Midwest premium	2022: $0.3015 2022: $0.2915
			Electricity	Rate of 2 million MWh per year
Total Asset Derivatives	$ 2			
Liability Derivatives				
Power contract	$ 284	MWh of energy needed to produce the forecasted mt of aluminum	LME (per mt)	2022: $2,803 2027: $2,287
			Electricity	Rate of 4 million MWh per year
Power contracts	1,006	MWh of energy needed to produce the forecasted mt of aluminum	LME (per mt)	2022: $2,803 2029: $2,364 2036: $2,660
			Midwest premium (per pound)	2022: $0.3015 2029: $0.2715 2036: $0.2715
			Electricity	Rate of 18 million MWh per year
Power contract (undesignated)	3	Estimated spread between the 30-year debt yield of Alcoa and the counterparty	Credit spread	1.30%: 30-year debt yield spread 4.10%: Alcoa (estimated) 2.80%: counterparty
Total Liability Derivatives	$ 1,293			

The fair values of Level 3 derivative instruments recorded in the accompanying Consolidated Balance Sheet were as follows:

Asset Derivatives	December 31, 2021	December 31, 2020
Derivatives not designated as hedging instruments:		
Current—financial contract	$ 2	$ —
Total derivatives not designated as hedging instruments	$ 2	$ —
Total Asset Derivatives	$ 2	$ —
Liability Derivatives		
Derivatives designated as hedging instruments:		
Current—power contracts	$ 262	$ 94
Current—financial contract	—	1
Noncurrent—power contracts	1,028	720
Total derivatives designated as hedging instruments	$ 1,290	$ 815
Derivatives not designated as hedging instruments:		
Current—embedded credit derivative	$ 1	$ 4
Noncurrent—embedded credit derivative	2	19
Total derivatives not designated as hedging instruments	$ 3	$ 23
Total Liability Derivatives	$ 1,293	$ 838

The following table shows the net fair values of the Level 3 derivative instruments at December 31, 2021 and the effect on these amounts of a hypothetical change (increase or decrease of 10%) in the market prices or rates that existed as of December 31, 2021:

	Fair value asset (liability)	Index change of + / -10%
Power contracts	$ (1,290)	$ 357
Embedded credit derivative	(3)	1
Financial contract	2	7

The following tables present a reconciliation of activity for Level 3 derivative instruments:

	Assets	Liabilities		
2021	Financial contract	Power contracts	Financial contract	Embedded credit derivative
January 1, 2021	$ —	$ 814	$ 1	$ 23
Total gains or losses included in:				
Sales (realized)	—	(277)	—	—
Cost of goods sold (realized)	(6)	—	(8)	—
Other expenses, net (unrealized/realized)	7	—	—	(20)
Other comprehensive (loss) income (unrealized)	—	753	6	—
Other	1	—	1	—
December 31, 2021	$ 2	$ 1,290	$ —	$ 3
Change in unrealized gains or losses included in earnings for derivative instruments held at December 31, 2021:				
Other expenses, net	$ 5	$ —	$ (1)	$ (19)

	Assets	Liabilities		
2020	Financial contract	Power contracts	Financial contract	Embedded credit derivative
January 1, 2020	$ 74	$ 598	$ —	$ 17
Total gains or losses included in:				
Sales (realized)	—	(74)	—	—
Cost of goods sold (realized)	14	—	—	—
Other expenses, net (unrealized/realized)	—	—	—	7
Other comprehensive (loss) income (unrealized)	(83)	290	1	—
Other	(5)	—	—	(1)
December 31, 2020	$ —	$ 814	$ 1	$ 23
Change in unrealized gains or losses included in earnings for derivative instruments held at December 31, 2020:				
Other, net	$ —	$ —	$ —	$ 11

Derivatives Designated As Hedging Instruments—Cash Flow Hedges

Assuming market rates remain constant with the rates at December 31, 2021, a realized loss of $262 related to power contracts is expected to be recognized in Sales over the next 12 months.

Material Limitations

The disclosures with respect to commodity prices and foreign currency exchange risk do not consider the underlying commitments or anticipated transactions. If the underlying items were included in the analysis, the gains or losses on the futures contracts may be offset. Actual results will be determined by several factors that are not under Alcoa Corporation's control and could vary significantly from those factors disclosed.

Alcoa Corporation is exposed to credit loss in the event of nonperformance by counterparties on the above instruments, as well as credit or performance risk with respect to its hedged customers' commitments. Alcoa Corporation does not anticipate nonperformance by any of these parties. Contracts are with creditworthy counterparties and are further supported by cash, treasury bills, or irrevocable letters of credit issued by carefully chosen banks. In addition, various master netting arrangements are in place with counterparties to facilitate settlement of gains and losses on these contracts.

Other Financial Instruments. The carrying values and fair values of Alcoa Corporation's other financial instruments were as follows:

	2021		2020	
December 31,	Carrying value	Fair value	Carrying value	Fair value
Cash and cash equivalents	$ 1,814	$ 1,814	$ 1,607	$ 1,607
Restricted cash	110	110	3	3
Short-term borrowings	75	75	77	77
Long-term debt due within one year	1	1	2	2
Long-term debt, less amount due within one year	1,726	1,865	2,463	2,692

Cash and cash equivalents and Restricted cash. The carrying amounts approximate fair value because of the short maturity of the instruments. The fair value amounts for Cash and cash equivalents and Restricted cash were classified in Level 1 of the fair value hierarchy.

Short-term borrowings and Long-term debt, including amounts due within one year. The fair value of Long-term debt, less amount due within one year was based on quoted market prices for public debt and on interest rates that are currently available to Alcoa Corporation for issuance of debt with similar terms and maturities for non-public debt. The fair value amounts for all Short-term borrowings and Long-term debt were classified in Level 2 of the fair value hierarchy.

Q. Income Taxes

Provision for income taxes. The components of Income (loss) before income taxes were as follows:

	2021	2020	2019
Domestic	$ (663)	$ (328)	$ (1,000)
Foreign	1,862	501	562
Total	$ 1,199	$ 173	$ (438)

Provision for income taxes consisted of the following:

	2021	2020	2019
Current:			
Federal	$ 8	$ 2	$ (4)
Foreign	473	211	404
State and local	1	—	—
	482	213	400
Deferred:			
Federal	6	—	2
Foreign	141	(26)	13
State and local	—	—	—
	147	(26)	15
Total	$ 629	$ 187	$ 415

Federal includes U.S. income taxes related to foreign income.

A reconciliation of the U.S. federal statutory rate to Alcoa's effective tax rate was as follows:

	2021	2020	2019
U.S. federal statutory rate	21.0%	21.0%	21.0%
Changes in valuation allowances	23.4	168.3	(70.3)
Taxes on foreign operations—rate differential	10.8	34.5	(19.3)
Impacts of the TCJA	2.0	(88.8)	5.0
Tax on foreign operations—other	1.7	(0.7)	(2.7)
Noncontrolling interest	0.5	1.6	(6.8)
Non-deductible losses on foreign divestitures	—	—	(23.1)
Adjustment of prior year income taxes	—	(2.5)	(1.1)
Uncertain tax positions	—	(21.5)	(0.6)
Equity (loss) income	(2.5)	2.0	(1.9)
Tax holidays	(2.8)	(1.9)	2.0
Other	(1.6)	(3.9)	2.9
Effective tax rate	52.5%	108.1%	(94.9)%

In the fourth quarter of 2020, the Supreme Court of Spain ruled in favor of Alcoa regarding the 2006 through 2009 tax year assessment. As a result, the reserve for Uncertain tax positions that was established in 2018 has been released. Refer to the Tax Matters section in Note S for further information.

On December 22, 2017, U.S. tax legislation known as the U.S. Tax Cuts and Jobs Act of 2017 (the TCJA) was enacted. In 2018, the Company made an accounting policy election to include as a period cost the tax impact generated by including Global Intangible Low-Taxed Income provisions (GILTI) in U.S. taxable income. During 2020, the U.S. Treasury Department finalized regulations

implementing the GILTI provisions of the TCJA. Included in these regulations is an exclusion from GILTI for income subject to a high rate of foreign tax, which permits taxpayers to elect to apply the exception to previously filed tax returns. During 2020, an amended tax return was filed for 2018 to make this election. As a result, the Company recorded a tax benefit of ($138) in 2020 to reflect the re-establishment of certain U.S. Federal net operating loss carryforwards and a corresponding tax charge of $138 to record a full valuation allowance against the increased deferred tax asset.

Certain income earned by AWAB is eligible for a tax holiday, which decreases the tax rate on this income from 34% to 15.25%, which will result in future cash tax savings. The holiday related to production at the Alumar refinery will end on December 31, 2027, and the holiday related to the operation of the Juruti (Brazil) bauxite mine will end on December 31, 2026. In 2020 and 2019, deferred tax assets expected to reverse in the holiday period were revalued at the holiday rate. This resulted in a discrete income tax charge of $15 and $7 in 2020 and 2019, respectively. In 2021, it was determined that the deferred taxes associated with the tax holiday would be fully exhausted within the holiday period. These amounts were therefore maintained on the balance sheet at the holiday tax rate.

Certain components of the 2019 restructuring charges resulting from the MRC divestiture and the Avilés and La Coruña facilities curtailment and subsequent divestiture are not deductible for tax purposes. These amounts are $65 for MRC and $35 for Avilés and La Coruña combined and are included in Non-deductible losses on foreign divestitures in the above table. See Note C for additional information on the divestiture charges.

Deferred income taxes. The components of deferred tax assets and liabilities based on the underlying attributes without regard to jurisdiction were as follows:

	2021		2020	
December 31,	**Deferred tax assets**	**Deferred tax liabilities**	**Deferred tax assets**	**Deferred tax liabilities**
Tax loss carryforwards	$ 1,554	$ —	$ 1,668	$ —
Employee benefits	409	—	711	—
Derivatives and hedging activities	345	—	214	—
Loss provisions	214	—	183	—
Depreciation	128	425	66	434
Investment basis differences	117	—	139	—
Interest	105	1	60	2
Lease assets and liabilities	26	22	37	36
Tax credit carryforwards	26	—	27	—
Deferred income/expense	2	135	22	116
Other	38	—	41	2
	2,964	583	3,168	590
Valuation allowance	(2,062)	—	(2,127)	—
Total	$ 902	$ 583	$ 1,041	$ 590

The following table details the expiration periods of the deferred tax assets presented above:

December 31, 2021	**Expires within 10 years**	**Expires within 11-20 years**	**No expiration**	**Other**	**Total**
Tax loss carryforwards	$ 232	$ 366	$ 956	$ —	$ 1,554
Tax credit carryforwards	17	9	—	—	26
Other	—	—	265	1,119	1,384
Valuation allowance	(249)	(374)	(958)	(481)	(2,062)
Total	$ —	$ 1	$ 263	$ 638	$ 902

Deferred tax assets with no expiration may still have annual limitations on utilization. Other represents deferred tax assets whose expiration is dependent upon the reversal of the underlying temporary difference.

The total deferred tax asset (net of valuation allowance) is supported by projections of future taxable income exclusive of reversing temporary differences and taxable temporary differences that reverse within the carryforward period. The composition of Alcoa's net deferred tax asset by jurisdiction as of December 31, 2021 was as follows:

	Domestic	Foreign	Total
Deferred tax assets	$ 1,066	$ 1,898	$ 2,964
Valuation allowance	(965)	(1,097)	(2,062)
Deferred tax liabilities	(100)	(483)	(583)
Total	$ 1	$ 318	$ 319

The Company has several income tax filers in various foreign countries. Of the $318 net deferred tax asset included under the Foreign column in the table above, approximately 85% relates to six of Alcoa's income tax filers (the "Foreign Filers") as follows: a $148 net deferred tax asset for Alcoa Canada Company in Canada; a $141 net deferred tax asset for Alcoa Alumínio S.A. in Brazil; a $68 net deferred tax asset for AWAB in Brazil; a $67 net deferred tax asset for Alcoa Lauralco Management Company in Canada; a $34 net deferred tax asset for Alcoa Wolinbec Company in Canada; and, a $182 net deferred tax liability for AofA in Australia.

The future realization of the net deferred tax asset for each of the Foreign Filers was based on projections of the respective future taxable income (defined as the sum of pretax income, other comprehensive income, and permanent tax differences), exclusive of reversing temporary differences and carryforwards. The realization of the net deferred tax assets of the Foreign Filers is not dependent on any future tax planning strategies.

The Foreign Filers do not have a history of tax loss carryforwards expiring unused. Additionally, tax loss carryforwards have an infinite life under the income tax code in Brazil. However, utilization of an existing tax loss carryforward is limited to 30% of taxable income in a particular year in Brazil.

Accordingly, management concluded that the net deferred tax assets of the Foreign Filers will more likely than not be realized in future periods, resulting in no need for a partial or full valuation allowance as of December 31, 2021.

In December 2021, Alcoa recorded a valuation allowance of $103 against the net deferred tax assets of Alúmina Española, S.A. (Española). Management concluded that it is more likely than not that Española's net deferred tax assets, which consist primarily of tax loss carryforwards, will not be realized as the entity's sole operating asset, the San Ciprián refinery, is in a three-year cumulative loss position for the period ended December 31, 2021. This cumulative loss position is the result of recent operating losses due to the high energy costs in Spain and the impact of the refinery workers' strike on the fourth quarter of 2021. Despite recent favorable increases in the sales price of alumina, management has forecasted operating losses for Española for the foreseeable future due to the high energy costs in Spain and increases in raw materials costs, resulting in a need for a full valuation allowance as of December 31, 2021.

The following table details the changes in the valuation allowance:

December 31,	2021	2020	2019
Balance at beginning of year	$ (2,127)	$ (1,778)	$ (1,684)
Establishment of new allowances[1]	(103)	—	—
Net change to existing allowances[2]	139	(315)	(101)
Foreign currency translation	29	(34)	7
Balance at end of year	$ (2,062)	$ (2,127)	$ (1,778)

(1) This line item reflects valuation allowances initially established as a result of a change in management's judgment regarding the realizability of deferred tax assets.

(2) This line item reflects movements in previously established valuation allowances, which increase or decrease as the related deferred tax assets increase or decrease. Such movements occur as a result of remeasurement due to a tax rate change and changes in the underlying attributes of the deferred tax assets, including expiration of the attribute and reversal of the temporary difference that gave rise to the deferred tax asset.

Undistributed net earnings. Certain earnings of Alcoa's foreign subsidiaries are deemed to be permanently reinvested outside the United States. The cumulative amount of Alcoa's foreign undistributed net earnings deemed to be permanently reinvested was approximately $2,377 as of December 31, 2021. Alcoa Corporation has several commitments and obligations related to the Company's operations in various foreign jurisdictions; therefore, management has no plans to distribute such earnings in the foreseeable future. Alcoa Corporation continuously evaluates its local and global cash needs for future business operations and anticipated debt facilities, which may influence future repatriation decisions. If these earnings were distributed in the form of dividends or otherwise, we could be subject to foreign income or withholding taxes and state income taxes. Due to the uncertainty of the manner in which the undistributed earnings would be brought back to the United States and the tax laws in effect at that time, it is not practicable to estimate the tax liability that might be incurred if such earnings were remitted to the U.S.

Unrecognized tax benefits. Alcoa and its subsidiaries file income tax returns in the U.S. federal jurisdiction and various foreign and U.S. state jurisdictions. With few exceptions, the Company is not subject to income tax examinations by tax authorities for years prior to 2014. The U.S. federal income tax filings of the Company's U.S. consolidated tax group have been examined through the 2018 tax year. Foreign jurisdiction tax authorities are in the process of examining income tax returns of several of Alcoa's subsidiaries for various tax years. Excluding the Australia tax matter discussed in Note S, the period under foreign examination includes the income tax years from 2009 through 2020. For U.S. state income tax purposes, the Company and its subsidiaries remain subject to income tax examinations for the 2017 tax year and forward.

In the third quarter of 2020, AofA paid approximately $74 (A$107) to the ATO related to the tax dispute described in Note S. Upon payment, AofA recorded a noncurrent prepaid tax asset, as the Company continues to believe it is more likely than not that AofA's tax position will be sustained and therefore is not recognizing any tax expense in relation to this matter. In accordance with Australian tax laws, the initial interest assessment and additional interest are deductible against AofA's taxable income resulting in approximately $169 (A$219) and $14 (A$19) of lower cash tax payments in the second half of 2020 and the year-ended December 31, 2021, respectively. Interest compounded in future years is also deductible against AofA's income in the respective periods. If AofA is ultimately successful, the interest deduction would become taxable as income in the year the dispute is resolved. In addition, should the ATO decide in the interim to reduce any interest already assessed, the reduction would be taxable as income at that point in time. During 2021, AofA continued to record its tax provision and tax liability without effect of the ATO assessment, since it expects to prevail. The tax payable will remain on AofA's balance sheet as a noncurrent liability, increased by the tax effect of subsequent periods' interest deductions, until dispute resolution, which is expected to take several years. The noncurrent liability resulting from the cumulative interest deductions was approximately $174 (A$238) and $169 (A$219) at December 31, 2021 and 2020, respectively.

The reserve balance for unrecognized tax benefits is included in Noncurrent income taxes on the Consolidated Balance Sheet. A reconciliation of the beginning and ending amount of unrecognized tax benefits (excluding interest and penalties) was as follows:

December 31,	2021	2020	2019
Balance at beginning of year	$ 4	$ 29	$ 30
Reductions for tax positions of prior years	—	(26)	—
Foreign currency translation	—	1	(1)
Balance at end of year	$ 4	$ 4	$ 29

For all periods presented, a portion of the balance at end of year pertains to state tax liabilities, which are presented before any offset for federal tax benefits. The effect of unrecognized tax benefits, if recorded, that would impact the annual effective tax rate for 2021, 2020, and 2019 would be 0%, 3%, and (7)%, respectively, of pretax book (loss) income. In 2018, the Company recorded a charge of $30 (€26), including $10 (€9) for interest, in Provision for income taxes on the accompanying Statement of Consolidated Operations to establish a liability for its 49% share of the estimated loss on a disputed income tax matter (see Spain in the Tax section of Note S). In 2020, the Company received a favorable final ruling in the Supreme Court of Spain on the Spain tax matter and recorded income of $32 (€26) from the reversal of the 2018 entry and the interest expense accrued through 2019. This change is reflected in the above table as Reductions for tax positions of prior years in the amount of $21 (€17), which is exclusive of interest previously charged to expense. The remainder of the change in Reductions for tax positions of prior years is primarily related to changes in Brazil income tax positions. There were no material changes in Reductions for tax positions of prior years in 2021. Alcoa does not anticipate that changes in its unrecognized tax benefits will have a material impact on the Statement of Consolidated Operations during 2022.

It is the Company's policy to recognize interest and penalties related to income taxes as a component of the Provision for income taxes on the accompanying Statement of Consolidated Operations. In 2021, 2020, and 2019 Alcoa recognized $0, $0, and $2, respectively, in interest and penalties. Due to the expiration of the statute of limitations, settlements with tax authorities, and refunded overpayments, the Company also recognized interest income of $0, $13, and $1 in 2021, 2020, and 2019, respectively. As of December 31, 2021 and 2020, the amount accrued for the payment of interest and penalties was $2 and $2, respectively.

R. Asset Retirement Obligations

Alcoa records AROs related to legal obligations associated with the standard operation of bauxite mines, alumina refineries, and aluminum smelters. These AROs consist primarily of costs associated with mine reclamation, closure of bauxite residue areas, spent pot lining disposal, and landfill closures. The Company also recognizes AROs for the disposal of regulated waste materials related to the demolition of facilities and for any significant lease restoration obligations, if required by a lease agreement.

The following table details the carrying value of recorded AROs by major category, of which $116 and $128 was classified as a current liability as of December 31, 2021 and 2020, respectively:

December 31,	2021	2020
Closure of bauxite residue areas	$ 274	$ 278
Mine reclamation	255	264
Spent pot lining disposal	107	108
Demolition	72	72
Landfill closure	30	31
Balance at end of year	$ 738	$ 753

The following table details the changes in the total carrying value of recorded AROs:

December 31,	2021	2020
Balance at beginning of year	$ 753	$ 717
Accretion expense	20	21
Liabilities incurred	101	107
Payments	(101)	(93)
Reversals of previously recorded liabilities	(6)	(17)
Foreign currency translation and other	(29)	18
Balance at end of year	$ 738	$ 753

Liabilities incurred in 2021 include:

- $30 for new mine areas opened during the year and higher estimated mine reclamation costs, partially driven by increased complexity of reclamation areas due to steeper mine pits and grades;
- $28 for bauxite residue areas, including new bauxite residue areas as well as changes in engineering designs for both open and closed bauxite residue areas;
- $17 related to spent pot lining treatment and disposal;
- $16 related to the closure of the Wenatchee smelter announced in the fourth quarter of 2021;
- $5 related to the closure of the Lake Charles anode facility announced in the third quarter of 2021; and,
- $5 related to changes in scope for landfill closures.

The additional accruals were primarily recorded with corresponding capitalized asset retirement costs (see Note B) except for $23 related to closed sites which were recorded to Restructuring and other charges, net on the accompanying Statement of Consolidated Operations (see Note D).

Liabilities incurred in 2020 include accruals for new mine areas opened during the year, higher estimated mine reclamation costs, accruals for bauxite residue areas opened during the year, and accruals related to spent pot lining treatment and disposals. The additional accruals were primarily recorded with corresponding capitalized asset retirement costs (see Note B) except for $2 which were recorded to Restructuring and other charges, net on the accompanying Statement of Consolidated Operations (see Note D).

In 2021, reversals of previously recorded liabilities included a reversal of $5 due to the determination that previously estimated demolition costs were not required at the previously closed Tennessee site. In 2020, reversals of previously recorded liabilities were primarily related to the sale of Gum Springs (see Note U) and completion of demolition projects at numerous permanently closed sites.

S. Contingencies and Commitments

Contingencies

Environmental Matters

Alcoa Corporation participates in environmental assessments and cleanups at several locations. These include currently or previously owned or operated facilities and adjoining properties, and waste sites, including Superfund (Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)) sites.

Alcoa Corporation's environmental remediation reserve balance reflects the most probable costs to remediate identified environmental conditions for which costs can be reasonably estimated. The following table details the changes in the carrying value of recorded environmental remediation reserves:

Balance at December 31, 2018	$	280
Liabilities incurred		73
Cash payments		(17)
Reversals of previously recorded liabilities		(1)
Balance at December 31, 2019		335
Liabilities incurred		7
Cash payments		(19)
Foreign currency translation and other		(1)
Balance at December 31, 2020		322
Liabilities incurred		21
Cash payments		(23)
Reversals of previously recorded liabilities		(17)
Foreign currency translation and other		6
Balance at December 31, 2021	$	309

At December 31, 2021 and 2020, the current portion of the remediation reserve balance was $44 and $29, respectively.

In 2021, the Company incurred liabilities of $21 primarily related to remediation design considerations at the Longview site in Washington, closure of the Wenatchee aluminum smelter in Washington, environmental activities at the Point Comfort site in Texas, closure of the anode plant at the Lake Charles site in Louisiana, and wetlands mitigation at the Longview site in Washington, as well as other increases for ongoing monitoring and maintenance at various sites. These charges are primarily recorded in Cost of goods sold and Restructuring and other charges, net on the accompanying Statement of Consolidated Operations. Payments related to remediation expenses applied against the reserve were $23. These amounts include mandated expenditures as well as those not required by any regulatory authority or third-party. Further, the Company recorded reversals of reserves of $17 related to:

- $7 due to the determination that previously estimated site remediation is not required at the previously closed Tennessee site;
- $5 due to lower costs for waste treatment at a previously closed Suriname site; and,
- $5 due to lower costs for site remediation related to a previously closed site in Brazil.

In 2020, the Company incurred liabilities of $7 which were primarily related to ongoing remediation work at various sites. The additional accruals were recorded to Cost of goods sold except for $1 which was recorded to Restructuring and other charges, net on the accompanying Statement of Consolidated Operations (see Note D).

In 2019, the Company incurred liabilities of $73 which were primarily related to the closure of the Point Comfort alumina refinery and recorded in Restructuring and other charges, net on the accompanying Statement of Consolidated Operations (see Note D). The remaining amount was recorded to Cost of goods sold.

The estimated timing of cash outflows from the environmental remediation reserve at December 31, 2021 is as follows:

2022	$	44
2023 - 2027		155
Thereafter		110
Total	$	309

Reserve balances at December 31, 2021 and 2020, associated with significant sites with active remediation underway or for future remediation were $247 and $259, respectively. In management's judgment, the Company's reserves are sufficient to satisfy the provisions of the respective action plans. Upon changes in facts or circumstances, a change to the reserve may be required. The Company's significant sites include:

Poços de Caldas, Brazil—The reserve associated with the 2015 closure of the Alcoa Alumínio S.A. smelter in Poços de Caldas, Brazil, is for remediation of historic spent potlining storage and disposal areas. The final remediation plan is currently under review; such review could require the reserve balance to be adjusted.

Fusina and Portovesme, Italy—Alcoa Corporation's subsidiary Alcoa Trasformazioni S.r.l. has remediation projects underway for its closed smelter sites at Fusina and Portovesme which have been approved by the Italian Ministry for Ecologic Transition (MET). Work is ongoing for soil remediation at the Fusina site with expected completion by the end of 2023 and at the Portovesme site with expected completion in the first half of 2022. The final remedial design for the groundwater remediation project at Portovesme was completed in 2020 and is awaiting approval from the MET.

Suriname—The reserve associated with the 2017 closure of the Suralco refinery and bauxite mine is for treatment and disposal of refinery waste and soil remediation. The work began in 2017 and is expected to be completed at the end of 2025.

Hurricane Creek, Arkansas—The reserve associated with the 1990 closure of two mining areas and refineries near Hurricane Creek, Arkansas is for ongoing monitoring and maintenance for water quality surrounding the mine areas and residue disposal areas.

Massena, New York—The reserve associated with the 2015 closure of the Massena East smelter by the Company's subsidiary, Reynolds Metals Company, is for subsurface soil remediation to be performed after demolition of the structures. Remediation work commenced in 2021 and will take four to eight years to complete.

Point Comfort, Texas—The reserve associated with the 2019 closure of the Point Comfort alumina refinery is for disposal of industrial wastes contained at the site, subsurface remediation, and post-closure monitoring and maintenance. The final remediation plan is currently under review, which may result in a change to the existing reserve.

Sherwin, Texas—In connection with the 2018 settlement of a dispute related to the previously-owned Sherwin alumina refinery, the Company's subsidiary, Copano Enterprises LLC, accepted responsibility for the final closure of four bauxite residue waste disposal areas (known as the Copano facility). Work commenced on the first residue disposal area in 2018 and will take up to six additional years to complete, depending on the nature of its potential re-use. Work on the next three areas has not commenced but is expected to be completed by 2048, depending on its potential re-use.

Longview, Washington—In connection with a 2018 Consent Decree and Cleanup Action Plan with the State of Washington Department of Ecology, the Company's subsidiary, Northwest Alloys as landowner, accepted certain responsibilities for future remediation of contaminated soil and sediments at the site located near Longview, Washington. In December 2020, the lessee of the land, who was a partner in the remediation of the site, filed for bankruptcy and exited the site in January 2021. Remediation design changes for consolidation and remediation of the onsite industrial waste landfills, groundwater remediation, and post-closure monitoring and maintenance at the site was completed in 2021. As of December 31, 2021, the reserve related to the site is deemed to be sufficient.

Other Sites—The Company is in the process of decommissioning various other plants and remediating sites in several countries for potential redevelopment or to return the land to a natural state. In aggregate, there are approximately 35 remediation projects at these other sites that are planned or underway. These activities will be completed at various times in the future with the latest expected to be in 2026, after which ongoing monitoring and other activities may be required. At December 31, 2021 and 2020, the reserve balance associated with these activities was $62 and $63, respectively.

Tax

Spain—In July 2013, following a corporate income tax audit covering the 2006 through 2009 tax years, an assessment was received from Spain's tax authorities disallowing certain interest deductions claimed by ParentCo's Spanish consolidated tax group. Through various stages of subsequent appeal, denial and re-assessment through the third quarter of 2018, Alcoa Corporation management came to believe that it was no longer more likely than not (greater than 50%) to prevail in this matter. Accordingly, in the third quarter of 2018, Alcoa Corporation recorded a charge of $30 (€26) in Provision for income taxes to establish a liability for its portion of the estimated loss in this matter, representing management's best estimate at the time.

On November 8, 2018, Alcoa filed a petition for appeal to the Supreme Court of Spain. During the fourth quarter of 2020, the Supreme Court of Spain met and ruled in favor of Alcoa on the 2006 through 2009 tax year assessment. The ruling is final and cannot be further appealed. As a result of the final ruling, in the fourth quarter of 2020 Alcoa reversed the $32 (€26) reserve that was established in 2018 and the matter is now considered closed. Additionally, a lien secured with the San Ciprián smelter to Spain's tax authorities that was provided in relation to this matter has been released.

Brazil (AWAB)—In March 2013, AWAB was notified by the Brazilian Federal Revenue Office (RFB) that approximately $110 (R$220) of value added tax credits previously claimed are being disallowed and a penalty of 50% assessed. Of this amount, AWAB received $41 (R$82) in cash in May 2012. The value-added tax credits were claimed by AWAB for both fixed assets and export sales related to the Juruti bauxite mine and São Luís refinery expansion. The RFB has disallowed credits they allege belong to the consortium in which AWAB owns an interest and should not have been claimed by AWAB. Credits have also been disallowed as a result of challenges to apportionment methods used, questions about the use of the credits, and an alleged lack of documented proof. AWAB presented defense of its claim to the RFB on April 8, 2013. If AWAB is successful in this administrative process, the RFB would have no further recourse. If unsuccessful in this process, AWAB has the option to litigate at a judicial level. Separately from AWAB's administrative appeal, in June 2015, new tax law was enacted repealing the provisions in the tax code that were the basis for the RFB assessing a 50% penalty in this matter. As such, the estimated range of reasonably possible loss for these matters is $0 to $39 (R$220). It is management's opinion that the allegations have no basis; however, at this time, the Company is unable to reasonably predict an outcome for this matter.

Australia (AofA)—In December 2019, AofA received a statement of audit position (SOAP) from the Australian Taxation Office (ATO) related to the pricing of certain historic third-party alumina sales. The SOAP proposed adjustments that would result in additional income tax payable by AofA. During 2020, the SOAP was the subject of an independent review process within the ATO. At the conclusion of this process, the ATO determined to continue with the proposed adjustments and issued Notices of Assessment (the Notices) that were received by AofA on July 7, 2020. The Notices asserted claims for income tax payable by AofA of approximately

$156 (A$214). The Notices also included claims for compounded interest on the tax amount totaling approximately $516 (A$707). On September 17, 2020, the ATO issued a position paper with its preliminary view on the imposition of administrative penalties related to the tax assessment issued to AofA. This paper proposed penalties of approximately $94 (A$128).

AofA disagreed with the Notices and with the ATO's proposed position on penalties. In September 2020, AofA lodged formal objections to the Notices. In the fourth quarter of 2020, AofA provided a submission on the ATO's imposition of interest and also submitted a response to the ATO's position paper on penalties. After the ATO completes its review of AofA's response to the penalties position paper, the ATO could issue a penalty assessment.

To date, AofA has not received a determination from the objections team on the Notices, nor has it received a response to its submission on the ATO's imposition of interest or its response to the ATO's position paper on penalties.

On February 1, 2022, AofA submitted statutory notices to the ATO requiring the ATO to make decisions on AofA's objections within a 60-day period.

The Company does not agree with the ATO's positions, and AofA will continue to defend this matter and pursue all available dispute resolution methods, up to and including the filing of proceedings in the Australian Courts, a process which could last several years and could involve significant expenses. The Company maintains that the sales subject to the ATO's review, which were ultimately sold to Aluminium Bahrain B.S.C., were the result of arm's length transactions by AofA over two decades and were made at arm's length prices consistent with the prices paid by other third-party alumina customers.

In accordance with the ATO's dispute resolution practices, AofA paid 50% of the assessed income tax amount exclusive of interest and any penalties, or approximately $74 (A$107), during the third quarter 2020, and the ATO is not expected to seek further payment prior to final resolution of the matter. If AofA is ultimately successful, any amounts paid to the ATO as part of the 50% payment would be refunded. AofA funded the payment with cash on hand and recorded the payment within Other noncurrent assets as a noncurrent prepaid tax asset; the related December 31, 2021 balance is $78 (A$107).

Further interest on the unpaid tax and interest amounts will continue to accrue during the dispute. The initial interest assessment and the additional interest accrued are deductible against taxable income by AofA but would be taxable as income in the year the dispute is resolved if AofA is ultimately successful. AofA applied this deduction beginning in the third quarter of 2020 which reduced cash tax payments by approximately $169 (A$219) in 2020 and $14 (A$19) in 2021. This amount has been reflected within Other noncurrent liabilities and deferred credits as a noncurrent accrued tax liability; the related December 31, 2021 balance is $174 (A$238) (see Note U).

The Company continues to believe it is more likely than not that AofA's tax position will be sustained and therefore is not recognizing any tax expense in relation to this matter. However, because the ultimate resolution of this matter is uncertain at this time, the Company cannot predict the potential loss or range of loss associated with the outcome, which may materially affect its results of operations and financial condition. References to any assessed U.S. dollar amounts presented in connection with this matter have been converted into U.S. dollars from Australian dollars based on the exchange rate in the respective period.

AofA is part of the Company's joint venture with Alumina Limited, an Australian public company listed on the Australian Securities Exchange. The Company and Alumina Limited own 60% and 40%, respectively, of the joint venture entities, including AofA.

Other

Spain—In July 2019, the Company completed the divestiture of the Avilés and La Coruña (Spain) aluminum facilities to PARTER Capital Group AG (PARTER) in a sale process endorsed by the Spanish government and supported by the workers' representatives following a collective dismissal process. In connection with the divestiture, Alcoa committed to make financial contributions to the divested entities of up to $95; a total of $78 was paid through December 31, 2021. In the fourth quarter of 2021, the Company reversed the remaining reserve of $17, in accordance with the terms of the agreement, as the period for which the divested entities could incur qualifying capital expenditures had lapsed.

In early 2020, PARTER sold a majority stake in the facilities to an unrelated party. Alcoa had no knowledge of the subsequent transaction prior to its announcement and on August 28, 2020, Alcoa filed a lawsuit with the Court of First Instance in Madrid, Spain asserting that the sale was in breach of the sale agreement between Alcoa and PARTER.

Related to this subsequent sale transaction, certain proceedings and investigations have been initiated by or at the request of the employees of the facilities against their current employers, the new owners of the current employers, and Alcoa, alleging that certain agreements from the 2019 collective dismissal process remain in force and that, under such agreements, Alcoa remains liable for certain related employment benefits. One such proceeding is a collective case before the Spanish National Court, filed on November 10, 2020, wherein the workers' representatives and employees are seeking to have the terms of a Collective Dismissal Agreement signed between Alcoa and the workers in January 2019 be fulfilled. Other proceedings include: a second collective claim filed in National Court on behalf employees that were not affected by the 2019 collective dismissal process, numerous individual labor claims filed in the labor courts of Avilés and La Coruña and the initiation of a separate criminal investigation by the National Court.

On June 15, 2021, the Spanish National Court ruled that the collective dismissal agreement for the divested Avilés and La Coruña aluminum facilities should be applied to the situation of the claimant workers, and that Alcoa should be liable for the severance of those employees to the extent they were affected by the 2019 collective dismissal process. Alcoa has appealed this ruling to the Supreme Court of Spain.

In July 2021, the Spanish National Court appointed a judicial director to oversee the facilities and later declared the facilities insolvent. In early 2022, the insolvency administrators appointed by the courts (one for each facility) announced their intention to collectively dismiss all employees at the two facilities.

In February 2022, Alcoa and relevant stakeholders initiated discussions to explore a potential global resolution of all pending matters involving Alcoa arising from the prior sale of the two facilities, including a waiver of all claims and investigations previously initiated by or at the request of the employees of the facilities. As of the date of this filing, these initial discussions are ongoing.

If a global resolution is not reached, Alcoa will continue with its appeal to the National Court ruling to the Spanish Supreme Court and will strongly defend all other pending and future legal proceedings arising from the sale of the Avilés and La Coruña facilities. Alcoa believes it has acted in good faith, in full compliance with the law and with all of the terms that it committed to in the contract for the sale of the Avilés and La Coruña facilities to PARTER and in the agreements that it entered into with the representatives of the workers of both facilities.

The estimated range of reasonably possible loss is $0 to $70. Due to the uncertainty regarding both the outcome of the discussions and the likelihood of securing waivers for all claims, Alcoa is unable to reasonably predict the ultimate outcome of this matter.

General

In addition to the matters discussed above, various other lawsuits, claims, and proceedings have been or may be instituted or asserted against Alcoa Corporation, including those pertaining to environmental, safety and health, commercial, tax, product liability, intellectual property infringement, employment, and employee and retiree benefit matters, and other actions and claims arising out of the normal course of business. While the amounts claimed in these other matters may be substantial, the ultimate liability is not readily determinable because of the considerable uncertainties that exist. Accordingly, it is possible that the Company's liquidity or results of operations in a particular period could be materially affected by one or more of these other matters. However, based on facts currently available, management believes that the disposition of these other matters that are pending or asserted will not have a material adverse effect, individually or in the aggregate, on the financial position of the Company.

Commitments

Purchase Obligations. Alcoa Corporation is party to unconditional purchase obligations for energy that expire between 2040 and 2041. Commitments related to these contracts total $57 in 2022, $60 in 2023, $62 in 2024, $64 in 2025, $66 in 2026, and $1,155 thereafter. Expenditures under these contracts totaled $86 in 2021, $79 in 2020, and $146 in 2019. Additionally, the Company has entered into other purchase commitments for energy, raw materials, and other goods and services, which total $3,829 in 2022 $1,853, in 2023, $1,585 in 2024, $1,637 in 2025, $1,594 in 2026, and $10,547 thereafter.

AofA has a gas supply agreement to power its three alumina refineries in Western Australia which began in July 2020 for a 12-year period. The terms of this agreement required AofA to make a prepayment of $500 in two installments, the first of which was made in June 2015 for $300. The second installment of $200 was made in April 2016. At December 31, 2021, Alcoa Corporation had a total asset of $417 (A$571), which was included in Prepaid expenses and other current assets ($40) and Other noncurrent assets ($377) (see Note U) on the accompanying Consolidated Balance Sheet related to these prepayments. At December 31, 2020, Alcoa Corporation had a total asset of $481 (A$625), which was included in Prepaid expenses and other current assets ($42) and Other noncurrent assets ($439) (see Note U) on the accompanying Consolidated Balance Sheet.

Guarantees of Third Parties. As of December 31, 2021 and 2020, the Company had no outstanding potential future payments for guarantees issued on behalf of a third-party.

Bank Guarantees and Letters of Credit. Alcoa Corporation has outstanding bank guarantees and letters of credit related to, among others, energy contracts, environmental obligations, legal and tax matters, leasing obligations, workers compensation, and customs duties. The total amount committed under these instruments, which automatically renew or expire at various dates between 2022 and 2026, was $312 (includes $110 issued under a standby letter of credit agreement —see below) at December 31, 2021. Additionally, ParentCo has outstanding bank guarantees and letters of credit related to the Company in the amount of $15 at December 31, 2021. In the event ParentCo would be required to perform under any of these instruments, ParentCo would be indemnified by Alcoa Corporation in accordance with the Separation and Distribution Agreement. Likewise, the Company has outstanding bank guarantees and letters of credit related to ParentCo in the amount of $11 at December 31, 2021. In the event Alcoa Corporation would be required to perform under any of these instruments, the Company would be indemnified by ParentCo in accordance with the Separation and Distribution Agreement.

In August 2017, Alcoa Corporation entered into a standby letter of credit agreement, which expires on May 3, 2023 (extended in August 2018, May 2019, and May 2021), with three financial institutions. The agreement provides for a $150 facility used by the Company for matters in the ordinary course of business. Alcoa Corporation's obligations under this facility are secured in the same manner as obligations under the Company's revolving credit facility. Additionally, this facility contains similar representations and warranties and affirmative, negative, and financial covenants as the Company's revolving credit facility (see Note M). As of December 31, 2021, letters of credit aggregating $110 were issued under this facility.

Surety Bonds. Alcoa Corporation has outstanding surety bonds primarily related to tax matters, contract performance, workers compensation, environmental-related matters, and customs duties. The total amount committed under these bonds, which automatically renew or expire at various dates between 2022 and 2026, was $158 at December 31, 2021. Additionally, ParentCo has outstanding surety bonds related to the Company in the amount of $12 at December 31, 2021. In the event ParentCo would be required to perform under any of these instruments, ParentCo would be indemnified by Alcoa Corporation in accordance with the Separation and Distribution Agreement. Likewise, the Company has outstanding surety bonds related to ParentCo in the amount of $3 at December 31, 2021. In the event Alcoa Corporation would be required to perform under any of these instruments, the Company would be indemnified by ParentCo in accordance with the Separation and Distribution Agreement.

T. Leasing

Management records a right-of-use asset and lease liability for several types of operating leases, including land and buildings, alumina refinery process control technology, plant equipment, vehicles, and computer equipment. These amounts are equivalent to the aggregate future lease payments on a discounted basis. The leases have remaining terms of less than one to 36 years. The discount rate applied to these leases is the Company's incremental borrowing rate based on the information available at the commencement date in determining the present value of lease payments, unless there is a rate implicit in the lease agreement. The Company does not have material financing leases.

Lease expense and operating cash flows include:

	2021	2020
Costs from operating leases	$ 70	$ 74
Variable lease payments	$ 13	$ 11
Short-term rental expense	$ 3	$ 3

The weighted average lease term and weighted average discount rate were as follows:

December 31,	2021	2020
Weighted average lease term for operating leases (years)	4.9	4.4
Weighted average discount rate for operating leases	5.2%	5.2%

The following represents the aggregate right-of-use assets and related lease obligations recognized in the Consolidated Balance Sheet:

December 31,	2021	2020
Properties, plants, and equipment, net	$ 97	$ 137
Other current liabilities	35	60
Other noncurrent liabilities and deferred credits	64	82
Total operating lease liabilities	$ 99	$ 142

Right-of-use assets and lease liabilities related to the Warrick Rolling Mill were excluded from the December 31, 2020 balances in the above table due to the sale of the rolling mill and were reclassified to Assets held for sale (see Note C).

New leases of $24 and $54 were added during the years ended December 31, 2021 and 2020, respectively.

The future cash flows related to the operating lease obligations as of December 31, 2021 were as follows:

Year Ending December 31,	
2022	$ 41
2023	27
2024	15
2025	10
2026	7
Thereafter	17
Total lease payments (undiscounted)	117
Less: discount to net present value	(18)
Total	$ 99

U. Other Financial Information

Interest Cost Components

	2021	2020	2019
Amount charged to expense	$ 195	$ 146	$ 121
Amount capitalized	6	9	13
	$ 201	$ 155	$ 134

Other (Income) Expenses, Net

	2021	2020	2019
Equity (gain) loss	$ (105)	$ 46	$ 49
Foreign currency losses, net	3	20	16
Net gain from asset sales	(354)	(173)	(3)
Net (gain) loss on mark-to-market derivative instruments (P)	(25)	11	(1)
Non-service costs – pension and OPEB (O)	47	108	117
Other, net	(11)	(4)	(16)
	$ (445)	$ 8	$ 162

In 2021, Net gain from asset sales of $354 was primarily related to the sales of the Rockdale site, the Eastalco site, and the Warrick Rolling Mill (see Note C). In 2020, Net gain from asset sales included a $181 gain related to the sale of EES (see Note C).

Other Noncurrent Assets

December 31,	2021	2020
Gas supply prepayment (S)	$ 377	$ 439
Prepaid gas transmission contract	304	315
Value-added tax credits	215	134
Deferred mining costs, net	149	136
Prepaid pension benefit (O)	164	—
Goodwill (L)	144	145
Noncurrent restricted cash (see below)	106	—
Noncurrent prepaid tax asset (S)	78	82
Intangibles, net (L)	35	45
Other	92	148
	$ 1,664	$ 1,444

Prepaid gas transmission contract—As part of a previous sale transaction of an equity investment, Alcoa maintained access to approximately 30% of the Dampier to Bunbury Natural Gas Pipeline transmission capacity in Western Australia for gas supply to three **alumina refineries. At December 31, 2021 and 2020, AofA had an asset of $304 and $315, respectively, representing prepayments made under the agreement for future gas transmission services.**

Value-added tax credits—The Value-added tax (VAT) credits (federal and state) relate to two of the Company's subsidiaries in Brazil, AWAB and Alumínio, concerning the São Luís smelter and refinery and the Juruti mine. This refinery pays VAT on the purchase of goods and services used in the alumina production process. The credits generally can be utilized to offset the VAT charged on domestic sales of alumina and aluminum.

In March 2021, the Brazil Federal Supreme Court provided clarification on an earlier ruling that found the inclusion of state VAT within the federal VAT tax base to be unconstitutional. After receiving further clarification from the court in August 2021, the Company finalized the amount of its recovery claim and submitted the claim to the tax authorities in the fourth quarter and received acknowledgment of the claim in January 2022. As a result, in the fourth quarter of 2021, the Company recorded $95 of additional VAT credits in Other noncurrent assets, $47 payable to Arconic Corporation within Other noncurrent liabilities, $34 in Sales, and $14 of interest income within Other (income) expenses, net. The amount due to Arconic Corporation represents VAT payments related to an Arconic subsidiary previously owned by Aluminio for a portion of the claim years and covered under agreements related to the Separation Transaction (see Note A).

In the fourth quarter of 2018, as a result of an assessment on the future realizability of the state VAT credits, management established an allowance on the accumulated state VAT credit balances and recorded a $107 charge in Restructuring and other charges, net, on the accompanying Statement of Consolidated Operations. While the Company retains the ability to utilize the state credits in the future, the restart of the Alumar smelter in São Luís, Brazil provided the only practical opportunity to monetize these credits. In 2021, the Company announced its plan to restart its 268 kmt per year share of capacity at the Alumar smelter, which had been fully curtailed since 2015. The smelter restart began in late 2021 and is expected to be operational at full capacity in the fourth quarter of 2022. Once smelter domestic sales start in mid-2022 and VAT credits are realized, the Company expects to reverse the initial valuation allowance with a credit to Restructuring and other charges, net and reverse the subsequent additions to the valuation allowance with a credit to Cost of goods sold (same account as when incurred).

Other Noncurrent Liabilities and Deferred Credits

December 31,	2021	2020
Noncurrent accrued tax liability (S)	$ 174	$ 169
Accrued compensation and retirement costs	120	116
Operating lease obligations (T)	64	82
Deferred carbon dioxide emission credits	54	56
Value-added tax credits payable to Arconic Corporation	47	—
Noncurrent restructuring reserve (D)	44	1
Deferred alumina sales revenue	36	45
Noncurrent site separation reserve (C)	26	—
Other	34	46
	$ 599	$ 515

Other noncurrent liabilities related to the Warrick Rolling Mill were excluded from the December 31, 2020 balances in the above table due to the sale of the rolling mill and were reclassified to Liabilities held for sale (see Note C).

Deferred carbon dioxide emission credits—Deferred credits relate to cash received for carbon dioxide emissions related to the San Ciprián smelter ($40) and refinery ($6), as well as the divested Avilés and La Coruña facilities ($8), from a governmental agency in Spain. The terms of the credits require the Company to comply with certain conditions for a period of three years. These deferred credits will be recognized as a reduction to Cost of goods sold once it is determined to be probable the Company will satisfy all conditions. Should the Company not meet all conditions during the three-year period, the credits will be repaid to the governmental agency.

Value-added tax credits payable to Arconic Corporation—See, Other noncurrent assets—Value-added tax credits, above.

Cash and Cash Equivalents and Restricted Cash

December 31,	2021	2020
Cash and cash equivalents	$ 1,814	$ 1,607
Current restricted cash	4	3
Noncurrent restricted cash	106	—
	$ 1,924	$ 1,610

Current restricted cash amounts are reported in Prepaid expenses and other current assets on the accompanying Consolidated Balance Sheet. Noncurrent restricted cash amounts are reported in Other noncurrent assets on the accompanying Consolidated Balance Sheet.

On December 29, 2021, the Company announced the two-year curtailment of the San Ciprián aluminum smelter in Spain. As a result of the agreement reached between Alcoa and the San Ciprián workers' representatives, the Company has restricted cash of $103 to be made available in the future to cover capital expenditures and future restart costs associated with the planned restart at the end of the curtailment period, expected to begin in January 2024.

Cash Flow Information

Cash paid for interest and income taxes was as follows:

	2021	2020	2019
Interest, net of amount capitalized	$ 191	$ 135	$ 113
Income taxes, net of amount refunded	152	183	732

V. Subsequent Events

On February 15, 2022, the Company signed an agreement to sell its share of its investment in Mineração Rio do Norte S.A in Brazil for $10 to South32 Limited. Related to this transaction, the Company expects to record an asset impairment of approximately $55 in the first quarter of 2022 in Restructuring and other charges, net on the Statement of Consolidated Operations. The transaction is expected to close by April 2022. Further, an additional $30 in cash could be paid to Alcoa if certain post-closing conditions are satisfied.

Item 9. Changes in and Disagreements with Accountants on Accounting and Financial Disclosure.

None.

Item 9A. Controls and Procedures.

(a) Evaluation of Disclosure Controls and Procedures

Alcoa Corporation's Chief Executive Officer and Chief Financial Officer have evaluated the Company's disclosure controls and procedures, as defined in Rules 13a-15(e) and 15d-15(e) of the U.S. Securities Exchange Act of 1934, as amended, as of the end of the period covered by this report, and they have concluded that these controls and procedures were effective as of December 31, 2021.

(b) Management's Annual Report on Internal Control over Financial Reporting

Management's Report on Internal Control over Financial Reporting is included in Part II Item 8 of this Form 10-K.

(c) Attestation Report of the Registered Public Accounting Firm

The effectiveness of Alcoa Corporation's internal control over financial reporting as of December 31, 2021 has been audited by PricewaterhouseCoopers LLP (PCAOB ID No. 238), an independent registered public accounting firm, as stated in their report, which is included in Part II Item 8 of this Form 10-K.

(d) Changes in Internal Control over Financial Reporting

There have been no changes in internal control over financial reporting during the fourth quarter of 2021 that have materially affected, or are reasonably likely to materially affect, the Company's internal control over financial reporting.

Item 9B. Other Information.

None.

Item 9C. Disclosure Regarding Foreign Jurisdictions that Prevent Inspections.

Not applicable.

PART III

Item 10. Directors, Executive Officers and Corporate Governance.

The information required by Item 401 of Regulation S-K regarding executive officers is set forth in Part I Item 1 of this Form 10-K under the caption "Information about our Executive Officers." The information required by Item 401 of Regulation S-K regarding directors is contained under the caption "Item 1 Election of 10 Director Nominees to Serve for One-Year Terms Expiring in 2023" of Alcoa Corporation's Definitive Proxy Statement for the 2022 Annual Meeting of Stockholders (Proxy Statement), which will be filed with the SEC within 120 days of the end of Alcoa Corporation's fiscal year ended December 31, 2021 (Proxy Statement) and is incorporated herein by reference.

The Company's Code of Conduct, which incorporates a Code of Ethics that applies to our principal executive officer, principal financial officer, principal accounting officer or controller, is publicly available on the Company's website at www.alcoa.com under the section "Investors—Governance—Governance Documents—Code of Conduct." Alcoa Corporation will post any amendments to, or waivers of, its Code of Conduct that apply to its principal executive officer, principal financial officer, principal accounting officer or controller on its website.

The information required by Items 407(c)(3), (d)(4) and (d)(5) of Regulation S-K is included under the captions "Item 1 Election of 10 Director Nominees to Serve for One-Year Terms Expiring in 2023—Nominating Board Candidates—Procedures and Director Qualifications," "Corporate Governance—Board Information—Meetings, Attendance and Committee Composition" and "Corporate Governance—Board Information—Committees of the Board" of the Proxy Statement and is incorporated herein by reference.

Item 11. Executive Compensation.

The information required by Item 402 of Regulation S-K is contained under the captions "Item 1 Election of 10 Director Nominees to Serve for One-Year Terms Expiring in 2023—Non-Employee Director Compensation Program," "Executive Compensation," "Corporate Governance—Board Information—The Board's Role in Risk Oversight," "Corporate Governance—Board Information—Committees of the Board," and "Corporate Governance—Compensation Matters" of the Proxy Statement. Such information is incorporated herein by reference.

The information required by Items 407(e)(4) and (e)(5) of Regulation S-K is contained under the captions "Corporate Governance—Compensation Matters—Compensation Committee Interlocks and Insider Participation" and "Executive Compensation—Compensation Committee Report," respectively, of the Proxy Statement. Such information (other than the Compensation Committee Report, which shall not be deemed to be filed) is incorporated herein by reference.

Item 12. Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters.

The information required by Item 201(d) of Regulation S-K is contained under the caption "Equity Compensation Plan Information" of the Proxy Statement and is incorporated herein by reference.

The information required by Item 403 of Regulation S-K is contained under the caption "Beneficial Ownership" of the Proxy Statement and is incorporated herein by reference.

Item 13. Certain Relationships and Related Transactions, and Director Independence.

The information required by Item 404 of Regulation S-K is contained under the caption "Corporate Governance —Related Person Transactions" of the Proxy Statement and is incorporated herein by reference.

The information required by Item 407(a) of Regulation S-K is contained under the caption "Corporate Governance—Board Information" of the Proxy Statement and is incorporated herein by reference.

Item 14. Principal Accountant Fees and Services.

The information required by Item 9(e) of Schedule 14A is contained under the caption "Item 2 Ratification of the Appointment of PricewaterhouseCoopers LLP as the Company's Independent Auditor for 2022—Audit Committee Pre-Approval Policy" and "Item 2 Ratification of the Appointment of PricewaterhouseCoopers LLP as the Company's Independent Auditor for 2022—Auditor Fees" of the Proxy Statement and is incorporated herein by reference.

PART IV

Item 15. Exhibit and Financial Statement Schedules.

(a) The consolidated financial statements and exhibits listed below are filed as part of this report.

(1) The Company's consolidated financial statements, the notes thereto and the report of the Independent Registered Public Accounting Firm are included in Part II Item 8 of this report.

(2) Financial statement schedules have been omitted because they are not applicable, not required, or the required information is included in the consolidated financial statements or notes thereto.

(3) Exhibits.

Exhibit No.	Description of Exhibit
3.1	Amended and Restated Certificate of Incorporation of Alcoa Corporation (incorporated by reference to Exhibit 3.1 to the Company's Current Report on Form 8-K filed November 3, 2016 (File No. 1-37816))
3.2	Amended and Restated Bylaws of Alcoa Corporation, as adopted on December 6, 2017 (incorporated by reference to Exhibit 3.1 to the Company's Current Report on Form 8-K filed December 8, 2017 (File No. 1-37816))
4.1	Indenture, dated May 17, 2018, among Alcoa Nederland Holding B.V., Alcoa Corporation, certain subsidiaries of Alcoa Corporation, and the Bank of New York Mellon Trust Company, N.A., as trustee (incorporated by reference to Exhibit 4.1 to the Company's Current Report on Form 8-K filed May 17, 2018 (File No. 1-37816))
4.2	Supplemental Indenture, dated as of December 9, 2019, among Alcoa Corporation, Alcoa Treasury S.à r.l, Alcoa Nederland Holding B.V., and The Bank of New York Mellon Trust Company, N.A. under the Indenture dated May 17, 2018 (incorporated by reference to Exhibit 4.5 to the Company's Annual Report on Form 10-K for the year ended December 31, 2019, filed February 21, 2020 (File No. 1-137816))
4.3	Indenture, dated July 13, 2020, among Alcoa Nederland Holding B.V., Alcoa Corporation, certain subsidiaries of Alcoa Corporation, and The Bank of New York Mellon Trust Company, National Association, as trustee (incorporated by reference to Exhibit 4.1 to the Company's Current Report on Form 8-K filed July 13, 2020 (File No. 1-37816))
4.4	Indenture, dated as of March 24, 2021, among Alcoa Nederland Holding B.V., Alcoa Corporation, certain subsidiaries of Alcoa Corporation, and The Bank of New York Mellon Trust Company, N.A., as trustee (incorporated by reference to Exhibit 4.1 to the Company's Current Report on Form 8-K filed March 24, 2021 (File No. 1-37816))
4.5	Description of Securities (incorporated by reference to Exhibit 4.6 to the Company's Annual Report on Form 10-K for the year ended December 31, 2019, filed February 21, 2020 (File No. 1-137816))
10.1	Separation and Distribution Agreement, dated as of October 31, 2016, by and between Arconic Inc. and Alcoa Corporation (incorporated by reference to Exhibit 2.1 to the Company's Current Report on Form 8-K filed November 4, 2016 (File No. 1-37816))
10.2	Tax Matters Agreement, dated as of October 31, 2016, by and between Arconic Inc. and Alcoa Corporation (incorporated by reference to Exhibit 2.3 to the Company's Current Report on Form 8-K filed November 4, 2016 (File No. 1-37816))
10.3	Alcoa Corporation to Arconic Inc. Patent, Know-How, and Trade Secret License Agreement, dated as of October 31, 2016, by and between Alcoa USA Corp. and Arconic Inc. (incorporated by reference to Exhibit 2.5 to the Company's Current Report on Form 8-K filed November 4, 2016 (File No. 1-37816))
10.4	First Amendment to Alcoa Corporation to Arconic Inc. Patent, Know-How, and Trade Secret License Agreement, dated January 5, 2017, by and between Alcoa USA Corp. and Arconic Inc. (filed herewith)
10.5	Second Amendment to Alcoa Corporation to Arconic Inc. Patent, Know-How, and Trade Secret License Agreement, effective as of October 18, 2021, by and between Alcoa USA Corp. and Howmet Aerospace Inc. (f/k/a Arconic Inc.) (filed herewith)
10.6	Arconic Inc. to Alcoa Corporation Patent, Know-How, and Trade Secret License Agreement, dated as of October 31, 2016, by and between Arconic Inc. and Alcoa USA Corp. (incorporated by reference to Exhibit 2.6 to the Company's Current Report on Form 8-K filed November 4, 2016 (File No. 1-37816))

Exhibit No.	Description of Exhibit
10.7	Amended and Restated Alcoa Corporation to Arconic Inc. Trademark License Agreement, dated as of June 25, 2017, by and between Alcoa USA Corp. and Arconic Inc. (incorporated by reference to Exhibit 2 to the Company's Quarterly Report on Form 10-Q filed August 3, 2017 (File No. 1-37816))
10.8	Second Amendment and Restatement Agreement, dated as of November 21, 2018, which includes, as Exhibit A thereto, the Revolving Credit Agreement, dated as of September 16, 2016, as amended as of October 26, 2016, as amended and restated as of November 14, 2017, among Alcoa Corporation, Alcoa Nederland Holding B.V., the lenders and issuers from time to time party thereto, and JPMorgan Chase Bank, N.A., as administrative agent for the lenders and issuers (incorporated by reference to Exhibit 10.1 to the Company's Current Report on Form 8-K filed November 26, 2018 (File No. 1-37816))
10.9	Amendment No. 1 dated as of August 16, 2019 to the Revolving Credit Agreement dated as of September 16, 2016, as amended as of October 26, 2016, as amended and restated as of November 14, 2017 and as amended and restated as of November 21, 2018, among Alcoa Corporation, Alcoa Nederland Holding B.V., the lenders and issuers from time to time party thereto, and JPMorgan Chase Bank, N.A., as administrative agent for the lenders and issuers (incorporated by reference to Exhibit 10.1 to the Company's Quarterly Report on Form 10-Q filed October 31, 2019 (File No. 1-37816))
10.10	Amendment No. 2 dated as of April 21, 2020 to the Revolving Credit Agreement dated as of September 16, 2016, as amended as of October 26, 2016, as amended and restated as of November 14, 2017 and as amended and restated as of November 21, 2018 and as amended on August 16, 2019, among Alcoa Corporation, Alcoa Nederland Holding B.V., the lenders and issuers from time to time party thereto, and JPMorgan Chase Bank, N.A., as administrative agent for the lenders and issuers (incorporated by reference to Exhibit 10.1 to the Company's Quarterly Report on Form 10-Q filed April 29, 2020 (File No. 1-37816))
10.11	Amendment No. 3 dated as of June 24, 2020 to the Revolving Credit Agreement dated as of September 16, 2016, as amended as of October 26, 2016, as amended and restated as of November 14, 2017 and as amended and restated as of November 21, 2018, as amended on August 16, 2019, and as amended on April 21, 2020, among Alcoa Corporation, Alcoa Nederland Holding B.V., the lenders and issuers from time to time party thereto, and JPMorgan Chase Bank, N.A., as administrative agent for the lenders and issuers (incorporated by reference to Exhibit 10.1 to the Company's Current Report on Form 8-K filed June 25, 2020 (File No. 1-37816))
10.12	Amendment No. 4 dated as of March 4, 2021 to the Revolving Credit Agreement dated as of September 16, 2016, as amended as of October 26, 2016, as amended and restated as of November 14, 2017 and as amended and restated as of November 21, 2018, as amended as of August 16, 2019, as amended as of April 21, 2020 and as amended as of June 24, 2020, among Alcoa Corporation, Alcoa Nederland Holding B.V., the lenders and issuers from time to time party thereto, and JPMorgan Chase Bank, N.A., as administrative agent for the lenders and issuers (incorporated by reference to Exhibit 10.1 to the Company's Current Report on Form 8-K filed March 4, 2021 (File No. 1-37816))
10.13	Amended and Restated Charter of the Strategic Council for the AWAC Joint Venture (incorporated by reference to Exhibit 10.1 to the Company's Current Report on Form 8-K filed November 4, 2016 (File No. 1-37816))
10.14	Side Letter of November 1, 2016, between Alcoa Corporation and Alumina Limited clarifying transfer restrictions (incorporated by reference to Exhibit 10.3 to the Company's Current Report on Form 8-K filed November 4, 2016 (File No. 1-37816))
10.15	Third Amended and Restated Limited Liability Company Agreement of Alcoa World Alumina LLC, dated as of November 1, 2016, by and among Alcoa USA Corp., ASC Alumina, Alumina International Holdings Pty Ltd, Alumina (USA) Inc., Reynolds Metals Company, LLC and Reynolds Metals Exploration, Inc. (incorporated by reference to Exhibit 10.2 to the Company's Current Report on Form 8-K filed November 4, 2016 (File No. 1-37816))
10.16	Shareholders' Agreement between Alcoa of Australia Limited, Alcoa Australian Pty Ltd and Alumina Limited, originally dated as of May 10, 1996 (incorporated by reference to Exhibit 10.13 to Amendment No. 2 to the Company's Registration Statement on Form 10 filed September 1, 2016 (File No. 1-37816))
10.17	Kwinana State Agreement of 1961 (incorporated by reference to Exhibit 10.7 to Amendment No. 2 to the Company's Registration Statement on Form 10 filed September 1, 2016 (File No. 1-37816))
10.18	Pinjarra State Agreement of 1969 (incorporated by reference to Exhibit 10.8 to Amendment No. 2 to the Company's Registration Statement on Form 10 filed September 1, 2016 (File No. 1-37816))
10.19	Wagerup State Agreement of 1978 (incorporated by reference to Exhibit 10.9 to Amendment No. 2 to the Company's Registration Statement on Form 10 filed September 1, 2016 (File No. 1-37816))

Exhibit No.	Description of Exhibit
10.20	Alumina Refinery Agreement of 1987 (incorporated by reference to Exhibit 10.10 to Amendment No. 2 to the Company's Registration Statement on Form 10 filed September 1, 2016 (File No. 1-37816))
10.21	Framework Agreement, dated June 26, 2019, between Saudi Arabian Mining Company (Ma'aden) and Alcoa Corporation (incorporated by reference to Exhibit 10.1 to the Company's Quarterly Report on Form 10-Q filed July 31, 2019 (File No. 1-37816))
10.22	Amendment and Restatement Deed dated June 26, 2019 relating to the Aluminium Project Framework Shareholders' Agreement originally dated December 20, 2009 between Saudi Arabian Mining Company (Ma'aden) and Alcoa Corporation (incorporated by reference to Exhibit 10.2 to the Company's Quarterly Report on Form 10-Q filed July 31, 2019 (File No. 1-37816))
10.23	Alcoa Corporation 2016 Stock Incentive Plan (as Amended and Restated as of May 9, 2018), (incorporated by reference to Exhibit 99.1 to the Company's Current Report on Form 8-K filed May 15, 2018 (File No. 1-37816))*
10.24	Alcoa USA Corp. Deferred Compensation Plan, as amended November 15, 2021 (filed herewith)*
10.25	Alcoa USA Corp. Nonqualified Supplemental Retirement Plan C (incorporated by reference to Exhibit 10.3 to Amendment No. 1 to the Company's Registration Statement on Form 10 filed August 12, 2016 (File No. 1-37816))*
10.26	Amendment 1 to Alcoa USA Corp. Nonqualified Supplemental Retirement Plan C, effective January 1, 2021 (incorporated by reference to Exhibit 10.9 to the Company's Annual Report on Form 10-K for the year ended December 31, 2017, filed February 23, 2018 (File No. 1-37816))*
10.27	Form of Amended and Restated Indemnification Agreement by and between Alcoa Corporation and individual directors or officers, effective August 1, 2017 (incorporated by reference to Exhibit 10.5 to the Company's Quarterly Report on Form 10-Q filed August 3, 2017 (File No. 1-37816))*
10.28	Alcoa Corporation Annual Cash Incentive Compensation Plan (as Amended and Restated), effective February 21, 2018 (incorporated by referenced to Exhibit 10 to the Company's Quarterly Report on Form 10-Q filed May 9, 2018 (File No. 1-37816))*
10.29	Alcoa Corporation Amended and Restated Change in Control Severance Plan, dated July 30, 2019 (incorporated by reference to Exhibit 10.5 to the Company's Quarterly Report on Form 10-Q filed October 31, 2019 (File No. 1-37816))*
10.30	Amended and Restated Form of Alcoa Corporation Chief Executive Officer and Chief Financial Officer Executive Severance Agreement, effective as of July 30, 2019 (incorporated by reference to Exhibit 10.6 to the Company's Quarterly Report on Form 10-Q filed October 31, 2019 (File No. 1-37816))*
10.31	Amended and Restated Form of Alcoa Corporation Corporate Officer Executive Severance Agreement, effective as of July 30, 2019 (incorporated by reference to Exhibit 10.7 to the Company's Quarterly Report on Form 10-Q filed October 31, 2019 (File No. 1-37816))*
10.32	Terms and Conditions for Employee Stock Option Awards (incorporated by reference to Exhibit 10.30 to the Company's Registration Statement on Form S-1 filed January 18, 2017 (File No. 333-215606))*
10.33	Terms and Conditions for Employee Stock Option Awards, dated January 24, 2018 (incorporated by reference to Exhibit 10.30 to the Company's Annual Report on Form 10-K for the year ended December 31, 2017, filed February 23, 2018 (File No. 1-37816))*
10.34	Terms and Conditions for Employee Restricted Share Units, effective October 1, 2019 (incorporated by reference to Exhibit 10.2 to the Company's Quarterly Report on Form 10-Q filed October 31, 2019 (File No. 1-37816))*
10.35	Terms and Conditions for Employee Stock Option Awards, effective October 1, 2019 (incorporated by reference to Exhibit 10.3 to the Company's Quarterly Report on Form 10-Q filed October 31, 2019 (File No. 1-37816))*
10.36	Terms and Conditions for Employee Special Retention Awards, effective October 1, 2019 (incorporated by reference to Exhibit 10.4 to the Company's Quarterly Report on Form 10-Q filed October 31, 2019 (File No. 1-37816))*
10.37	Terms and Conditions for Employee Restricted Share Units, effective December 8, 2021 (filed herewith)*
10.38	Terms and Conditions for Employee Special Retention Awards, effective December 8, 2021 (filed herewith)*
10.39	Letter Agreement, dated December 17, 2018, between John Slaven and Alcoa Corporation (incorporated by reference to Exhibit 10.36 to the Company's Annual Report on Form 10-K for the fiscal year ended December 31, 2019, filed February 21, 2020 (1-37816))*

Exhibit No.	Description of Exhibit
10.40	Alcoa Corporation Non-Employee Director Compensation Policy, effective September 24, 2020 (incorporated by reference to Exhibit 10.1 to the Company's Quarterly Report on Form 10-Q filed October 30, 2020 (File No. 1-37816))*
10.41	Terms and Conditions for Deferred Fee Restricted Share Units Director Awards, effective December 1, 2016 (incorporated by reference to Exhibit 10.34 to the Company's Registration Statement on Form S-1 filed January 18, 2017 (File No. 333-215606))*
10.42	Terms and Conditions for Restricted Share Units Annual Director Awards, effective December 1, 2016 (incorporated by reference to Exhibit 10.35 to the Company's Registration Statement on Form S-1 filed January 18, 2017 (File No. 333-215606))*
10.43	Terms and Conditions for Restricted Share Units Annual Director Awards, effective May 9, 2017 (incorporated by reference to Exhibit 10.3 to the Company's Quarterly Report Form 10-Q filed August 3, 2017 (File No. 1-37816))*
10.44	Alcoa Corporation 2016 Deferred Fee Plan for Directors, effective November 1, 2016, as amended and restated on December 5, 2018 (incorporated by reference to Exhibit 10.37 to the Company's Annual Report on Form 10-K for the fiscal year ended December 31, 2019, filed February 26, 2019 (1-37816))*
21.1	List of Subsidiaries
23.1	Consent of PricewaterhouseCoopers LLP
23.2	Consent of SLR International Corporation
31.1	Certification of Principal Executive Officer required by Securities and Exchange Commission Rule 13a-14(a) or 15d-14(a)
31.2	Certification of Principal Financial Officer required by Securities and Exchange Commission Rule 13a-14(a) or 15d-14(a)
32.1	Certification of Principal Executive Officer, required by Rule 13a-14(b) or Rule 15d-14(b) and Section 1350 of Chapter 63 of Title 18 of the United States Code
32.2	Certification of Principal Financial Officer, required by Rule 13a-14(b) or Rule 15d-14(b) and Section 1350 of Chapter 63 of Title 18 of the United States Code
95.1	Mine Safety Disclosure
96.1	Technical Report Summary for Darling Range, Western Australia
96.2	Technical Report Summary for Juruti, Brazil
99.1	Amended and Restated Grantor Trust Agreement by and between Alcoa Corporation and Wells Fargo Bank, National Association, effective October 24, 2017 (incorporated by reference to Exhibit 99.1 to the Company's Annual Report on Form 10-K for the year ended December 31, 2017, filed February 23, 2018 (File No. 137816))
101.INS	Inline XBRL Instance Document
101.SCH	Inline XBRL Taxonomy Extension Schema Document
101.CAL	Inline XBRL Taxonomy Extension Calculation Linkbase Document
101.DEF	Inline XBRL Taxonomy Extension Definition Linkbase Document
101.LAB	Inline XBRL Taxonomy Extension Label Linkbase Document
101.PRE	Inline XBRL Taxonomy Extension Presentation Linkbase Document
104	Cover Page Interactive Data File (formatted as Inline XBRL and contained in Exhibit 101)

Certain schedules exhibits, and appendices have been omitted in accordance with to Item 601(a)(5) of Regulation S-K. The Company hereby undertakes to furnish copies of any omitted schedule, exhibit, or appendix to the Commission upon request.

* Denotes management contracts or compensatory plans or arrangements required to be filed as Exhibits to this Form 10-K.

Item 16. Form 10-K Summary.

Not applicable.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized.

ALCOA CORPORATION

By: /s/ Molly S. Beerman
Molly S. Beerman
Senior Vice President and Controller

February 24, 2022

Pursuant to the requirements of the Securities Exchange Act of 1934, this report has been signed below by the following persons on behalf of the registrant and in the capacities indicated and as of February 24, 2022.

/s/ Roy C. Harvey
Roy C. Harvey
President, Chief Executive Officer and Director (Principal Executive Officer and Director)

/s/ William F. Oplinger
William F. Oplinger
Executive Vice President and Chief Financial Officer (Principal Financial Officer)

/s/ Molly S. Beerman
Molly S. Beerman
Senior Vice President and Controller
(Principal Accounting Officer)

/s/ Steven W. Williams
Steven W. Williams
Director, Chairman of the Board of Directors

/s/ Mary Anne Citrino
Mary Anne Citrino
Director

/s/ Pasquale Fiore
Pasquale Fiore
Director

/s/ Thomas J. Gorman
Thomas J. Gorman
Director

/s/ James A. Hughes
James A. Hughes
Director

/s/ James E. Nevels
James E. Nevels
Director

/s/ Carol L. Roberts
Carol L. Roberts
Director

/s/ Suzanne Sitherwood
Suzanne Sitherwood
Director

/s/ Ernesto Zedillo
Ernesto Zedillo
Director

FIRST AMENDMENT
TO PATENT, KNOW-HOW AND TRADE SECRET LICENSE AGREEMENT

THIS FIRST AMENDMENT TO THE PATENT, KNOW-HOW AND TRADE SECRET LICENSE AGREEMENT (the **"First Amendment")** is made and entered into effective as of November 1, 2016 **("First Amendment Effective Date"),** by and between Alcoa USA Corp. **("Alcoa")** and Arconic Inc. **("Arconic").**

RECITALS

WHEREAS, Alcoa and Alcoa Inc. are parties to that certain Patent, Know-How and Trade Secret License Agreement, having an effective date of October 31, 2016 (the **"Agreement");**

WHEREAS, effective as of November 1, 2016, Alcoa Inc. changed its name to Arconic Inc.;

WHEREAS, Alcoa and Arconic now desire to amend the Agreement.

NOW, THEREFORE, in consideration of the mutual promises and covenants contained herein, and good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the Parties hereto, intending to be legally bound, agree as follows:

1. Definitions. All capitalized terms used in this Amendment but not defined in this Amendment shall have the meanings ascribed to them in the Agreement. To the extent there is a conflict in meaning or interpretation as between the Agreement and this Amendment, this Amendment shall govern.

2. Amendments to the Agreement. The Agreement is hereby amended as of the First Amendment Effective Date by adding the following to the Patent section of Schedule 5:

PATIO	Title	Status	Country	Serial No.	Patent No.	Technology
16- 114242	SYSTEMS AND METHODS FOR MAKING CERAMIC POWDERS AND CERAMIC PRODUCTS	Filed	US	62/353,880		Advanced Ceramics
16- 114059	SYSTEMS AND METHODS FOR MAKING CERAMIC POWDERS	Filed	US	62/360,079		Advanced Ceramics

3. No Other Amendments; Confirmation. Except as expressly amended hereby, the provisions of the Amendment are and shall remain in full force and effect. Nothing herein shall be deemed to entitle either party to a consent to, or a waiver, amendment, modification or other change of, any of the terms, conditions, obligations, covenants or agreements contained in the Amendment other than as provided herein.

4. Severability. If any term, provision, covenant or condition of this Amendment is held invalid or unenforceable for any reason, the remaining provisions of this Amendment shall continue in full force and effect as if this Amendment had been executed with the invalid portion eliminated, provided the effectiveness of the remaining portions of this Amendment will not defeat the overall intent of the parties. In such a situation, the parties agree, to the extent legal and possible, to incorporate a replacement provision to accomplish the originally intended effect.

5. Electronic/Facsimile Signatures; Counterparts. The parties agree that a facsimile or electronically-copied signature has the same effect as an original signature. This Amendment may be executed in multiple copies, each of which is an original and all of which constitute one instrument.

[Signature page follows]

IN WITNESS WHEREOF, the parties hereto have executed this Amendment or caused the same to be executed by a duly authorized officer as of the Amendment Effective Date.

Alcoa USA Corp.

By: /s/ John Kenna
Name: John Kenna
Title: Vice President, Tax
Date: 1/5/17

Arconic Inc.

By: /s/ Max Laun
Name: Max Laun
Title: VP and General Counsel
Date: 1/5/17

SECOND AMENDMENT TO PATENT, KNOW-HOW AND TRADE SECRET LICENSE AGREEMENT

THIS SECOND AMENDMENT TO THE PATENT, KNOW-HOW AND TRADE SECRET LICENSE AGREEMENT (the "Second Amendment") is made and entered into effective as of October 18, 2021 (the "Second Amendment Effective Date"), by and between Alcoa USA Corp. ("Alcoa") and Howmet Aerospace Inc. ("Howmet"). Individually, Alcoa and Howmet are referred to in this Second Amendment as a "Party" and collectively as the "Parties."

RECITALS

WHEREAS, Alcoa and Howmet (f/k/a Arconic Inc. and Alcoa Inc.) are parties to that certain Patent, Know-How and Trade Secret License Agreement, having an effective date of October 31, 2016 under which Alcoa is the "Licensor" and Howmet is the "Licensee" (the "Agreement");

WHEREAS, on January 5, 2017 Alcoa and Howmet signed a FIRST AMENDMENT TO PATENT, KNOW-HOW AND TRADE SECRET LICENSE AGREEMENT (the "First Amendment") to the Agreement;

WHEREAS, on November 1, 2016 Howmet changed its name to Arconic Inc. from Alcoa Inc. and on March 30, 2020 Howmet changed its name to Howmet Aerospace Inc. from Arconic Inc.; and

WHEREAS, the Parties now desire to amend the Agreement for a second time.

NOW, THEREFORE, in consideration of the mutual promises and covenants contained herein, and good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the Parties hereto, intending to be legally bound, agree as follows:

1. Definitions. All capitalized terms used in this Second Amendment but not defined in this Second Amendment or in Exhibit 1, annexed hereto and made a part of this Second Amendment, shall have the meanings ascribed to them in the Agreement and/or First Amendment. To the extent there is a conflict in meaning or interpretation as between the Agreement, First Amendment, and this Second Amendment, this Second Amendment shall govern.

   a. "Competitors of Howmet" shall mean (i) the companies listed by their generally known (as opposed to legal entity) name (each a "Parent Company" and collectively the "Parent Companies") set forth in Exhibit 1 hereto: and (ii) the Parent Companies' subsidiaries: (a) that are wholly owned by a Parent Company, or (b) whose financial results are consolidated into a Parent Company's reported financial results, or (c) that are reasonably understood to be under the control of a Parent Company (each a "Subsidiary" and collectively the "Subsidiaries"), provided further that the Subsidiary's primary business is in competition with Howmet's business.

      For purposes of this definition, "control", when used with respect to a Subsidiary, means the power to direct the management and policies of such party, directly or indirectly, whether through ownership of voting securities, by contract or otherwise.

2. Amendments to the Agreement. The Agreement is hereby amended as of the Second Amendment Effective Date as follows:

A. Schedule 2 of the Agreement is hereby deleted in its entirety and replaced by the version attached hereto.

B. In consideration for the changes made in this Second Amendment to Schedule 2:

i. Alcoa shall pay Howmet $350,000.00 (three hundred fifty thousand United States Dollars) within thirty (30) days of the Second Amendment Effective Date. All payments made by Alcoa to Howmet hereunder shall and will be payable in United States Dollars in immediately available funds to an account designated by Howmet via Electronic Funds Transfer (EFT) or such other electronic payment form as agreed to in writing by Howmet.

ii. Absent Howmet's express written consent, which consent may be withheld by Howmet in Howmet's sole discretion, Alcoa agrees not to license (or permit any third-party to license or sublicense) Competitors of Howmet to: (i) make Advanced Ceramics Products using Technology (including without limitation as set forth in Schedule 5), unless such Advanced Ceramic Products are for Smelting Applications; and/or (ii) sell, offer for sale, import, export, or otherwise convey Advanced Ceramics Products produced using such Technology unless such Advanced Ceramics Products are sold thereto by Alcoa.

3. No Other Amendments; Confirmation. Except as expressly amended hereby, the provisions of the Agreement are and shall remain in full force and effect. Nothing herein shall be deemed to entitle either Party to a consent to, or a waiver, amendment, modification or other change of, any of the terms, conditions, obligations, covenant or agreements contained in the Second Amendment other than as provided herein.

4. Severability. If any term, provision, covenant or condition of this Second Amendment is held invalid or unenforceable for any reason, the remaining provisions of this Second Amendment shall continue in full force and effect as if this Second Amendment had been executed with the invalid portion eliminated, provided the effectiveness of the remaining portions of this Second Amendment will not defeat the overall intent of the Parties. In such a situation, the Parties agree, to the extent legal and possible, to incorporate a replacement provision to accomplish the originally intended effect.

5. Electronic/Facsimile Signatures; Counterparts. The Parties agree that a facsimile or electronically-copied signature has the same effect as an original signature. This Second Amendment may be executed in multiple copies, each of which is an original and all of which constitute one instrument.

IN WITNESS WHEREOF, the Parties hereto have executed this Second Amendment or caused the same to be executed by a duly authorized officer as of the Second Amendment Effective Date.

ALCOA USA CORP.	HOWMET AEROSPACE INC.
/s/ Benjamin D. Kahrs	/s/ Michael Chantry
By: Signature	By: Signature
Benjamin D. Kahrs	Michael Chantry
Name:	Name:
Executive Vice President	Vice President & Chief Commercial Officer
Title:	Title:
Pittsburgh, PA – Alcoa	Westchester, OH – Howmet
Place:	Place:
10/18/21	10/18/21
Date:	Date:

SCHEDULE 2:

ADVANCED CERAMICS PRODUCTS

"Advanced Ceramics Products" means products made using certain proprietary advanced ceramic processes, but excluding Technology pertaining to boron nitride.

"Smelting Applications" means products for use in smelting or refining or molten metal processing, as well as ceramic armor (other than boron nitride for ceramic armor), TiB2 applications in electronics tooling, and TiB2 applications in semi-conductor tooling applications.

The license granted with respect to Technology (including without limitation as set forth in Schedule 5) and pertaining to Advanced Ceramics Products is a worldwide, non-exclusive, royalty-free right and license (with no right to sublicense other than to joint ventures controlled by Licensee) to make and have made and to use and have used solely for the Licensee's internal uses (including joint ventures) any Advanced Ceramics Products that are not Smelting Applications.

Licensor retains the exclusive rights of ownership of all Technology (including without limitation as set forth in Schedule 5) pertaining to Advanced Ceramics Products.

Licensee shall have a non-exclusive license (with no right to sublicense) to use the Advanced Ceramics Products that are smelting or molten metal processing on projects related to smelting metals other than aluminum for its internal use (including joint ventures) only.

Licensee shall have an exclusive (even as to Licensor) license for all applications containing boron nitride.

For a period of four (4) years following the Effective Date, subject to obligations of confidentiality, each party will provide the other with details of Improvements relating to the vertical reactor only. Each party agrees to license and hereby licenses to the other party any such Improvements on a worldwide, non-exclusive, royalty-free and perpetual basis.

Licensor will provide Licensee with access to complete engineering and electrical drawings for all vertical reactor equipment and copies of all laboratory reports relating to the vertical reactor generated prior to the Effective Date. All such drawings and laboratory reports will be considered "Confidential Information" for the purposes of this Agreement.

Licensor will grant access to the vertical reactor to Licensee to produce powders for Licensee's commercialization efforts under the terms of "Schedule ATC-01: Ceramics" to the Transition Services Agreement between Licensor and Licensee ("TSA"). Licensee will pay Licensor's then current overhead rate to Licensor for such access to the vertical reactor. Licensee's access to the vertical reactor during 2017 will be limited to approximately 50% of the vertical reactor's available time and approximately 25% of the vertical reactor's available time in 2018. Licensee will not have access to the vertical reactor after 2018. Licensee acknowledges that the vertical reactor is subject to three-months' downtime each year due to the need to change tubes. If Licensee does not utilize its access to the vertical reactor as granted in this Schedule 2 then Licensor is free to use this time. Licensee will provide Licensor with a rolling two-month forward looking schedule of its desired access time to the vertical reactor. In the event of a conflict between the terms of this Schedule 2 and the TSA, the terms of the TSA will prevail.

ALCOA USA CORP. DEFERRED COMPENSATION PLAN
(EFFECTIVE AUGUST 1, 2016, AS AMENDED NOVEMBER 15, 2021)

Effective August 1, 2016, in anticipation of its separation into two separate publicly-traded companies, Alcoa Inc. spun off certain assets and liabilities from the Alcoa Deferred Compensation Plan (now referred to as the Arconic Deferred Compensation Plan) (the "Predecessor Plan") to form this Plan. This Plan is intended as a continuation of the Predecessor Plan for the Participants covered by this Plan and recognizes elections and Retirements under the Predecessor Plan. No person is entitled to a benefit under both this Plan and the Predecessor Plan. References in this Plan to dates and actions prior to August 1, 2016, refer to the Predecessor Plan.

The Predecessor Plan and this Plan were adopted for the exclusive benefit of select management and highly compensated employees (1) who are actively at work for the Company (as defined below) or a subsidiary on or after June 1, 1990, (2) who meet the requirements for participation hereunder, and (3) who are not in a collective bargaining unit.

The purposes of this Plan are to promote the growth and profitability of the Company, to attract and retain employees and to provide eligible employees with certain benefits under the terms and conditions as set forth herein. In order to enhance the benefits provided under this Plan, the Predecessor Plan was amended and restated effective October 30, 1992. All Credits in Participants' accounts under the Predecessor Plan as of December 31, 2004, including any Earnings Credits thereon after December 31, 2004, shall continue to be subject to all Plan provisions in effect as of that date.

Effective January 1, 2009, the AFL Deferred Compensation and Excess Plan, (which was created by the merger of the Alcoa Fujikura Ltd. Telecommunications Division Deferred Compensation Plan and Alcoa Fujikura Ltd. Deferred Compensation Plan effective January 1, 1993) ("AFL Plan") was merged into the Predecessor Plan and the Predecessor Plan was the surviving plan. All Pre-2005 Credits from the AFL Plan and earnings thereon continued to be treated as Pre-2005 Credits under the Predecessor Plan. All Post-2004 Credits from the AFL Plan and earnings thereon, including all account balances of any Participant with less than three (3) years of Continuous Service as of January 1, 2005, are treated as Post-2004 Credits under this Plan.

ARTICLE I - DEFINITIONS

1.1 The following terms have the specified meanings.

"Additional Salary Reduction Credits" means any amounts deemed to be credited to a Participant's account equivalent to the dollar amount by which a Participant elected to reduce his or her salary up to a whole percentage of not more than 14%. Effective June 1, 1995, a Participant who is authorized by the Committee may elect to reduce his or her salary up to a whole percentage of not more than 20%. Effective January 1, 2011, a Participant who is authorized by the Committee may elect to reduce his or her salary up to a whole percentage of not more than 25%; provided however that a Participant who has elected and is contributing a portion of his or her Salary under the Savings Plan, may not elect to defer any percentage of said Salary as an Additional Salary Reduction Credit under this Plan, except as otherwise provided in Section 3.2 but only up to the foregoing limitation. In no circumstance shall any portion of an Employee's sales incentive payments be included for the preceding purposes.

"Affiliate" means any corporate or non-corporate business entity which the Company and/or one or more Subsidiaries, or Alcoa Upstream Corporation (anticipated in the second half of 2016 to be renamed Alcoa Corporation) (the parent of the Company) or one of its subsidiaries, controls in fact.

"Award Year" means the calendar year for which awards are made under the provisions of the Incentive Compensation Plan.

"Award Date" means February of the calendar year following the Award Year except as may be otherwise designated in accordance with the provisions of the Incentive Compensation Plan.

"Beneficiary" means the person or persons designated in writing by a Participant, in accordance with Article VIII of this Plan, to receive benefits in the event of the Participant's death. Beneficiary also includes any person or persons designated in writing by a Participant's Beneficiary, to receive benefits in the event of the Participant's Beneficiary's death. Beneficiary designations made under the Predecessor Plan will be honored under this Plan.

"Board" means the Board of Directors of the Company or any duly authorized committee thereof.

"Code" means the Internal Revenue Code of 1986, as amended and the regulations promulgated thereunder.

"Committee" means the Benefits Management Committee of the Company, administrative committee that has complete authority to control and manage the operation and administration of this Plan.

"Company" means Alcoa USA Corp. Prior to August 1, 2016, references to the Company shall mean Alcoa Inc.

"Company Stock" means the Company Stock of the Company's publicly traded parent corporation, as defined in the Savings Plan.

"Continuous Service" means, except as modified by the balance of this definition, the period of continuous employment with the Company, Subsidiary or Affiliate, either as a salaried employee or as an hourly-rated employee, subject to such rules as may be adopted from time to time by the Committee. Continuous Service shall terminate upon any quit, dismissal, discharge or any other termination of employment with the Company, Subsidiary or Affiliate; any determination by the Committee that employment with these entities has terminated shall be conclusive. Continuous Service upon reemployment does not include any Continuous Service accrued prior to a termination of Continuous Service, except that if a Participant's Continuous Service is terminated by reason of Retirement, Continuous Service at the time of such termination shall be reinstated upon the date of his or her reemployment with the Company, a Subsidiary or Affiliate. Effective January 1, 2009, absences from such employment due to inactive status, sick leave, leave of absence or layoff shall constitute a termination of Continuous Service after such status has continued for 6 months, except to the extent the Participant has the legal right to be reemployed either through contract or statute. Effective as of July 1, 1998 all years of service accrued with Alumax, Inc. or any of its subsidiaries ("Alumax") on and after June 16, 1998, by any Participant who was actively employed with Alumax on June 16, 1998, will be taken into account to determine Continuous Service.

"Credits" means the Salary Reduction Credits, Additional Salary Reduction Credits, Incentive Compensation Deferral Credits, Employer Contribution Credits, Excess D Deferral Credits and Matching Company Credits credited to a Participant's account with a deemed value equivalent to the unit value of the Investment Option in which each Credit is deemed to be invested. In no circumstance shall any portion of an Employee's sales incentive payments be included for the preceding purposes.

"Earnings Credits" mean:

(a) the interest deemed to be credited to the accounts of Participants in the Equivalent Fixed Income Investment Fund,

(b) the amount of the increase or decrease in the deemed value of Participant's investments in the Equivalent Equity Investment Fund,

and

(c) , as described in Section 5.1(c), the deemed amount of dividends received, and gain or loss realized on, Equivalent Company Stock.

"Eligible Employee" means any employee who is a member of the group of select management and highly compensated employees, who on or after June 1, 1990 is actively at work for the Company, a Subsidiary or Affiliate, has a job grade of 19 or higher, as determined by the Company, is not in a collective bargaining unit, and (a) who is eligible for participation in the Savings Plan, or (b) who on or after January 1, 1999 is eligible to participate in the Alumax Inc. Thrift Plan for Salaried Employees and is named as an Eligible Employee by the Executive Vice President—Human Resources, as previously identified, or (c) who on or after May 3, 2000 is a Reynolds Metals Company employee and is eligible for Incentive Compensation. Such Alumax eligible employees will be eligible to make Salary Reduction Credits and/or Incentive Compensation Deferral Credits, in accordance with this plan, as previously identified, or (d) who is a participant in the Howmet Deferred Compensation Plan, and has elected to transfer their account balance in that plan to this Plan prior to December 1, 2007. Effective January 1, 2013, only employees, who are in a job grade 21 or higher or effective August 11, 2014, employees who are in a job band of 40 or higher (or under a comparable level of compensation band), as determined by the Company, are eligible to participate in the Plan. All Credits, including Earnings Credits in the accounts of former Eligible Employees who are not in a job grade of 21 or higher or effective August 11, 2014, a job band of 40 or higher (or under a comparable level of compensation band) will continue to be maintained under all Plan provisions.

"Employer Contribution Credits" means an amount deemed to be equivalent to the dollar amount that otherwise would have been contributed by the Company to the Participant's account under the Savings Plan as either a Discretionary Contribution, Restricted

Discretionary Contribution or an Employer Retirement Income Contribution, had the contribution under the Savings Plan not been limited by the Code's limits on contributions to the Savings Plan. In no circumstance shall any portion of an Employee's sales incentive payments be included for the preceding purposes.

"Equivalent Company Stock" means the number of shares of Company Stock deemed to be credited to a Participant's account. "Equivalent Equity Investment Fund" means the phantom investment vehicle which is deemed to be equivalent in all respects, including value, to the Equity Investment Fund established under the Savings Plan.

"Equivalent Fixed Income Fund" means the phantom investment vehicle which is deemed to be equivalent in all respects, including value, to the Fixed Income Fund established under the Savings Plan.

"Excess D Deferral Credits" means any amounts on and after January 1, 1993 deemed to be credited to a Participant's account equivalent to the dollar amount which the Participant will have automatically credited to the Plan in accordance with the Company's Employees' Excess Benefits Plan D.

"Incentive Compensation Plan" means the Incentive Compensation Plan of the Company, and effective January 1, 1997 the Management Incentive Program of Alcoa Building Products for employees in Job Grades 19 and above.

"Incentive Compensation Deferral Credits" means any amounts deemed to be credited to a Participant's account on the applicable Award Date equivalent to the percentage that the Participant has elected to defer from an award which he or she is eligible to receive under the Company's Incentive Compensation Plan for the 1991 Award Year or any later Award Year. Any such deferrals must be in an amount equal to 25%, 50%, 75%, or 100% of such award.

"Investment Options" means the phantom investment vehicles established hereunder for either Salary Reduction Credits, Additional Salary Reduction Credits, Matching Company Credits, Incentive Compensation Deferral Credits, Employer Contribution Credits, and/or Excess D Deferral Credits with reference to the equivalent investment options under the Savings Plan, or any other such equivalent investment option added to the Savings Plan after January 1, 1993 unless otherwise determined by the Committee.

"Matching Company Credits" means an amount deemed to be equivalent to the dollar amount that otherwise would have been contributed by the Company to the Participant's account under the Savings Plan, had the Participant elected to contribute to the Savings Plan an amount equivalent to the Participant's elected Salary Reduction Credits under this Plan and the Participant's contribution under the Savings Plan had not been limited by the Code's limits on contributions to the Savings Plan. In no circumstance shall any portion of an Employee's sales incentive payments be included for the preceding purposes.

"Other Plan" means any cash or deferred arrangements established under Section 401(k) of the Code, other than the Savings Plan, under which a Participant may elect to have a portion of his or her Salary reduced.

"Participant" means any Eligible Employee who commences participation in this Plan as provided in Article II. Effective August 1, 2016, "Participant" shall not include any person who is a participant in the Arconic Deferred Compensation Plan.

"Plan" means the Alcoa USA Corp. Deferred Compensation Plan, adopted by the Company as described herein or as from time to time hereafter amended. References to the Plan prior to August 1, 2016, shall be references to the Predecessor Plan.

"Post-2004 Credits" means Salary Reduction Credits, Additional Salary Reduction Credits, Incentive Compensation Deferral Credits, and Matching Company Credits credited to a Participant's account on and after January 1, 2005, including any Earnings Credits on such amounts. Notwithstanding anything herein to the contrary, Post-2004 Credits also include all Credits of any Participant with less than three (3) years of Continuous Service as of January 1, 2005. In no circumstance shall any portion of an Employee's sales incentive payments be included for the preceding purposes.

"Predecessor Plan" means Arconic Deferred Compensation Plan (prior to August 1, 2016, referred to as the Alcoa Deferred Compensation Plan).

"Retirement" means termination of employment after either:

(a) becoming eligible for a normal or early Retirement type under a qualified pension plan of the Company, a Subsidiary or Affiliate; or

(b) if not eligible to participate in a qualified pension plan pursuant to the above subsection (a) , attaining either:

(i) age 55 and completing 10 or more years of Continuous Service; or

(ii) age 65 and completing three or more years of Continuous Service.

"Salary" means "Eligible Compensation" as defined in the Savings Plan or "Compensation" as defined in the Alumax Inc. Thrift Plan for Salaried Employees, as applicable, without regard to the limitations imposed by Section 401(a)(17) of the Code. In no circumstance shall any portion of an Employee's sales incentive payments be included for the preceding purposes.

"Salary Reduction Credits" means any amounts deemed to be credited to a Participant's account equivalent to the dollar amount by which a Participant elected to reduce his or her Salary by a whole percentage of not more than 6%; provided, however, a Participant who has elected and is contributing a portion of his or her Salary under the Savings Plan, may not elect to defer any percentage of said Salary as a Salary Reduction Credit under this Plan except as otherwise provided in Section 3.2 but only up to the foregoing limitation. In no circumstance shall any portion of an Employee's sales incentive payments be included for the preceding purposes.

"Savings Plan" means, effective August 1, 2016, the Retirement Savings Plan for Salaried Employees of Alcoa USA Corp., as now in existence or hereinafter amended. Prior to August 1, 2016, "Savings Plan" refers to the Arconic Salaried Retirement Savings Plan, the Arconic Hourly Non-Bargaining Retirement Savings Plan, and/or the Arconic Fastener Systems and Rings Retirement Savings Plan.

"Specified Employee" means a "specified employee" as defined under written guidelines adopted by the Company, which comply with Section 409A of the Code and any regulations promulgated thereunder.

"Subsidiary" means a corporation at least 50% of whose outstanding voting stock is owned or controlled by the Company and/or one or more other Subsidiaries, and any non-corporate business entity in which the Company and/or one or more other Subsidiaries have at least a 50% interest in capital or profits.

"Year of Plan Participation" means any 12-month period extending from the first day of the month a Participant begins participation in the Savings Plan and/or this Plan if the Participant has maintained an account in the Savings Plan and/or this Plan for such 12-month period.

ARTICLE II - PARTICIPATION

2.1 An Eligible Employee shall commence participation in this Plan upon the first day of his or her first full payroll period following the receipt of his or her application or request for participation by the Company or its designee. Such Eligible Employee may only become a Participant after executing the appropriate form for authorizing payroll deductions from his or her Salary and for selecting investment options. An Eligible Employee shall also commence participation on the Award Date applicable to the portion of any award which he or she is eligible to receive under the provisions of the Incentive Compensation Plan and has deferred for the 1991 Award Year or any later Award Year, or on such date that his or her account would have been credited with Excess D Deferral Credits. If a Participant ceases to participate in this Plan as a result of the transfer of such Participant's employment to a company whose employees participate in the Arconic Deferred Compensation Plan ("Arconic Plan") after August 1, 2016, but before the date of the legal separation of Alcoa Inc. into two separate publicly-traded companies (Arconic Inc. and Alcoa Corporation) (the "Separation Date"), the account balance of such Participant shall automatically be transferred from this Plan to the Arconic Plan and such person shall cease to be a Participant. If a participant in the Arconic Plan transfers employment to the Company (or an Affiliate or Subsidiary) after August 1, 2016, but before the Separation Date, the Arconic Plan account balance of such Participant shall be accepted by this Plan.

ARTICLE III - PARTICIPANT DEFERRALS

3.1 Commencing January 1, 1993 a Participant may by proper election reduce his or her Salary each month in an amount up to, but not more than 6% of his or her Salary, which shall be deemed to be credited to his or her account as Salary Reduction Credits. Whether or not the Participant elects any Salary Reduction Credits, Participant may by proper election reduce his or her Salary each month in an amount up to, but not more than 14% of said Salary, which shall be credited to his or her account as Additional Salary

Reduction Credits. Effective June 1, 1995, the figure 14% in the foregoing sentence is revised to read 20% for Participants whose Additional Salary Reduction Credit limitation has been increased to 20% by the Committee.

A Participant may change a previously elected percentage of Salary reduction or terminate further deferrals in this Plan effective for the first full payroll period following the date the Company or its designee is advised of such request either orally or in writing in accordance with uniform rules established by the Committee. Effective January 1, 2005, elections for salary reductions must be received by the Plan in the year before such salary is earned, and such election is irrevocable. Effective January 1, 2011, the figure 20% in the foregoing sentence is revised to read 25% for Participants whose Additional Salary Reduction Credit limitation has been increased to 25% by the Committee. Elections made under the Predecessor Plan as of August 1, 2016, are recognized under the Plan, and Participants do not have the ability to change such elections unless they otherwise would have had such right under the Predecessor Plan.

3.2 In accordance with uniform rules established by the Committee, Salary Reduction Credits and Additional Salary Reduction Credits shall be deemed to be credited to the Participant's account equivalent to the amount by which the Participant's Salary is reduced in each category.

Effective January 1, 2013, only Eligible Employees, including any promotions, new hires or rehires on or after that date, who are in a job band of 60 or above (or under a comparable level of compensation band and formerly job grade 25) at the time of election may elect or remove a "spill over" election. From that date forward, an Eligible Employee who is in a job band 60 or above (or under a comparable level of compensation band and formerly job grade 25), who has elected and is contributing a portion of his or her Salary under the Savings Plan, but has been limited by Code limits on their contributions to the Savings Plan, and who has elected to make a "spill-over" election to this Plan will be credited with Salary Reduction Credits or Additional Salary Reduction Credits, as applicable, up to the amount that their election to the Savings Plan was limited. An Eligible Employee, who is in a job band 50 (or under a comparable level of compensation band and formerly job grade 24) on or after January 1, 2013 will not be eligible to elect a "spill- over" election. Notwithstanding the forgoing, any Participant who was in a job band 50 (formerly job grade 24), and who was eligible to make a "spill-over" election to this Plan, on December 31, 2012, will remain eligible to do so in the future as long as they have not incurred a severance from service.

3.3 Commencing for the 1991 Award Year and later Award Years a Participant who by proper election has deferred under the Incentive Compensation Plan all or a portion of an award which he or she is eligible to receive under said Plan, shall have his or her account deemed to be credited with Incentive Compensation Deferred Credits in an amount equal to the amount of such deferral. Effective January 1, 2005, such Incentive Compensation Deferral Credit elections must be received by the Plan at least 6 months before the end of the year in which they are earned, and such election is irrevocable.

3.4 Excess D Deferral Credits shall be credited to Participants' accounts as applicable.

3.5 A Participant who is authorized by the Committee and who by proper election has deferred the receipt of any "special payments" (as determined by the Company), shall have his or her account credited in an amount equal to the amount of such deferral. Such special payment credits shall be treated as Incentive Compensation Deferral Credits. Participant elections related to the deferrals of "special payments," which were elected prior to the Participant's termination of Continuous Service, will be credited to the Participant's Plan account at the time payment would otherwise have been made. Payments in 2001 under the Performance Enhancement Reward Program will be treated as "special payments" under this plan.

3.6 Effective as of May 1, 2008, to the extent the Company agrees to contribute an amount(s) to a Participant's account pursuant to an employment agreement approved by the Compensation Committee of the Board, the Participant shall have his or her account credited with such amount(s). Any vesting contingencies related to such amount(s) that are provided for in such employment agreement will continue to apply to any such amount(s) pursuant to the terms of such employment agreement. Except for the vesting contingencies, which will continue to apply, any such contributed amount(s) will be treated the same as an Employer Contribution Credit.

ARTICLE IV - MATCHING COMPANY CREDIT

4.1 A Participant who has elected to reduce his or her Salary under this Plan shall have his or her account deemed to be credited with Matching Company Credits for which he or she is eligible.

Effective April 1, 2009, no Matching Company Credits will be deemed to be credited to any Participant account under this Plan. Effective February 1, 2010, Matching Company Credits equivalent to the dollar amount that otherwise would have been contributed by the Company to the Participant's account under the Savings Plan on or after February 1, 2010 will again be deemed to be credited to Participant accounts under this Plan.

ARTICLE V - INVESTMENTS

5.1 (a) Employer Contribution Credits, Salary Reduction Credits, Additional Salary Reduction Credits, Excess D Deferral Credits and Incentive Compensation Deferral Credits shall be deemed to be invested in 1% increments, at the election of the Participant, in one or more of the Investment Options. A Participant may change his or her investment election, effective for the first full payroll period following the date the appropriate direction has been properly received by the Company or its designee, in accordance with uniform rules established by the Committee.

(a) Matching Company Credits shall be deemed to be invested in the phantom investment vehicle which is equivalent to the investment vehicle under the Savings Plan in which the Company's matching contributions to Participants' accounts are invested.

(b) To the extent a Participant holds Equivalent Company Stock, on the date that the Company pays a cash dividend (if any) to holders of shares of Common Stock, the Participant shall be credited with cash per share of Equivalent Company Stock equal to the amount of such dividend. Any amounts credited pursuant to the preceding sentence shall be deemed invested in the Equivalent Equity Investment Fund and shall be deferred and paid in the same manner in cash and at the same time as the Equivalent Company Stock to which amounts credited relate.

(c) Any interest deemed to be credited to the account of a Participant in the Equivalent Fixed Income Investment Fund shall be deferred and paid in the same manner in cash and at the same time as the portion of the Participant's account in the Equivalent Fixed Investment Account to which the deemed interest relates.

ARTICLE VI - CREDIT CONVERSION

All Credits and Earnings Credits in a Participant's account on October 30, 1992 shall be converted to the applicable Investment Option in accordance with the conversion of investments in the Savings Plan as in effect on October 30, 1992, and shall thereafter be contingently credited by reference to the unit value of the Investment Options.

ARTICLE VII - TRANSFER OF CREDITS

7.1 (a) A Participant may, by appropriate direction which is properly received by the Company or its designee, in accordance with uniform rules established by the Company, elect to transfer in increments of 1% or $1.00 all or part of the deemed value of his or her Salary Reduction Credits, Additional Salary Reduction Credits, Incentive Compensation Deferral Credits, Matching Company Credits, Excess D Deferral Credits, except as may be limited by the Committee, from any one or more investment Options to any one or more other such Investment Options. Such a transfer may be made daily.

(a) Effective Date of Transfer. The effective date of any transfer under paragraph (a) above shall be the date for which the Appropriate Direction to the Company or its designee has been properly received in accordance with uniform rules established by the Company.

(b) Notwithstanding the foregoing, upon a Participant's termination of employment, for any reason other than Retirement, he or she may not elect to transfer any part of his or her Salary Reduction Credits, Additional Salary Reduction Credits, Matching Company Credits, Incentive Compensation Deferral Credits, Excess D Deferral Credits and Earnings Credits from the investment vehicle in which such Credits were deemed to be invested on the date employment was terminated, to any other investment vehicle.

(c) The Company reserves the right to refuse to honor any Participant direction related to investments or withdrawals, including transfers among investment options, where necessary or desirable to assure compliance with applicable law including U.S. and other Securities laws. However, the Company does not assume any responsibility for compliance by officers or others with any such laws, and any failure by the Company to delay or dishonor any such direction shall not be deemed to increase the Company's legal exposure to the Participant or third parties.

ARTICLE VIII - DISTRIBUTIONS

8.1 Except as otherwise specified in this Article VIII, the amount of Credits in a Participant's account shall be distributed to the Participant upon his or her termination of Continuous Service, unless the Participant has the legal right to be reemployed either through contract or statute.

Effective September 1, 2000, any transfer of employment to a subsidiary or affiliate in which the Company and/or any one or more Subsidiaries have at least a 20% ownership interest will not be considered a termination in Continuous Service for purposes of this Article VIII– Distributions.

Effective June 1, 2007, Participants, whose employment is with such a subsidiary or affiliate of the Company in which the Company and/or any one or more Subsidiaries have at least a 20% ownership interest but less than a majority ownership interest, must notify the Company upon his or her termination of Continuous Service with such subsidiary or affiliate. Notwithstanding the foregoing, any contributions made pursuant to Section 3.6 will be subject to the vesting contingencies related thereto.

8.2 All distributions of Pre-2005 Credits made pursuant to the termination of the Participant's Continuous Service by reason other than death or Retirement shall be paid to the Participant as soon as administratively practical in a lump sum. All distributions of Post-2004 Credits made pursuant to the termination of the Participant's Continuous Service by reason other than Retirement, or to the extent such Post-2004 Credits are valued equal or less than $50,000, shall be paid to the Participant as soon as administratively practical in a lump sum. The term "as soon as administratively practical" for purposes of this paragraph means within 90 days of Retirement or termination.

8.3 For Pre-2005 Credits, prior to his or her Retirement date, a Participant may elect that the value of his or her account be distributed either in a lump sum at Retirement or in annual installments of any number designated by the Participant up to, but not more than ten (10) following his or her Retirement, commencing the January 31 of the first calendar year following such Retirement and each January 31 thereafter until he or she has received all installments. A Participant's election to receive installments must be made at least 6 months prior to his or her Retirement date. The Participant's election to receive either a lump sum or annual installments shall become irrevocable 6 months prior to the Participant's Retirement date, or at such other time as may be approved by the Committee. In the event the Participant fails to make such an election, all amounts in his or her account shall be distributed as a lump sum distribution as soon as administratively practical after his or her Retirement. All distributions of Post-2004 Credits made pursuant to the termination of the Participant's Continuous Service by reason of Retirement and to the extent such Post-2004 Credits are valued more than $50,000, shall be paid to the Participant in ten (10) annual installments, unless the Participant made an irrevocable election for a different distribution option as of the later of: i. June 30, 2005 or ii. within 30 days after becoming a Eligible Participant. The term "as soon as administratively practical" for purposes of this paragraph means within 90 days of Retirement.

If a Participant has irrevocably elected to receive annual installments following Retirement or is receiving annual installments, for either Pre- 2005 or Post-2004 Credits, and is subsequently reemployed by the Company on or after January 1, 2009, such annual installments shall continue regardless of reemployment or reinstatement of Continuous Service. Credits and Earnings Credits thereon accrued during the term of reemployment will be distributed separately upon subsequent termination.

8.4 The Beneficiary under this Plan shall be the Participant's spouse unless otherwise designated in writing by the Participant and such other designated Beneficiary has been agreed to in writing by the Participant's spouse on a form approved by the Committee.

Distributions from this Plan to a Beneficiary shall be in a lump sum or in annual installments of any number designated by the Participant up to, but not more than ten (10) following his or her death commencing the first January 31 after the Participant's death and each January 31 thereafter until all installments have been distributed.

In the event a Beneficiary dies prior to receiving all the annual installments which he or she is entitled to receive from this Plan, any remaining installments will be distributed as soon as administratively practical in a lump sum to the Beneficiary's designated Beneficiary, or if there is no designated Beneficiary, then to the Beneficiary's estate, The term "as soon as administratively practical" for purposes of this paragraph means within 90 days of death.

8.5 This Plan shall not be construed as conferring any rights upon any Participant for continuation of employment with the Company, Subsidiary or Affiliate, nor shall it interfere with the rights of the Company, Subsidiary or Affiliate to terminate the

employment of any Participant and/or to take any personnel action affecting any Participant without regard to the effect which such action may have upon such Participant as to recipient of benefits under this Plan.

8.6 No benefit under this Plan may be assigned, transferred, pledged or encumbered or be subject in any manner to alienation or anticipation except as provided in a qualified domestic relations order.

8.7 (a) Benefits payable hereunder shall be payable out of the general assets of the Company or a participating Subsidiary, and no segregation of assets for such benefits shall be made. The right of a Participant or any Beneficiary to receive benefits under this Plan shall be an unsecured claim against said assets and shall be no greater than the rights of an unsecured general creditor to the Company. Notwithstanding the foregoing, in the event the Company establishes a trust, to which it may, but shall not be required to contribute money or other property of the Company in contemplation of paying benefits under this Plan, such money or other property shall remain subject to the claims of creditors of the Company.

(a) Notwithstanding any other provisions of this Plan, if any amounts held in a trust of the above described nature are found, due to the creation or operation of said trust, in a final decision by a court of competent jurisdiction, or under a "determination" by the Internal Revenue Service in a closing agreement in audit or a final refund disposition (within the meaning of Section 1313(a) of the Code), to have been includable in the gross income of a Participant or Beneficiary prior to payment of such amounts from said trust, the trustee for the trust shall, as soon as administratively practicable, pay to such Participant or Beneficiary an amount equal to the amount determined to have been includable in gross income in such determination, and shall accordingly reduce the Participant's or Beneficiary's future benefits payable under this Plan. The trustee shall not make any distribution to a Participant or Beneficiary pursuant to this paragraph 8.7(b) unless it has received a copy of the written determination described above together with any legal opinion which it may request as to the applicability thereof. The term "as soon as administratively practical" in this Section means within 90 days of the trustee's determination.

8.8 To the extent a Participant is a Specified Employee, any distribution to the Participant, will be delayed until the first day of the seventh month following the date that the distribution would otherwise have begun. Other than Earnings Credits, no other Credits will be applied to the Participant's account during that time.

ARTICLE IX - ADMINISTRATION AND EXPENSES OF THE PLAN

9.1 The general administration of this Plan shall be by the Committee. The Committee's discretion with respect to this Plan includes the authority to determine eligibility under all provisions, correct all defects, supply all omissions, reconcile all inconsistencies in the Plan, ensure all benefits are paid in accordance to the Plan, interpret Plan provisions for all Participants or Beneficiaries, and decide all issues of credibility necessary to carry out and operate the Plan. Benefits under this Plan will be paid only if the Committee in its sole and absolute discretion decides that the applicant is entitled to them. All actions, decisions, or interpretations of the Committee are conclusive, final, and binding.

All costs and expenses incurred in administering the Plan, including the expenses of the Committee, the fees and expenses of the Trustee, the fees and charges payable under the investment arrangements, and other legal and administrative expenses, shall be paid by the Plan. Notwithstanding, for any Affiliate of which the Company owns less than an 80% interest as defined under Code Section 1504, the obligation of and liability for the deferred compensation benefits accrued under this Plan for Participants employed by such an Affiliate, shall remain the sole obligation and liability of the Affiliate by express resolution of its board or other governing body.

ARTICLE X - AMENDMENT AND TERMINATION

10.1 This Plan may be amended, suspended or terminated at any time by the Board or any other entity approved by the Board, including the Committee, provided that no such amendment, suspension or termination shall reduce or in any manner adversely affect any Participant's or Board's rights with respect to benefits that are payable or may become payable under this Plan based upon said Participant's Credits as of the date of such amendment, suspension or termination.

ARTICLE XI - - CONSTRUCTION

11.1 This Plan shall be construed, regulated and administered under the laws of the Commonwealth of Pennsylvania, including its choice of law provisions and applicable statute of limitations.

11.2 The Plan is intended to comply with the requirements of Section 409A of the Code, and the provisions of the Plan and any deferral election form shall be interpreted in a manner that satisfies the requirements of Section 409A of the Code, and the Plan shall be operated accordingly. If any provision of the Plan or any term or condition of any deferral election form would otherwise frustrate or conflict with this intent, such provision, term or condition will be interpreted and deemed amended so as to avoid this conflict. Although the Company may attempt to avoid adverse tax treatment under Section 409A of the Code, the Company makes no representation to that effect and expressly disavows any covenant to maintain favorable or avoid unfavorable tax treatment.

ARTICLE XII - -CLAIMS AND APPEALS

12.1 If a claim by a Participant or Beneficiary is denied, in whole or in part the Participant or Beneficiary, or their representative will receive written notice from the plan administrator. This notice will include the reasons for denial, the specific plan provision involved, an explanation of how claims are reviewed, the procedure for requesting a review of the denied claim, and a description of the information that must be submitted with the appeal. The Participant or Beneficiary, or their representative, may file a written appeal for review of a denied claim to the Committee or its delegate. The process and the time frames for the determination claims and appeals are as follows:

(a) The plan administrator reviews initial claim and makes determination within 90 days of the date the claim is received.

(b) The plan administrator may extend the above 90-day period an additional 90 days if required due to special circumstances beyond control of plan administrator.

(c) The Participant or Beneficiary, or their representative, may submit an appeal of a denied claim within 60 days of receipt of the denial.

(d) The plan administrator reviews and makes a determination on the appeal within 60 days of the date the appeal was received.

(e) The plan administrator may extend the above 60-day period an additional 60 days if required by special circumstances beyond the control of the plan administrator.

12.2 In the case where the plan administrator requires an extension of the period to provide a determination on an initial claim or an appeal, the Plan will notify the Participant or Beneficiary, or their representative, prior to the expiration of the initial determination period. The notification will describe the circumstances requiring the extension and the date a determination is expected to be made. If additional information is required from the Participant or Beneficiary, the determination period will be suspended until the earlier of i) the date the information is received by the plan administrator or ii) 45 days from the date the information was requested.

12.3 Participants or Beneficiaries, or their representative, who having received an adverse appeal determination and thereby exhausted the remedies provided under the this Plan, proceed to file suit in state or federal court, must file such suit within 180 days from the date of the adverse appeal determination notice or any right to file such suit will be permanently foreclosed.

Exhibit 10.37

ALCOA CORPORATION
TERMS AND CONDITIONS FOR RESTRICTED SHARE UNITS

These terms and conditions, including Appendices attached hereto (the "Award Terms"), are authorized by the Compensation and Benefits Committee (the "Committee") of the Board of Directors. They are deemed to be incorporated into and form a part of the Award of Restricted Share Units issued on or after December 8, 2021 under the Alcoa Corporation 2016 Stock Incentive Plan, as may be amended from time to time (the "Plan").

Terms that are defined in the Plan have the same meanings in the Award Terms.

General Terms and Conditions

1. Restricted Share Units are subject to the provisions of the Plan and the provisions of the Award Terms. If the Plan and the Award Terms are inconsistent, the provisions of the Plan will govern. Interpretations of the Plan and the Award Terms by the Committee are binding on the Participant and the Company. A Restricted Share Unit is an undertaking by the Company to issue the number of Shares indicated in the Participant's account with the Company's designated stock plan broker or service provider (the "Broker"), subject to the fulfillment of certain conditions, except to the extent otherwise provided in the Plan or herein. A Participant has no voting rights or rights to receive dividends on Restricted Share Units, but the Board of Directors may authorize that dividend equivalents be accrued and paid on Restricted Share Units upon vesting in accordance with paragraphs 2 and 4 below.

Vesting and Payment

2. A Restricted Share Unit vests on the third anniversary date of the grant date and, subject to paragraph 3 and, if the Restricted Share Unit is subject to a performance condition, paragraph 33, will be paid to the Participant in Shares on the vesting date or within 90 days thereafter (or, if it is not practicable to make payment by such date, as soon as practicable thereafter, but in no event later than the end of the calendar year in which the vesting date occurs and/or later than the time permitted under Section 409A of the Code).

3. Notwithstanding the foregoing, except as provided in paragraph 4, if a Participant's employment with the Company (including its Subsidiaries) is terminated before the Restricted Share Unit vests, the Award is forfeited and is automatically canceled.

4. The following are exceptions to the vesting rules:

- Death or Disability: a Restricted Share Unit held by a Participant, who dies while an Employee or who is permanently and totally disabled (as defined below) while an Employee, is not forfeited but vests and is paid on the original stated vesting date set forth in paragraph 2.

A Participant is deemed to be permanently and totally disabled if the Participant is unable to engage in any substantial gainful activity by reason of any medically determinable physical or mental impairment which can be expected to result in death or which has lasted or can be expected to last for a continuous period of not less than 12 months. A Participant shall not be considered to be permanently and totally disabled unless the Participant furnishes proof of the existence thereof in such form and manner, and at such times, as the Company may require. In the event of a dispute, the determination whether a Participant is permanently and totally disabled will be made by the Committee or its delegate.

• Change in Control: a Restricted Share Unit vests if a Replacement Award is not provided following certain Change in Control events, as described in the Plan. Notwithstanding anything in the Award Terms to the contrary, if a Change in Control qualifies as a "change in control event" within the meaning of Treas. Reg. § 1.409-3(i)(5), the vested Restricted Share Unit (whether vested pursuant to the preceding sentence or otherwise and with vesting determined under Section 409A of the Code) will be paid to the Participant within 30 days following the Change in Control. If the Change in Control does not so qualify, the vested Restricted Share Unit will vest and be paid to the Participant on the original stated vesting date set forth in paragraph 2.

• Termination Following Change in Control: as further described in the Plan, if a Replacement Award is provided following a Change in Control, but within 24 months of such Change in Control the Participant's employment is terminated without Cause (as defined in the Alcoa Corporation Change in Control Severance Plan) or by the Participant for Good Reason (as defined in the Alcoa Corporation Change in Control Severance Plan), the Replacement Award will vest and be paid to the Participant on the original stated vesting date set forth in paragraph 2.

• Retirement: unless otherwise determined by the Committee or its delegate, a Restricted Share Unit is not forfeited if it is held by a Participant who terminates employment due to Retirement (as defined in the Plan) at least six months after the grant date. In such event, the Restricted Share Unit vests and is paid on the original vesting schedule of the grant set forth in paragraph 2.

• Divestiture: if a Restricted Share Unit is held by a Participant who is to be terminated from employment with the Company or a Subsidiary as a result of a divestiture of a business or a portion of a business of the Company (each, a "Divestiture") and the Participant either becomes an employee of (or is leased or seconded to) the entity acquiring the business on the date of the closing, or the Participant is not offered employment with the entity acquiring the business and is terminated by the Company or a Subsidiary within 90 days of the closing of the sale, then, at the discretion of the Chief Executive Officer of the Company, for Participants other than those subject to the short-swing profit rules of Section 16(b) of the Exchange Act (a "Section 16 Insider"), or, at the discretion of the Committee for Section 16 Insiders, as the case may be, the Restricted Share Unit will not be forfeited and will vest and be paid on the original vesting schedule set forth in paragraph 2. For purposes of this paragraph, employment by "the entity acquiring the business" includes employment by a subsidiary or affiliate of the entity acquiring the business; and "Divestiture of a business" means the sale of assets or stock resulting in the sale of a going concern. "Divestiture of a business" does not include a plant shut down or other termination of a business.

• Involuntary Termination without Cause: in circumstances other than a Divestiture, if a Participant is involuntarily terminated without Cause (as defined below) from employment with the Company or a Subsidiary at least one year after the grant date and during the vesting period, the Restricted Share Unit Award is not forfeited in whole but only in part upon termination of employment. The portion of the Restricted Share Unit Award that is not forfeited vests on the original stated vesting date set forth in paragraph 2 and is calculated based on a proportionate share of the time during the vesting period that the Participant remained actively employed with the Company or a Subsidiary, with the remaining portion being automatically forfeited. The proportionate share is computed on the basis of the actual number of days actively employed after the date of grant over the total numbers of days in the three years vesting period (with the resulting Restricted Share Units rounded up to the next whole unit). For example, a Participant who is

involuntarily terminated without Cause from employment with the Company (or a Subsidiary) at the end of the first year of the three-year vesting period will receive one-third of the Shares upon vesting, with the remaining two-thirds of the Shares being automatically forfeited upon termination.

For this purpose, if the Participant participates in the Alcoa Corporation Change in Control Severance Plan, "Cause" shall have the meaning set forth in such plan. If the Participant does not participate in the Alcoa Corporation Change in Control Severance Plan, "Cause" means (i) the willful and continued failure by the Participant to substantially perform the Participant's duties with the Company or Subsidiary employer that has not been cured within 30 days after a written demand for substantial performance is delivered to the Participant by the Board or the Participant's direct supervisor, which demand specifically identifies the manner in which the Participant has not substantially performed the Participant's duties, (ii) the willful engaging by the Participant in conduct which is demonstrably and materially injurious to the Company or a Subsidiary, monetarily or otherwise; (iii) the Participant's fraud or acts of dishonesty relating to the Company or any of its Subsidiaries, or (iv) the Participant's conviction of any misdemeanor relating to the affairs of the Company or any of its Subsidiaries or indictment for any felony. For purposes of clauses (i) and (ii) of this definition, no act, or failure to act, on the Participant's part shall be deemed "willful" unless done, or omitted to be done, by the Participant not in good faith and without reasonable belief that the Participant's act, or failure to act, was in the best interest of the Company.

5. A Participant will receive one Share upon the vesting and payment of a Restricted Share Unit. Notwithstanding the foregoing or anything in the Award Terms to the contrary, to the extent that payment in Shares is prohibited under applicable law or would require the Participant or the Company to obtain the approval of any governmental and/or regulatory body in the Participant's country, or as necessary to meet tax objectives, the Company in its sole discretion may substitute a cash payment in lieu of Shares, such cash payment to be equal to the Fair Market Value of the Shares on the date that such Shares would have otherwise been issued under the terms of the Plan and the Award Terms.

Taxes

6. All taxes required to be withheld under applicable tax laws in connection with a Restricted Share Units must be paid by the Participant at the appropriate time under applicable tax laws. The Company may satisfy applicable tax withholding obligations by any of the means set forth in Section 15(k) of the Plan, but will generally withhold from the Shares to be issued upon payment of the Restricted Share Units that number of Shares with a fair market value on the vesting date equal to the taxes required to be withheld at the minimum required rates, or at any other rate approved by the Committee, up to the maximum individual tax rate for the applicable tax jurisdiction, which include, for Participants subject to taxation in the United States, applicable income taxes, federal and state unemployment compensation taxes and FICA/FUTA taxes. Notwithstanding the foregoing, if the Participant is a Section 16 Insider, the Company will withhold Shares from the Shares to be issued upon payment of the Restricted Share Unit, as described herein, at the minimum required rates or such other rates approved by the Committee and other means will not be used to satisfy such tax withholding obligations.

Beneficiaries

7. If permitted by the Company, Participants will be entitled to designate one or more beneficiaries to receive all Restricted Share Units that have not yet vested at the time of death of the Participant. All beneficiary designations will be on beneficiary designation forms approved for the Plan. Copies of the form will generally be available from the Broker or may otherwise be obtained from the Company.

8. Beneficiary designations on an approved form will be effective at the time received by the Company, including, as applicable, through submission to the Broker. A Participant may revoke a beneficiary designation at any time by written notice to the Company, including as applicable, through submission to the Broker, or by filing a new designation form. Any designation form previously filed by a Participant will be automatically revoked and superseded by a later-filed form.

9. A Participant will be entitled to designate any number of beneficiaries on the form, and the beneficiaries may be natural or corporate persons.

10. The failure of any Participant to obtain any recommended signature on the form will not prohibit the Company from treating such designation as valid and effective. No beneficiary will acquire any beneficial or other interest in any Restricted Share Unit prior to the death of the Participant who designated such beneficiary.

11. Unless the Participant indicates on the form that a named beneficiary is to receive Restricted Share Units only upon the prior death of another named beneficiary, all beneficiaries designated on the form will be entitled to share equally in the Restricted Share Units upon vesting. Unless otherwise indicated, all such beneficiaries will have an equal, undivided interest in all such Restricted Share Units.

12. Should a beneficiary die after the Participant but before the Restricted Share Units are paid, such beneficiary's rights and interest in the Award will be transferable by the beneficiary's last will and testament or by the laws of descent and distribution. A named beneficiary who predeceases the Participant will obtain no rights or interest in Restricted Share Units, nor will any person claiming on behalf of such individual. Unless otherwise specifically indicated by the Participant on the beneficiary designation form, beneficiaries designated by class (such as "children," "grandchildren" etc.) will be deemed to refer to the members of the class living at the time of the Participant's death, and all members of the class will be deemed to take "per capita."

13. If a Participant does not designate a beneficiary or if the Company does not permit a beneficiary designation, the Restricted Share Units that have not yet vested or been paid at the time of death of the Participant will be paid to the Participant's legal heirs pursuant to the Participant's last will and testament or by the laws of descent and distribution.

Adjustments

14. In the event of an Equity Restructuring or other transaction described in Section 4(f) of the Plan, the Committee will equitably adjust the Restricted Share Units as it deems appropriate in accordance with the terms of the Plan. The adjustments authorized by the Committee will be final and binding.

Repayment/Forfeiture

15. As an additional condition of receiving the Restricted Share Units, the Participant agrees that the Restricted Share Units and any benefits or proceeds the Participant may receive hereunder shall be subject to forfeiture and/or repayment to the Company as provided in Sections 15(e) and (f) of the Plan including, without, limitation, to the extent required (i) under the terms of any recoupment or "clawback" policy adopted by the Company to comply with applicable laws or with the Corporate Governance Guidelines or other similar requirements, as such policy may be amended from time to time (and such requirements shall be deemed incorporated into the Award Terms without the consent) or (ii) to comply with any requirements imposed under applicable laws and/or the rules and regulations of the

securities exchange or inter-dealer quotation system on which the Shares are listed or quoted, including, without limitation, pursuant to Section 954 of the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010. Further, if the Participant receives any amount in excess of what the Participant should have received under the terms of the Restricted Share Units for any reason (including without limitation by reason of a financial restatement, mistake in calculations or administrative error), all as determined by the Committee, then the Participant shall be required to promptly repay any such excess amount to the Company. By accepting this Award, subject to applicable law, Participant agrees and acknowledges the obligation to cooperate with, and provide any and all assistance necessary to, the Company to recover or recoup this Award or amounts paid hereunder pursuant to this Section 15 and the Plan.

Miscellaneous Provisions

16. *Stock Exchange Requirements; Applicable Laws.* Notwithstanding anything to the contrary in the Award Terms, no Shares issuable upon vesting of the Restricted Share Units, and no certificate representing all or any part of such Shares, shall be issued or delivered if, in the opinion of counsel to the Company, such issuance or delivery would cause the Company to be in violation of, or to incur liability under, any securities law, or any rule, regulation or procedure of any U.S. national securities exchange upon which any securities of the Company are listed, or any listing agreement with any such securities exchange, or any other requirement of law or of any administrative or regulatory body having jurisdiction over the Company or a Subsidiary.

17. *Non-Transferability.* The Restricted Share Units are non-transferable and may not be assigned, alienated, pledged, attached, sold or otherwise transferred or encumbered by the Participant other than by will or the laws of descent and distribution and any such purported assignment, alienation, pledge, attachment, sale, transfer or encumbrance shall be void and unenforceable against the Company; provided, that, the designation of a beneficiary shall not constitute an assignment, alienation, pledge, attachment, sale, transfer or encumbrance.

18. *Stockholder Rights.* No person or entity shall be entitled to vote, receive dividends or be deemed for any purpose the holder of any Shares until the Restricted Share Units shall have vested and been paid in the form of Shares in accordance with the provisions of the Award Terms.

19. *Notices.* Any notice required or permitted under the Award Terms shall be in writing and shall be deemed sufficient when delivered personally or sent by confirmed email, telegram, or fax or five days after being deposited in the mail, as certified or registered mail, with postage prepaid, and addressed to the Company at the Company's principal corporate offices or to the Participant at the address maintained for the Participant in the Company's records or, in either case, as subsequently modified by written notice to the other party.

20. *Severability and Judicial Modification.* If any provision of the Award Terms is held to be invalid or unenforceable under the applicable laws of any country, state, province, territory or other political subdivision or the Company elects not to enforce such restriction, the remaining provisions shall remain in full force and effect and the invalid or unenforceable provision shall be modified only to the extent necessary to render that provision valid and enforceable to the fullest extent permitted by law. If the invalid or unenforceable provision cannot be, or is not, modified, that provision shall be severed from the Award Terms and all other provisions shall remain valid and enforceable.

21. *Successors.* The Award Terms shall be binding upon and inure to the benefit of the Company and its successors and assigns, on the one hand, and the Participant and his or her heirs, beneficiaries, legatees and personal representatives, on the other hand.

22. *Appendices.* Notwithstanding any provisions in the Award Terms, for Participants residing and/or working outside the United States, the Restricted Share Units shall be subject to the additional terms and conditions set forth in Appendix A to the Award Terms and to any special terms and conditions for the Participant's country set forth in Appendix B to the Award Terms. Further, Appendices C and D include information for European Union / European Economic Area Participants. Moreover, if the Participant relocates outside the United States or relocates between the countries included in Appendix B, the additional terms and conditions set forth in Appendix A and the special terms and conditions for such country set forth in Appendices B, C and D will apply to the Participant, to the extent the Company determines that the application of such terms and conditions is necessary or advisable for legal or administrative reasons. The Appendices constitute part of the Award Terms.

23. *Imposition of Other Requirements.* The Company reserves the right to impose other requirements on the Participant's participation in the Plan, on the Restricted Share Units and on any Shares acquired under the Plan, to the extent the Company determines it is necessary or advisable for legal or administrative reasons, and to require the Participant to sign any additional agreements or undertakings that may be necessary to accomplish the foregoing.

24. *Compliance with Code Section 409A.* It is intended that the Restricted Share Units granted pursuant to the Award Terms be compliant with (or exempt from) Section 409A of the Code and the Award Terms shall be interpreted, construed and operated to reflect this intent. Notwithstanding the foregoing, the Award Terms and the Plan may be amended at any time, without the consent of any party, to the extent necessary or desirable to satisfy any of the requirements under Section 409A of the Code, but the Company shall not be under any obligation to make any such amendment. Further, the Company and its Subsidiaries do not make any representation to the Participant that the Restricted Share Units granted pursuant to the Award Terms satisfies the requirements of Section 409A of the Code, and the Company and its Subsidiaries will have no liability or other obligation to indemnify or hold harmless the Participant or any other party for any tax, additional tax, interest or penalties that the Participant or any other party may incur in the event that any provision of the Award Terms or any amendment or modification thereof or any other action taken with respect thereto, is deemed to violate any of the requirements of Section 409A of the Code.

25. *Waiver.* A waiver by the Company of breach of any provision of the Award Terms shall not operate or be construed as a waiver of any other provision of the Award Terms, or of any subsequent breach by the Participant or any other Participant.

26. *No Advice Regarding Award.* The Company is not providing any tax, legal or financial advice, nor is the Company making any recommendations regarding the Participant's participation in the Plan, or the Participant's acquisition or sale of the underlying Shares. The Participant is hereby advised to consult with the Participant's own personal tax, legal and financial advisors regarding the Participant's participation in the Plan before taking any action related to the Plan.

27. *Governing Law and Venue.* As stated in the Plan, the Restricted Share Units and the provisions of the Award Terms and all determinations made and actions taken thereunder, to the extent not otherwise governed by the laws of the United States, shall be governed by the laws of the State of Delaware, United States of America, without reference to principles of conflict of laws, and construed

accordingly. The jurisdiction and venue for any disputes arising under, or any actions brought to enforce (or otherwise relating to), the Restricted Share Units will be exclusively in the courts in the State of Delaware, including the Federal Courts located therein (should Federal jurisdiction exist).

28. *Electronic Delivery and Acceptance.* The Company may, in its sole discretion, decide to deliver any documents related to current or future participation in the Plan by electronic means. The Participant hereby consents to receive such documents by electronic delivery and agrees to participate in the Plan through an on-line or electronic system established and maintained by the Company or a third party designated by the Company.

29. *Entire Agreement.* The Award Terms and the Plan embody the entire understanding and agreement of the parties with respect to the subject matter hereof (including, without limitation, the obligations and understandings set forth in Section 15(e) of the Plan), and no promise, condition, representation or warranty, express or implied, not stated or incorporated by reference herein, shall bind either party hereto.

30. *Employment at Will.* Nothing in the Award Terms or the Plan provide the Participant with any right to continue in the Company's or any of its affiliates' employ for any period of specific duration or interfere with or otherwise restrict in any way the Participant's or the rights of the Company and its affiliates to terminate the Participant's service at any time for any reason, with or without cause, subject to applicable law. The Participant's status with the Company and its affiliates will accordingly remain at will.

31. *Amendments.* Except as otherwise provided herein or the Plan, these Award Terms may be amended or modified at any time by an instrument in writing signed by the parties hereto or by the Company without the consent of the Participant if such action would not materially impair the rights of the Participant under this Award.

Acceptance of Award

32. In accordance with Section 15(c) of the Plan (as in effect at the grant date), the Participant may reject the Restricted Share Units by notifying the Company within 30 days of the grant date that he or she does not accept the Restricted Share Units. The Participant's acceptance of the Restricted Share Units constitutes the Participant's acceptance of and agreement with the Award Terms. Notwithstanding the foregoing, if required by the Company, the Participant will provide a signed copy of the Award Terms in such manner and within such timeframe as may be requested by the Company. The Company has no obligation to issue Shares to the Participant if the Participant does not accept the Restricted Share Units.

Performance Feature

33. If the vesting of Restricted Share Units is subject to a performance condition, the following additional terms and conditions will apply to that Award:

- The Participant will have the right to receive from 0% to 200% of the number of Shares indicated on the grant date, based on achievement of performance goals established by the Committee for that Award.

- The performance period is three years, which may consist of a single performance period or multiple interim periods as determined by the Committee.
- Achievement of performance objectives will be determined or certified by the Committee following the end of the applicable period.
- Except as otherwise set forth in paragraph 4 of the Award Terms or below in this "Performance Feature" section, vesting of the Award will occur upon satisfaction of the time-based vesting conditions set forth in paragraph 2 of the Award Terms and vesting and payment of the Award will be based on the extent to which the performance objectives established by the Committee have been attained. In any case, except where payment of the Award is made upon a Change in Control within the meaning of Treas. Reg. § 1.409-3(i)(5), in no event will payment of the Award occur outside of the time period set forth in paragraph 2.
- In the event of termination of the Participant's employment with the Company (including its Subsidiaries) before the vesting of the Restricted Share Units by reason of death, disability, Retirement, Divestiture, or involuntary termination without Cause, each as described in paragraph 4, payment of the Restricted Share Unit Award (or portion thereof in the case of an involuntary termination without Cause) will be based on the extent to which the performance objectives established by the Committee have been attained following the end of the performance period.
- In the event of a Change in Control, the performance feature of the Award will cease to apply and the Award will be converted into a time-based award in accordance with the formula set forth in Section 12(a)(v) of the Plan. The vesting and payment of such Award will then be governed in accordance with paragraph 4.

APPENDIX A
TO THE ALCOA CORPORATION
2016 Stock Incentive Plan
Terms and Conditions for Restricted Share Units
for Non-U.S. Participants

This Appendix A contains additional (or, if so indicated, different) terms and conditions that govern the Restricted Share Units if the Participant resides and/or works outside of the United States. Capitalized terms used but not defined herein shall have the same meanings assigned to them in the Plan and the Terms and Conditions for Restricted Share Units (the "Terms and Conditions").

A. *Termination.* This provision supplements paragraph 3 of the Terms and Conditions.

The Company will determine when the Participant is no longer providing services for purposes of the Restricted Share Units (including whether the Participant may still be considered to be providing services while on a leave of absence).

B. *Responsibility for Taxes.* This provision replaces paragraph 6 of the Terms and Conditions (except to the extent that the Participant is a Section 16 Insider).

The Participant acknowledges that, regardless of any action taken by the Company or, if different, the Subsidiary that employs the Participant (the "Employer"), the ultimate liability for all income tax, social insurance, payroll tax, fringe benefits tax, payment on account or other tax-related items related to the Participant's participation in the Plan and legally applicable to the Participant ("Tax-Related Items") is and remains the Participant's responsibility and may exceed the amount actually withheld by the Company or the Employer. The Participant further acknowledges that the Company and/or the Employer (a) make no representations or undertakings regarding the treatment of any Tax-Related Items in connection with any aspect of these Restricted Shares Units, including, but not limited to, the grant, vesting or settlement of Restricted Shares Units, the subsequent sale of Shares acquired pursuant to the Restricted Share Units and the receipt of any dividends or dividend equivalents; and (b) do not commit to and are under no obligation to structure the terms of the Restricted Share Units or any aspect of the Restricted Share Units to reduce or eliminate the Participant's liability for Tax-Related Items or achieve any particular tax result. The Participant shall not make any claim against the Company, the Employer or any other Subsidiary, or their respective board, officers or employees related to Tax-Related Items arising from this Award. Furthermore, if the Participant has become subject to tax in more than one jurisdiction, the Participant acknowledges that the Company and/or the Employer (or former employer, as applicable) may be required to withhold or account for Tax-Related Items in more than one jurisdiction.

Prior to any relevant taxable or tax withholding event, as applicable, the Participant will pay or make adequate arrangements satisfactory to the Company and/or the Employer to satisfy all Tax-Related Items. In this regard, the Participant authorizes the Company and/or the Employer, or their respective agents, at their discretion, to satisfy their withholding obligations with regard to all Tax-Related Items by: (i) requiring a cash payment from the Participant; (ii) withholding from the Participant's wages or other cash compensation paid to the Participant by the Company and/or the Employer, (iii) withholding from the proceeds of the sale of Shares acquired pursuant to the Restricted Share Units, either through a voluntary sale or through a mandatory sale arranged by the Company (on the Participant's behalf pursuant to this authorization without further consent); and/or (iv) withholding from the Shares subject to Restricted Share Units.

Depending on the withholding method, the Company may withhold or account for Tax-Related Items by considering applicable minimum statutory withholding rates or other applicable withholding rates, including maximum applicable rates, in which case the Participant may receive a refund of any over-withheld amount in cash (with no entitlement to the Share equivalent) or, if not refunded, the Participant may seek a refund from the local tax authorities. If the obligation for Tax-Related Items is satisfied by withholding in Shares, the Participant is deemed, for tax purposes, to have been issued the full number of Shares subject to the vested Restricted Shares Units, notwithstanding that a number of the Shares is held back solely for the purpose of paying the Tax-Related Items.

Finally, the Participant shall pay to the Company and/or the Employer any amount of Tax-Related Items that the Company and/or the Employer may be required to withhold or account for as a result of the Participant's participation in the Plan that cannot be satisfied by the means previously described. The Company may refuse to issue or deliver the Shares or the proceeds of the sale of Shares if the Participant fails to comply with his or her obligations in connection with the Tax-Related Items.

C. *Nature of Award.* In accepting the Restricted Share Units, the Participant acknowledges, understands and agrees that:

a. the Plan is established voluntarily by the Company, is discretionary in nature and may be modified, amended, suspended, or terminated by the Company at any time, to the extent permitted by the Plan;

b. this Award of Restricted Share Units is exceptional, voluntary and occasional and does not create any contractual or other right to receive future Restricted Share Units, or benefits in lieu of Restricted Share Units, even if Restricted Share Units have been granted in the past;

c. all decisions with respect to future Restricted Share Units or other Awards, if any, will be at the sole discretion of the Company;

d. this Award of Restricted Share Units and the Participant's participation in the Plan shall not create a right to, or be interpreted as forming an employment or service contract with the Company and shall not interfere with the ability of the Employer to terminate the Participant's employment contract (if any) at any time;

e. the Participant's participation in the Plan is voluntary;

f. this Award of Restricted Share Units and the Shares acquired under the Plan, and the income from and value of same, are not intended to replace any pension rights or compensation;

g. this Award of Restricted Share Units and the Shares acquired under the Plan, and the income and value of the same, are not part of normal or expected compensation or salary for any purposes, including, without limitation, calculating any severance, resignation, termination, redundancy, dismissal, end-of-service payments, bonuses, long-service awards, pension or retirement or welfare benefits or similar payments;

h. the future value of the Shares subject to the Restricted Share Units is unknown, indeterminable and cannot be predicted with certainty;

i. no claim or entitlement to compensation or damages shall arise from the forfeiture of any portion of this Award of Restricted Share Units resulting from the Participant's termination of

employment and/or service relationship (for any reason whatsoever, whether or not later found to be invalid or in breach of employment or other laws in the jurisdiction where the Participant is employed or otherwise rendering services, or the terms of his or her employment or service agreement, if any);

j. unless otherwise agreed with the Company, Restricted Share Units and the Shares acquired under the Plan, and the income from and value of the same, are not granted as consideration for, or in connection with, the service the Participant may provide as a director of any Subsidiary;

k. unless otherwise provided in the Plan or by the Company in its discretion, this Award of Restricted Share Units and the benefits under the Plan evidenced by these Award Terms do not create any entitlement to have this Award of Restricted Share Units or any such benefits transferred to, or assumed by, another company nor to be exchanged, cashed out or substituted for, in connection with any corporate transaction affecting the Shares; and

l. neither the Company, the Employer nor any other Subsidiary shall be liable for any foreign exchange rate fluctuation between the Participant's local currency and the United States Dollar that may affect the value of the Restricted Share Units or of any amounts due to the Participant pursuant to the Restricted Share Units or the subsequent sale of any Shares acquired under the Plan.

D. ***Data Privacy. The following Data Privacy consent only applies to Participants located outside the EU. Participants located in the EU should review the GDPR Notice in Appendix D.***

The Participant hereby explicitly and unambiguously consents to the collection, use and transfer, in electronic or other form, of the Participant's personal data as described in these Award Terms and any other grant materials by and among, as applicable, the Company, the Employer and any other Subsidiary for the exclusive purpose of implementing, administering and managing the Participant's participation in the Plan.

The Participant understands that the Company and the Employer may hold certain personal information about the Participant, including, but not limited to, the Participant's name, home address, email address and telephone number, date of birth, social insurance number, passport or other identification number, salary, nationality, job title, any shares of stock or directorships held in the Company, details of all Restricted Share Units or any other entitlement to shares of stock awarded, canceled, exercised, vested, unvested or outstanding in the Participant's favor ("Data"), for the exclusive purpose of implementing, administering and managing the Plan.

The Participant understands that Data may be transferred to the Broker or such additional or other stock plan service providers as may be selected by the Company, which are assisting the Company with the implementation, administration and management of the Plan. The Participant understands that the recipients of Data may be located in the United States or elsewhere, and that the recipients' country (e.g., the United States) may have different data privacy laws and protections than the Participant's country. The Participant understands that the Participant may request a list with the names and addresses of any potential recipients of Data by contacting the Participant's local human resources representative. The Participant authorizes the Company, the Broker and any other possible recipients which may assist the Company (presently or in the future) with implementing, administering and managing the Plan to receive, possess, use, retain and transfer Data, in electronic or other form, for the sole purpose of implementing, administering and managing the Participant's

participation in the Plan. The Participant understands that Data will be held only as long as is necessary to implement, administer and manage the Participant's participation in the Plan. The Participant understands that the Participant may, at any time, view Data, request additional information about the storage and processing of Data, require any necessary amendments to Data or refuse or withdraw the consents herein, in any case without cost, by contacting in writing the Participant's local human resources representative. Further, the Participant understands that the Participant is providing the consents herein on a purely voluntary basis. If the Participant does not consent, or if the Participant later seeks to revoke the Participant's consent, the Participant's employment and career with the Employer will not be affected; the only consequence of refusing or withdrawing the Participant's consent is that the Company would not be able to grant this Award of Restricted Share Units or other Awards to the Participant or administer or maintain such Awards. Therefore, the Participant understands that refusing or withdrawing the Participant's consent may affect the Participant's ability to participate in the Plan. For more information on the consequences of the Participant's refusal to consent or withdrawal of consent, the Participant understands that the Participant may contact the Participant's local human resources representative.

E. *Retirement.* Notwithstanding paragraph 4 of the Terms and Conditions, if the Company receives an opinion of counsel that there has been a legal judgment and/or legal development in the Participant's jurisdiction that would likely result in the favorable treatment applicable to the Restricted Share Units pursuant to paragraph 4 being deemed unlawful and/or discriminatory, then the Company will not apply the favorable treatment at the time of the Participant's retirement, and the Restricted Share Units will be treated as set forth in the remaining provisions of paragraph 4 of the Terms and Conditions.

F. *Language.* If the Participant has received these Award Terms, or any other document related to this Award of Restricted Share Units and/or the Plan translated into a language other than English and if the meaning of the translated version is different than the English version, the English version will control.

G. *Insider Trading Restrictions/Market Abuse Laws.* The Participant acknowledges that, depending on his or her country of residence, the Broker's country of residence, or where the Shares are listed, the Participant may be subject to insider trading restrictions and/or market abuse laws in applicable jurisdictions, which may affect his or her ability to accept, acquire, sell or attempt to sell or otherwise dispose of Shares or rights to Shares (e.g., Restricted Share Units) or rights linked to the value of Shares, during such times as the Participant is considered to have "inside information" regarding the Company (as defined by applicable laws or regulations in the applicable jurisdictions). Local insider trading laws and regulations may prohibit the cancellation or amendment of orders the Participant placed before possessing inside information. Furthermore, the Participant may be prohibited from (i) disclosing the inside information to any third party including colleagues of the Participant (other than on a "need to know" basis) and (ii) "tipping" third parties or causing them otherwise to buy or sell securities. Any restrictions under these laws or regulations are separate from and in addition to any restrictions that may be imposed under any applicable Company insider trading policy. The Participant acknowledges that it is his or her responsibility to comply with any applicable restrictions, and the Participant should consult his or her personal advisor on this matter.

H. *Foreign Asset/Account Reporting Requirements, Exchange Controls and Tax Requirements.* The Participant acknowledges that his or her country may have certain foreign asset and/or account reporting requirements and exchange controls which may affect his or her ability to acquire or hold Shares under the Plan or cash received from participating in the Plan (including from any dividends received or sale proceeds arising from the sale of Shares) in a brokerage or bank account outside his or her country. The

Participant understands that he or she may be required to report such accounts, assets or transactions to the tax or other authorities in his or her country. The Participant also may be required to repatriate sale proceeds or other funds received as a result of the Participant's participation in the Plan to his or her country through a designated bank or broker and/or within a certain time after receipt. The Participant acknowledges that it is his or her responsibility to be compliant with all such requirements, and that the Participant should consult his or her personal legal and tax advisors, as applicable, to ensure the Participant's compliance.

APPENDIX B
TO THE ALCOA CORPORATION
2016 Stock Incentive Plan
Terms and Conditions for Restricted Share Units
For Non-U.S. Participants

Capitalized terms used but not defined in this Appendix B have the meanings set forth in the Plan and the Terms and Conditions for Restricted Share Units (the "Terms and Conditions").

Terms and Conditions

This Appendix B includes special terms and conditions that govern Restricted Share Units if the Participant resides and/or works in one of the countries listed below.

If the Participant is a citizen or resident of a country other than the country in which the Participant is currently residing and/or working, or if the Participant transfers to another country after the grant of Restricted Share Units or is considered a resident of another country for local law purposes, the Committee shall, in its discretion, determine to what extent the special terms and conditions contained herein shall be applicable to the Participant.

Notifications

This Appendix B also includes information regarding exchange controls, tax and certain other issues of which the Participant should be aware with respect to participation in the Plan. The information is based on the securities, exchange control, tax and other laws in effect in the respective countries as of October 2021. Such laws are often complex and change frequently. As a result, the Company strongly recommends that the Participant not rely on the information in this Appendix B as the only source of information relating to the consequences of participation in the Plan because the information may be out of date at the time the Participant sells Shares acquired under the Plan.

In addition, the information contained herein is general in nature and may not apply to the Participant's particular situation and the Company is not in a position to assure the Participant of any particular result. Accordingly, the Participant should seek appropriate professional advice as to how the relevant laws in the Participant's country may apply to his or her situation.

Finally, if the Participant is a citizen or resident of a country other than the country in which the Participant currently works and/or resides, or if the Participant transfers to another country after the grant of the Restricted Share Unit, or is considered a resident of another country for local law purposes, the information contained herein may not be applicable to the Participant in the same manner.

AUSTRALIA

Terms and Conditions

Australia Offer Document.

The grant of Restricted Share Units is intended to comply with the provisions of the Corporations Act, 2001, Australian Securities & Investments Commission ("ASIC") Regulatory Guide 49 and ASIC Class Order CO 14/1000. Additional details are set forth in the Offer Document for the Restricted Share Units to Australian resident employees, which is being provided to the Participant with the Award Terms.

Notifications

Exchange Control Information.

Exchange control reporting is required for cash transactions exceeding A$10,000 and for international fund transfers. If an Australian bank is assisting with the transaction, the bank will file the report on the Participant's behalf.

Tax Information.

The Plan is a plan to which Subdivision 83A-C of the Income Tax Assessment Act 1997 (Cth) applies (subject to conditions in the Act). The Restricted Share Units should satisfy the real risk of forfeiture test for deferral.

BELGIUM

Notifications

Stock Exchange Tax.

A stock exchange tax applies to transactions executed through a non-Belgian financial intermediary. The stock exchange tax will likely apply when Shares are sold. The Participant should consult with his or her personal tax advisor to determine the Participant's obligations with respect to the stock exchange tax.

Foreign Asset/Account Reporting Information.

Belgian residents are required to report any security (*e.g.*, Shares acquired under the Plan) or bank account established outside of Belgium on their annual tax return. In a separate report, Belgian residents are also required to provide the National Bank of Belgium with certain details regarding such foreign accounts (including the account number, bank name and country in which any such account was opened). The forms to complete this report are available on the website of the National Bank of Belgium. Belgian residents should consult with their personal tax advisors to determine their personal reporting obligations.

BRAZIL

Terms and Conditions

Compliance with Law.

By accepting the Restricted Share Units, the Participant acknowledges that he or she agrees to comply with applicable Brazilian laws and to pay any and all applicable taxes associated with the vesting of the Restricted Share Units, the sale of the Shares acquired under the Plan and the receipt of any dividends or dividend equivalents.

Acknowledgement of Nature of the Grant.

This provision supplements paragraph C "Nature of Award" of Appendix A:

By accepting the Restricted Share Units, the Participant agrees that he or she is making an investment decision, the Shares will be issued to the Participant only if the vesting conditions are met and any necessary services are rendered by the Participant over the vesting period, and the value of the underlying Shares is not fixed and may increase or decrease in value over the vesting period without compensation to the Participant.

Notifications

Exchange Control Information.

If the Participant is a resident of or domiciled in Brazil, he or she will be required to submit an annual declaration of assets and rights held outside of Brazil to the Central Bank of Brazil if the aggregate value of the assets and rights is equal to or greater than US$1,000,000. If such amount exceeds US$100,000,000, the declaration must be submitted quarterly. Assets and rights that must be reported include Shares acquired under the Plan. Foreign individuals holding Brazilian visas are considered Brazilian residents for purposes of this reporting requirement and must declare at least the assets held abroad that were acquired subsequent to the date of admittance as a resident of Brazil.

Tax on Financial Transactions (IOF).

Repatriation of funds (e.g., sale proceeds) into Brazil and the conversion of USD into BRL associated with such fund transfers may be subject to the Tax on Financial Transactions. It is the Participant's responsibility to comply with any applicable Tax on Financial Transactions arising from the Participant's participation in the Plan. The Participant should consult with his or her personal tax advisor for additional details.

CANADA

Terms and Conditions

Payment.

Notwithstanding anything to the contrary in paragraphs 2 and 4 of the Terms and Conditions, any vested Restricted Share Unit will be paid to the Participant by no later than the end of the calendar year in which the vesting date specified in paragraph 2 occurs (i.e., by the end of the calendar year in which the third anniversary of the grant date occurs).

Notwithstanding anything to the contrary in the Terms and Conditions, a Participant will receive one Share upon the vesting and payment of a Restricted Share Unit. Notwithstanding paragraph 5 of the Terms and Conditions, the Company shall not have discretion to substitute a cash payment in lieu of Shares.

Further, in no event will the Restricted Share Units carry any right to receive payment of any dividend equivalents in cash. To the extent the Board of Directors authorizes that dividend equivalents be accrued and paid on vesting of Restricted Share Units, such dividend equivalents shall be paid in such whole number of Shares with a fair market value at the time the Restricted Share Units vest equal to the amount of dividend equivalents accrued on the Restricted Share Units at that time. Any fractional Shares attributable to dividend equivalents shall be rounded down to the nearest whole Share, and the Participant shall not be entitled to any consideration for such fractional Shares, or any other amount in respect of the accrued dividend equivalents.

Withholding.

Notwithstanding anything to the contrary in the Terms and Conditions, the number of Shares otherwise required to be issued to a Participant on vesting and payment of a Restricted Share Unit shall not be reduced to satisfy the payment of Tax Obligations, except for at the election of a Participant, in the Participant's sole discretion. A Participant who is not a Section 16 Insider shall be permitted to make such an election only if the Company has established procedures for such withholding.

Termination of Service.

The following provision replaces paragraph A "Termination" of Appendix A:

For purposes of the Restricted Share Units, the Participant's employment relationship will be considered terminated (regardless of the reason for such termination and whether or not later found to be invalid or in breach of Canadian laws or the terms of the Participant's employment agreement, if any) effective as of the date that is the earlier of (i) the date the Participant receives notice of termination, or (ii) the date the Participant is no longer actively providing service (the "Termination Date"), except, in either case, to the extent applicable employment standards legislation requires the Restricted Share Units to continue through any minimum termination notice period applicable under the legislation. In such case, the Termination Date will be the last day of the Participant's minimum statutory termination notice period.

Unless otherwise expressly provided in these Award Terms or determined by the Company, or explicitly required by applicable legislation, the Participant's right to vest in the Restricted Share Units, if any, will terminate on the Termination Date and the Participant will not earn or be entitled to (i) any pro-rated vesting for that period of time before the Termination Date, (ii) any portion of the Restricted Share

Units that is thereby forfeited upon termination, or (iii) any payment of damages in lieu thereof. Unless otherwise expressly provided in these Award Terms or determined by the Company, there shall be no vesting of Restricted Share Units during any applicable common law or civil law reasonable notice period following the Termination Date or any payment of damages in lieu thereof. Subject to application legislation, in the event the Termination Date cannot be reasonably determined under the terms of the Award Terms and/or the Plan, the Committee shall have the exclusive discretion to determine the Termination Date for purposes of the Restricted Share Unit (including whether the Participant may still be considered to be providing services while on a leave of absence).

The following provision supplements section C "Nature of Award" of Appendix A:

Subsections C(b), C(g) and C(i) of this Appendix A are subject to such explicit and minimal requirements set forth under local employment standards or pension-related legislation.

The Following Provisions Apply for Participants Resident in Quebec:

Consent to Receive Information in English.

The Participant acknowledges that it is the express wish of the parties that these Award Terms, as well as all documents, notices and legal proceedings entered into, given or instituted pursuant hereto or relating directly or indirectly hereto, be written in English.

Les parties reconnaissent avoir exigé la rédaction en anglais de Conditions d'attribution, ainsi que de tous documents, avis et procédures judiciaires, exécutés, donnés ou intentés en vertu de, ou liés directement ou indirectement à, la présente convention.

Authorization to Release and Transfer Necessary Personal Information.

The following provision supplements paragraph D "Data Privacy" of Appendix A:

The Participant hereby authorizes the Company and the Company's representatives to discuss with and obtain all relevant information from all personnel, professional or not, involved in the administration and operation of the Plan. The Participant further authorizes the Company, any Subsidiary and the administrator of the Plan to disclose and discuss the Plan with their advisors. The Participant further authorizes the Company and any Subsidiary to record such information and to keep such information in the Participant's Employee file.

Notifications

Securities Law Information.

The Participant acknowledges that he or she is permitted to sell the Shares acquired under the Plan through the Broker, provided the sale of the Shares takes place outside of Canada through facilities of a stock exchange on which the Shares are listed (i.e., the NYSE).

Foreign Asset/Account Reporting Information.

Canadian residents are required to report to the tax authorities any foreign property held outside of Canada (including Restricted Share Units and Shares acquired under the Plan) annually on form T1135 (Foreign Income Verification Statement) if the total cost of the foreign property exceeds C$100,000 at

any time in the year. The form must be filed by April 30 of the following year. Restricted Share Units must be reported--generally at a nil cost--if the C$100,000 cost threshold is exceeded because of other foreign property the Participant holds. If Shares are acquired, their cost generally is the adjusted cost base ("ACB") of the Shares. The ACB would normally equal the fair market value of the Shares at vesting, but if the Participant owns other Shares, this ACB may have to be averaged with the ACB of the other Shares. The Participant should consult with his or her personal legal advisor to ensure compliance with applicable reporting obligations.

CHINA

Terms and Conditions

The following terms and conditions will apply to Participants who are subject to exchange control restrictions and regulations in the People's Republic of China ("PRC"), including the requirements imposed by the State Administration of Foreign Exchange ("SAFE"), as determined by the Company in its sole discretion:

Termination of Employment.

Due to exchange control laws in PRC, the Participant agrees that the Company reserves the right to require the sale of any Shares acquired at vesting of the Restricted Share Units upon the termination of the Participant's employment for any reason. If the Company, in its discretion, does not exercise its right to require the automatic sale of Shares issuable upon vesting of the Restricted Share Units, as described in the preceding sentence, the Participant understands and agrees that any Shares acquired by the Participant under the Plan must be sold no later than six (6) months after termination of the Participant's employment, or within any other such time frame as permitted by the Company or required by SAFE. The Participant understands that any Shares acquired under the Plan that have not been sold within six (6) months of the Participant's termination of employment will be automatically sold by a designated broker at the Company's discretion, pursuant to this authorization by the Participant.

The Participant agrees that the Company is authorized to instruct its designated broker to assist with the mandatory sale of such Shares (on the Participant's behalf, pursuant to this authorization), and the Participant expressly authorizes the Company's designated broker to complete the sale of such Shares. The Participant also agrees to sign any agreements, forms and/or consents that may be reasonably requested by the Company (or the designated broker) to effectuate the sale of the Shares (including, without limitation, as to the transfers of the proceeds and other exchange control matters noted below) and shall otherwise cooperate with the Company with respect to such matters, provided that the Participant shall not be permitted to exercise any influence over how, when or whether the sales occur. The Participant acknowledges that the Company's designated broker is under no obligation to arrange for the sale of the Shares at any particular price. Due to fluctuations in the Share price and/or applicable exchange rates between vesting and (if later) the date on which the Shares are sold, the amount of proceeds ultimately distributed to the Participant may be more or less than the market value of the Shares upon vesting (which is the amount relevant to determining the Participant's liability for Tax-Related Items). The Participant understands and agrees that the Company is not responsible for the amount of any loss the Participant may incur and the Company assumes no liability for any fluctuations in the Share price and/or any applicable exchange rate.

Upon the sale of the Shares, the Company agrees to pay the cash proceeds from the sale (less any Tax-Related Items, brokerage fees or commissions) to the Participant in accordance with the applicable

exchange control laws and regulations including but not limited to the restrictions set forth in this Appendix B for China below under "Exchange Control Restrictions."

Exchange Control Restrictions.

The Participant understands and agrees that, pursuant to local exchange control requirements, the Participant will be required to immediately repatriate any cash payments or proceeds obtained with respect to participation in the Plan to the PRC. The Participant further understands that such repatriation of any cash payments or proceeds may need to be effectuated through a special exchange control account established by the Company or any Subsidiary, and the Participant hereby consents and agrees that any payment or proceeds may be transferred to such special account prior to being delivered to the Participant. Any payment or proceeds may be paid to the Participant in U.S. dollars or local currency at the Company's discretion. If the payments or proceeds are paid to the Participant in U.S. dollars, the Participant will be required to set up a U.S. dollar bank account in the PRC (if the Participant does not already have one) so that the payments or proceeds may be deposited into this account. If the payments or proceeds are paid to the Participant in local currency, the Company is under no obligation to secure any particular exchange conversion rate and the Company may face delays in converting the payments or proceeds to local currency due to exchange control restrictions. The Participant agrees to bear any currency exchange conversion rate fluctuation risk between the time the cash proceeds are received and the time the cash proceeds are distributed to the Participant through the special account described above.

The Participant further agrees to comply with any other requirements that may be imposed by the Company in the future to facilitate compliance with exchange control requirements in the PRC.

HUNGARY

There are no country-specific provisions.

ICELAND

There are no country-specific provisions.

ITALY

Terms and Conditions

Plan Document Acknowledgement.

By accepting the Restricted Share Units, the Participant acknowledges that the Participant has received a copy of the Plan and the Award Terms and has reviewed the Plan and the Award Terms, including the Appendices, in their entirety and fully understands and accepts all provisions of the Plan and the Award Terms, including the Appendices. The Participant further acknowledges that the Participant has read and specifically and expressly approves the following paragraphs of the Award Terms: paragraphs 2-5: Vesting and Payment; paragraph 15: Repayment and Forfeiture; paragraph 16: Stock Exchange Requirements and Applicable Laws; paragraph 20: Severability and Judicial Modification; paragraph 22: Appendices; paragraph 23: Imposition of Other Requirements; paragraph 27: Governing Law and Venue; paragraph A of Appendix A: Termination; Appendix D: GDPR Notice.

Notifications

Foreign Asset/Account Reporting Information.

Italian residents who, during the fiscal year, hold investments abroad or foreign financial assets (e.g., cash, Shares) which may generate income taxable in Italy are required to report such on their annual tax returns (UNICO form, RW Schedule) or on a special form if no tax return is due. The same reporting obligations apply to Italian residents who, even if they do not directly hold investments abroad or foreign financial assets (e.g., cash, Shares), are beneficial owners of the investment pursuant to Italian money laundering provisions. The Participant should consult his or her personal tax advisor to ensure compliance with applicable reporting obligations.

Tax on Foreign Financial Assets.

The value of the financial assets held outside of Italy by Italian residents is subject to a foreign asset tax at an annual rate of 2 per thousand (0.2%). The taxable amount will be the fair market value of the financial assets (including Shares) assessed at the end of the calendar year and is subject to pro-ration for the portion of the year that the Participant holds the Shares received at vesting.

NETHERLANDS

There are no country-specific provisions.

NORWAY

There are no country-specific provisions.

SAUDI ARABIA

Terms and Conditions

Notifications

Securities Law Information.

This document may not be distributed in the Kingdom of Saudi Arabia except to such persons as permitted under the Offers of Securities Regulations issued by the Capital Market Authority.

The Capital Market Authority does not make any representation as to the accuracy or completeness of this document, and expressly disclaims any liability whatsoever for any loss arising from, or incurred in reliance upon, any part of this document. The Participant should conduct his or her own due diligence on the accuracy of the information relating to the Restricted Share Units and the underlying Shares. The Participant should consult with his or her authorized financial advisor in this regard.

SINGAPORE

Terms and Conditions

Sale Restriction.

The Participant agrees that any Shares received upon vesting will not be offered for sale or sold in Singapore prior to the six-month anniversary of the grant date, unless such sale or offer is made pursuant to the exemption under Part XIII Division (1) Subdivision (4) (other than Section 280) of the Securities and Futures Act (Chapter 289, 2006 Ed.) ("SFA").

Notifications

Securities Law Information.

The grant of the Restricted Share Units is being made in reliance on the "Qualifying Person" exemption under section 273(1)(f) of the SFA under which it is exempt from the prospectus and registration requirements under the SFA and the grant of the Restricted Share Units is not made to the Participant with a view to the Shares being subsequently offered for sale to any other party. The Plan has not been lodged or registered as a prospectus with the Monetary Authority of Singapore.

Director Notification Obligation.

Directors, associate directors or shadow directors of a Singapore Subsidiary are subject to certain notification requirements under the Singapore Companies Act. Specifically, such directors must notify the Singapore Subsidiary in writing of an interest (e.g., Restricted Share Units, Shares, etc.) in the Company or any related company within two business days of (i) its acquisition or disposal, (ii) any change in a previously-disclosed interest (e.g., upon vesting of Restricted Share Units or when Shares acquired under the Plan are subsequently sold), or (iii) becoming a director.

SPAIN

Terms and Conditions

No Entitlement for Claims or Compensation.

The following provisions supplement paragraph A "Termination" of Appendix A.

By accepting the Restricted Share Units, the Participant consents to participation in the Plan and acknowledges that Participant has received a copy of the Plan.

The Participant understands and agrees that, as a condition of the grant of the Restricted Share Units, if the Participant's employment terminates, unless otherwise provided in the Award Terms or by the Company, any unvested Restricted Share Units shall be forfeited without entitlement to the underlying Shares or to any amount as indemnification in the event of a termination, including, but not limited to: resignation, disciplinary dismissal adjudged to be with cause, disciplinary dismissal adjudged or recognized to be without cause, individual or collective layoff on objective grounds, whether adjudged to be with cause or adjudged or recognized to be without cause, material modification of the terms of employment under Article 41 of the Workers' Statute, relocation under Article 40 of the Workers'

Statute, Article 50 of the Workers' Statute, unilateral withdrawal by the Employer, and under Article 10.3 of Royal Decree 1382/1985.

The Participant understands that the Company has unilaterally, gratuitously and in its sole discretion decided to grant Restricted Share Units under the Plan to individuals who may be Employees of the Company or a Subsidiary. The decision is limited and entered into based upon the express assumption and condition that any Restricted Share Units will not economically or otherwise bind the Company or any Subsidiary, including the Employer, on an ongoing basis, other than as expressly set forth in the Award Terms. Consequently, the Participant understands that the Restricted Share Units are granted on the assumption and condition that the Restricted Share Units shall not become part of any employment or service agreement (whether with the Company or any Subsidiary, including the Employer) and shall not be considered a mandatory benefit, salary for any purpose (including severance compensation) or any other right whatsoever. Furthermore, the Participant understands and freely accepts that there is no guarantee that any benefit whatsoever shall arise from the grant of Restricted Share Units, which is gratuitous and discretionary, since the future value of the Restricted Share Units and the underlying Shares is unknown and unpredictable. The Participant also understands that the grant of Restricted Share Units would not be made but for the assumptions and conditions set forth hereinabove; thus, the Participant understands, acknowledges and freely accepts that, should any or all of the assumptions be mistaken or any of the conditions not be met for any reason, the Restricted Share Unit and any right to the underlying Shares shall be null and void.

Notifications

Securities Law Information.

No "offer of securities to the public", as defined under Spanish law, has taken place or will take place in the Spanish territory with respect to the Restricted Share Units. No public offering prospectus has been nor will be registered with the Comisión Nacional del Mercado de Valores (Spanish Securities Exchange Commission) ("CNMV"). Neither the Plan nor the Award Terms constitute a public offering prospectus and they have not been, nor will they be, registered with the CNMV.

Exchange Control Information.

The Participant may be required to declare electronically to the Bank of Spain any securities accounts (including brokerage accounts held abroad), any foreign instruments (e.g., Shares) and any transactions with non-Spanish residents (including any payments of cash or Shares made to the Participant by the Company or Broker) if the balances in such accounts together with the value of such instruments as of December 31, or the volume of transactions with non-Spanish residents during the prior or current year, prior tax year exceed €1,000,000. Once the €1,000,000 threshold has been surpassed in either respect, the Participant will generally be required to report all of his or her foreign accounts, foreign instruments and transactions with non-Spanish residents, even if the relevant threshold has not been crossed for an individual item.

Share Reporting Information.

It is the Participant's responsibility to declare the acquisition, ownership and disposition of Shares to the Spanish Direccion General de Comercio e Inversiones (the "DGCI") of the Ministry of Economy and Competitiveness on a Form D-6. Generally, the declaration must be made in January for Shares owned as of December 31 of the prior year and/or shares acquired or disposed of during the prior year;

however, if the value of the Shares acquired or disposed of or the amount of the sale proceeds exceeds a designated threshold, the declaration must be filed within one month of the acquisition or disposition, as applicable. The Participant should consult with his or her personal advisor to determine the Participant's obligations in this respect.

Foreign Asset/Account Reporting Information.

To the extent that the Participant holds Shares and/or has bank accounts outside Spain with a value in excess of €50,000 (for each type of asset) as of December 31, the Participant will be required to report information on such assets on his or her tax return (tax form 720) for such year. After such Shares and/or accounts are initially reported, the reporting obligation will apply for subsequent years only if the value of any previously-reported Shares or accounts increases by more than €20,000 or if the Participant sells or otherwise disposes of any previously-reported Shares or accounts.

SURINAME

There are no country-specific provisions.

SWITZERLAND

Notifications

Securities Law Information.

Neither this document nor any other materials relating to the Restricted Share Units (i) constitute a prospectus according to articles 35 et seq. of the Swiss Federal Act on Financial Services (FinSA), (ii) may be publicly distributed nor otherwise made publicly available in Switzerland to any person other than an Employee of the Company or other Participant or (iii) has been or will be filed with, approved or supervised by any Swiss reviewing body according to article 51 FinSA or any Swiss regulatory authority, including the Swiss Financial Market Supervisory Authority (FINMA).

Exhibit 10.38

ALCOA CORPORATION
TERMS AND CONDITIONS FOR
SPECIAL RETENTION AWARDS
(RESTRICTED SHARE UNITS)

These terms and conditions, including Appendices attached hereto (the "Award Terms"), are authorized by the Compensation and Benefits Committee (the "Committee") of the Board of Directors. They are deemed to be incorporated into and form a part of every special retention Award ("Special Retention Award") issued on or after December 8, 2021 under the Alcoa Corporation 2016 Stock Incentive Plan, as may be amended from time to time (the "Plan").

Terms that are defined in the Plan have the same meanings in the Award Terms.

General Terms and Conditions

1. Special Retention Awards are subject to the provisions of the Plan and the provisions of the Award Terms. If the Plan and the Award Terms are inconsistent, the provisions of the Plan will govern. Interpretations of the Plan and the Award Terms by the Committee are binding on the Participant and the Company. A Special Retention Award is an undertaking by the Company to issue the number of Shares indicated in the notice of the Special Retention Award on the date the Special Retention Award ***vests***, subject to the fulfilment of certain conditions, except to the extent otherwise provided in the Plan or herein.

Vesting and Payment

2. A Special Retention Award vests on the third anniversary date of the grant date, and, subject to paragraph 3, will be paid to the Participant in Shares on the vesting date or within 90 days thereafter (or, if it is not practicable to make payment by such date, as soon as practicable thereafter, but in no event later than the end of the calendar year in which the vesting date occurs and/or later than the time permitted under Section 409A of the Code).

3. Notwithstanding the foregoing, as a condition to a Special Retention Award vesting, a Participant must remain an active employee of the Company or a Subsidiary through the date of vesting. Except as provided in paragraph 5, if a Participant's employment with the Company (including its Subsidiaries) is terminated prior to the vesting date of the Special Retention Award, the Special Retention Award is forfeited and is automatically cancelled.

4. Special Retention Awards will be paid by the issuance to the Participant of Shares covered by the Special Retention Award. Prior to issuance of the Shares, the Participant has no voting rights. A Participant will receive one Share upon the vesting and payment of a Restricted Share Unit. Notwithstanding the foregoing or anything in the Award Terms to the contrary, to the extent that payment in Shares is prohibited under applicable law or would require the Participant or the Company to obtain the approval of any governmental and/or regulatory body in the Participant's country, or as necessary to meet tax objectives, the Company in its sole discretion may substitute a cash payment in lieu of Shares, such cash payment to be equal to the Fair Market Value of the Shares on the date that such Shares would have otherwise been issued under the terms of the Plan and the Award Terms. Dividend equivalents will accrue on Special Retention Awards, unless the Committee determines that no dividend equivalents may be accrued or paid. Dividend equivalents that accrue on Special Retention Awards will be equal to the common stock dividend per Share payable on the Company's common stock multiplied by the number of Shares covered by the Special Retention Award. Notwithstanding any provision herein to the contrary, no dividends or dividend equivalents will be paid on Special Retention Awards that have not vested. Payment of any dividend equivalents will be made in accordance with paragraph 2.

5. The following are exceptions to the vesting rules:

- Involuntary Termination without Cause: An unvested Special Retention Award held by a Participant who is involuntarily terminated without Cause (as defined below) from employment with the Company or a Subsidiary during the vesting period is not forfeited in whole but only in part upon termination of employment. The portion of the Special Retention Award that is not forfeited vests on the original stated vesting date set forth in paragraph 2 and is calculated based on a proportionate share of the time during the vesting period that the Participant remained actively employed with the Company or a Subsidiary, with the remaining portion being automatically forfeited. The proportionate share is computed on the basis of the actual number of days actively employed after the date of grant over the total number of days in the three-year vesting period (with the resulting Restricted Share Units rounded up to the next whole unit). For example, a Participant who is involuntarily terminated without Cause from employment

with the Company (or a Subsidiary) at the end of the first year of the three-year vesting period will receive one-third of the Shares upon vesting, with the remaining two-thirds of the Shares being automatically forfeited upon termination.

For this purpose, if the Participant participates in the Alcoa Corporation Change in Control Severance Plan, "Cause" shall have the meaning set forth in such plan. If the Participant does not participate in the Alcoa Corporation Change in Control Severance Plan, "Cause" means (i) the willful and continued failure by the Participant to substantially perform the Participant's duties with the Employer that has not been cured within thirty (30) days after a written demand for substantial performance is delivered to the Participant by the Board or the Participant's direct supervisor, which demand specifically identifies the manner in which the Participant has not substantially performed the Participant's duties, (ii) the willful engaging by the Participant in conduct which is demonstrably and materially injurious to the Company or a Subsidiary, monetarily or otherwise; (iii) the Participant's fraud or acts of dishonesty relating to the Company or any of its Subsidiaries, or (iv) the Participant's conviction of any misdemeanor relating to the affairs of the Company or any of its Subsidiaries or indictment for any felony. For purposes of clauses (i) and (ii) of this definition, no act, or failure to act, on the Participant's part shall be deemed "willful" unless done, or omitted to be done, by the Participant not in good faith and without reasonable belief that the Participant's act, or failure to act, was in the best interest of the Company.

- Death or Disability: An unvested Special Retention Award held by a Participant, who dies while an employee or who is permanently and totally disabled (as defined below) while an employee, is not forfeited but vests on the original stated vesting date set forth in paragraph 2.

A Participant is deemed to be permanently and totally disabled if the Participant is unable to engage in any substantial gainful activity by reason of any medically determinable physical or mental impairment which can be expected to result in death or which has lasted or can be expected to last for a continuous period of not less than 12 months. A Participant shall not be considered to be permanently and totally disabled unless the Participant furnishes proof of the existence thereof in such form and manner, and at such times, as the Company may require. In the event of a dispute, the determination whether a Participant is permanently and totally disabled will be made by the Committee or its delegate.

- Change in Control: A Special Retention Award vests if a Replacement Award is not provided following certain Change in Control events, as described in the Plan. Notwithstanding anything in the Award Terms to the contrary, if a Change in Control qualifies as a "change in control event" within the meaning of Treas. Reg. § 1.409-3(i)(5), the vested Special Retention Award (whether vested pursuant to the preceding sentence or otherwise and with vesting determined under Section 409A of the Code) will be paid to the Participant within 30 days following the Change in Control. If the Change in Control does not so qualify, the vested Special Retention Award will be paid to the Participant on the original stated vesting date set forth in paragraph 2.

- Termination Following Change in Control: As further described in the Plan, if a Replacement Award is provided following a Change in Control, but within 24 months of such Change in Control the Participant's employment is terminated without Cause (as defined in the Alcoa Corporation Change in Control Severance Plan) or by the Participant for Good Reason (as defined in the Alcoa Corporation Change in Control Severance Plan), such award will vest and will be paid to the Participant on the original stated vesting date set forth in paragraph 2.

Taxes

6. All taxes required to be withheld under applicable tax laws in connection with a Special Retention Award must be paid by the Participant at the appropriate time under applicable tax laws. The Company may satisfy applicable tax withholding obligations by any of the means set forth in Section 15(k) of the Plan, but will generally withhold from the Shares to be issued upon payment of the Special Retention Award that number of Shares with a fair market value on the vesting date equal to the taxes required to be withheld at the minimum required rates, or at any other rate approved by the Committee, up to the maximum individual tax rate for the applicable tax jurisdiction, which include, for Participants subject to taxation in the United States, applicable income taxes, federal and state unemployment compensation taxes and FICA/FUTA taxes. Notwithstanding the foregoing, if the Participant is subject to the short-swing profit rules of Section 16(b) of the Exchange Act, the Company will withhold Shares from the Shares to be issued upon payment of the Special Retention Award, as described herein, at the minimum required rates or such other rates approved by the Committee and other means will not be used to satisfy such tax withholding obligations.

Beneficiaries

7. If permitted by the Company, Participants will be entitled to designate one or more beneficiaries to receive all Special Retention Awards that have not yet vested at the time of death of the Participant. All beneficiary designations will be

on beneficiary designation forms approved for the Plan. Copies of the form will generally be available from the Company's designated stock plan broker or service provider (the "Broker") or may otherwise be obtained from the Company.

8. Beneficiary designations on an approved form will be effective at the time received by the Company, including, as applicable, through submission to the Broker. A Participant may revoke a beneficiary designation at any time by written notice to the Company, including as applicable, through submission to the Broker, or by filing a new designation form. Any designation form previously filed by a Participant will be automatically revoked and superseded by a later-filed form.

9. A Participant will be entitled to designate any number of beneficiaries on the form, and the beneficiaries may be natural or corporate persons.

10. The failure of any Participant to obtain any recommended signature on the form will not prohibit the Company from treating such designation as valid and effective. No beneficiary will acquire any beneficial or other interest in any Special Retention Award prior to the death of the Participant who designated such beneficiary.

11. Unless the Participant indicates on the form that a named beneficiary is to receive Special Retention Awards only upon the prior death of another named beneficiary, all beneficiaries designated on the form will be entitled to share equally in the Special Retention Awards upon vesting. Unless otherwise indicated, all such beneficiaries will have an equal, undivided interest in all such Special Retention Awards.

12. Should a beneficiary die after the Participant but before the Special Retention Award is paid, such beneficiary's rights and interest in the Special Retention Award will be transferable by the beneficiary's last will and testament or by the laws of descent and distribution. A named beneficiary who predeceases the Participant will obtain no rights or interest in a Special Retention Award, nor will any person claiming on behalf of such individual. Unless otherwise specifically indicated by the Participant on the beneficiary designation form, beneficiaries designated by class (such as "children," "grandchildren" etc.) will be deemed to refer to the members of the class living at the time of the Participant's death, and all members of the class will be deemed to take "per capita."

13. If a Participant does not designate a beneficiary or if the Company does not permit a beneficiary designation, the Special Retention Award that has not yet vested or been paid at the time of death of the Participant will vest and be paid to the Participant's legal heirs pursuant to the Participant's last will and testament or by the laws of descent and distribution.

Adjustments

14. In the event of an Equity Restructuring or other transaction described in Section 4(f) of the Plan, the Committee will equitably adjust the Special Retention Award as it deems appropriate in accordance with the terms of the Plan. The adjustments authorized by the Committee will be final and binding.

Repayment/Forfeiture

15. As an additional condition of receiving the Special Retention Award, the Participant agrees that the Special Retention Award and any benefits or proceeds the Participant may receive hereunder shall be subject to forfeiture and/or repayment to the Company as provided in Sections 15(e) and (f) of the Plan including, without, limitation, to the extent required (i) under the terms of any recoupment or "clawback" policy adopted by the Company to comply with applicable laws or with the Company's Corporate Governance Guidelines or other similar requirements, as such policy may be amended from time to time (and such requirements shall be deemed incorporated into the Award Terms without the Participant's consent) or (ii) to comply with any requirements imposed under applicable laws and/or the rules and regulations of the securities exchange or inter-dealer quotation system on which the Shares are listed or quoted, including, without limitation, pursuant to Section 954 of the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010. Further, if the Participant receives any amount in excess of what the Participant should have received under the terms of the Special Retention Award for any reason (including without limitation by reason of a financial restatement, mistake in calculations or administrative error), all as determined by the Committee, then the Participant shall be required to promptly repay any such excess amount to the Company. By accepting this Award, subject to applicable law, Participant agrees and acknowledges the obligation to cooperate with, and provide any and all assistance necessary to, the Company to recover or recoup this Award or amounts paid hereunder pursuant to this Section 15 and the Plan.

Miscellaneous Provisions

16. *Stock Exchange Requirements; Applicable Laws*. Notwithstanding anything to the contrary in the Award Terms, no Shares issuable upon vesting of the Special Retention Awards, and no certificate representing all or any part of such Shares, shall be issued or delivered if, in the opinion of counsel to the Company, such issuance or delivery would cause the Company to be in violation of, or to incur liability under, any securities law, or any rule, regulation or procedure of any U.S. national securities exchange upon which any securities of the Company are listed, or any listing agreement with any such securities exchange, or any other requirement of law or of any administrative or regulatory body having jurisdiction over the Company or a Subsidiary.

17. *Non-Transferability.* The Special Retention Awards are non-transferable and may not be assigned, alienated, pledged, attached, sold or otherwise transferred or encumbered by the Participant other than by will or the laws of descent and distribution and any such purported assignment, alienation, pledge, attachment, sale, transfer or encumbrance shall be void and unenforceable against the Company; provided, that, the designation of a beneficiary shall not constitute an assignment, alienation, pledge, attachment, sale, transfer or encumbrance.

18. *Stockholder Rights*. No person or entity shall be entitled to vote, receive dividends or be deemed for any purpose the holder of any Shares until the Special Retention Award shall have vested and been paid in the form of Shares in accordance with the provisions of the Award Terms.

19. *Notices*. Any notice required or permitted under the Award Terms shall be in writing and shall be deemed sufficient when delivered personally or sent by confirmed email, telegram, or fax or five days after being deposited in the mail, as certified or registered mail, with postage prepaid, and addressed to the Company at the Company's principal corporate offices or to the Participant at the address maintained for the Participant in the Company's records or, in either case, as subsequently modified by written notice to the other party.

20. *Severability and Judicial Modification*. If any provision of the Award Terms is held to be invalid or unenforceable under the applicable laws of any country, state, province, territory or other political subdivision or the Company elects not to enforce such restriction, the remaining provisions shall remain in full force and effect and the invalid or unenforceable provision shall be modified only to the extent necessary to render that provision valid and enforceable to the fullest extent permitted by law. If the invalid or unenforceable provision cannot be, or is not, modified, that provision shall be severed from the Award Terms and all other provisions shall remain valid and enforceable.

21. *Successors*. The Award Terms shall be binding upon and inure to the benefit of the Company and its successors and assigns, on the one hand, and the Participant and his or her heirs, beneficiaries, legatees and personal representatives, on the other hand.

22. *Appendices*. Notwithstanding any provisions in the Award Terms, for Participants residing and/or working outside the United States, the Special Retention Award shall be subject to the additional terms and conditions set forth in Appendix A to the Award Terms and to any special terms and conditions for the Participant's country set forth in Appendix B to the Award Terms. Further, Appendices C and D include information for European Union / European Economic Area Participants. Moreover, if the Participant relocates outside the United States or relocates between the countries included in Appendix B, the additional terms and conditions set forth in Appendix A and the special terms and conditions for such country set forth in Appendices B, C and D will apply to the Participant, to the extent the Company determines that the application of such terms and conditions is necessary or advisable for legal or administrative reasons. The Appendices constitute part of the Award Terms.

23. *Imposition of Other Requirements*. The Company reserves the right to impose other requirements on the Participant's participation in the Plan, on the Special Retention Award and on any Shares acquired under the Plan, to the extent the Company determines it is necessary or advisable for legal or administrative reasons, and to require the Participant to sign any additional agreements or undertakings that may be necessary to accomplish the foregoing.

24. *Compliance with Code Section 409A*. It is intended that the Special Retention Award granted pursuant to the Award Terms be compliant with (or exempt from) Section 409A of the Code and the Award Terms shall be interpreted, construed and operated to reflect this intent. Notwithstanding the foregoing, the Award Terms and the Plan may be amended at any time, without the consent of any party, to the extent necessary or desirable to satisfy any of the requirements under Section 409A of the Code, but the Company shall not be under any obligation to make any such amendment. Further, the Company and its Subsidiaries do not make any representation to the Participant that the Special Retention Award granted pursuant to the Award Terms satisfies the requirements of Section 409A of the Code,

and the Company and its Subsidiaries will have no liability or other obligation to indemnify or hold harmless the Participant or any other party for any tax, additional tax, interest or penalties that the Participant or any other party may incur in the event that any provision of the Award Terms or any amendment or modification thereof or any other action taken with respect thereto, is deemed to violate any of the requirements of Section 409A of the Code.

25. *Waiver*. A waiver by the Company of breach of any provision of the Award Terms shall not operate or be construed as a waiver of any other provision of the Award Terms, or of any subsequent breach by the Participant or any other Participant.

26. *No Advice Regarding Award*. The Company is not providing any tax, legal or financial advice, nor is the Company making any recommendations regarding the Participant's participation in the Plan, or the Participant's acquisition or sale of the underlying Shares. The Participant is hereby advised to consult with the Participant's own personal tax, legal and financial advisors regarding the Participant's participation in the Plan before taking any action related to the Plan.

27. *Governing Law and Venue*. As stated in the Plan, the Special Retention Award and the provisions of the Award Terms and all determinations made and actions taken thereunder, to the extent not otherwise governed by the laws of the United States, shall be governed by the laws of the State of Delaware, United States of America, without reference to principles of conflict of laws, and construed accordingly. The jurisdiction and venue for any disputes arising under, or any actions brought to enforce (or otherwise relating to), the Special Retention Award will be exclusively in the courts in the State of Delaware, including the Federal Courts located therein (should Federal jurisdiction exist).

28. *Electronic Delivery and Acceptance*. The Company may, in its sole discretion, decide to deliver any documents related to current or future participation in the Plan by electronic means. The Participant hereby consents to receive such documents by electronic delivery and agrees to participate in the Plan through an on-line or electronic system established and maintained by the Company or a third party designated by the Company.

29. *Entire Agreement*. The Award Terms and the Plan embody the entire understanding and agreement of the parties with respect to the subject matter hereof (including, without limitation, the obligations and understandings set forth in Section 15(e) of the Plan), and no promise, condition, representation or warranty, express or implied, not stated or incorporated by reference herein, shall bind either party hereto.

30. *Employment at Will*. Nothing in the Award Terms or the Plan provide the Participant with any right to continue in the Company's or any of its affiliates' employ for any period of specific duration or interfere with or otherwise restrict in any way the Participant's or the rights of the Company and its affiliates to terminate the Participant's service at any time for any reason, with or without cause, subject to applicable law. The Participant's status with the Company and its affiliates will accordingly remain at will.

31. *Amendments.* Except as otherwise provided herein or the Plan, these Award Terms may be amended or modified at any time by an instrument in writing signed by the parties hereto or by the Company without the consent of the Participant if such action would not materially impair the rights of the Participant under this Award.

Acceptance of Award

32. In accordance with Section 15(c) of the Plan (as in effect at the grant date), the Participant may reject the Special Retention Award by notifying the Company within 30 days of the grant date that he or she does not accept the Special Retention Award. The Participant's acceptance of the Special Retention Award constitutes the Participant's acceptance of and agreement with the Award Terms. Notwithstanding the foregoing, if required by the Company, the Participant will provide a signed copy of the Award Terms in such manner and within such timeframe as may be requested by the Company. The Company has no obligation to issue Shares to the Participant if the Participant does not accept the Special Retention Award.

APPENDIX A
TO THE ALCOA CORPORATION
2016 Stock Incentive Plan
Terms and Conditions for Special Retention Awards
For Non-U.S. Participants

This Appendix A contains additional (or, if so indicated, different) terms and conditions that govern the Special Retention Awards if the Participant resides and/or works outside of the United States. Capitalized terms used but not defined herein shall have the same meanings assigned to them in the Plan and the Terms and Conditions for Special Retention Awards (the "Terms and Conditions").

A. *Termination*. This provision supplements paragraph 3 of the Terms and Conditions.

The Company will determine when the Participant is no longer providing services for purposes of the Special Retention Awards (including whether the Participant may still be considered to be providing services while on a leave of absence).

B. *Responsibility for Taxes*. This provision replaces paragraph 6 of the Terms and Conditions (except to the extent that the Participant is a Section 16 Insider).

The Participant acknowledges that, regardless of any action taken by the Company or, if different, the Subsidiary that employs the Participant (the "Employer"), the ultimate liability for all income tax, social insurance, payroll tax, fringe benefits tax, payment on account or other tax-related items related to the Participant's participation in the Plan and legally applicable to the Participant ("Tax-Related Items") is and remains the Participant's responsibility and may exceed the amount actually withheld by the Company or the Employer. The Participant further acknowledges that the Company and/or the Employer (a) make no representations or undertakings regarding the treatment of any Tax-Related Items in connection with any aspect of these Special Retention Awards, including, but not limited to, the grant, vesting or settlement of Special Retention Awards, the subsequent sale of Shares acquired pursuant to the Special Retention Award and the receipt of any dividends or dividend equivalents; and (b) do not commit to and are under no obligation to structure the terms of the Special Retention Awards or any aspect of the Special Retention Awards to reduce or eliminate the Participant's liability for Tax-Related Items or achieve any particular tax result. The Participant shall not make any claim against the Company, the Employer or any other Subsidiary, or their respective board, officers or employees related to Tax-Related Items arising from this Award. Furthermore, if the Participant has become subject to tax in more than one jurisdiction, the Participant acknowledges that the Company and/or the Employer (or former employer, as applicable) may be required to withhold or account for Tax-Related Items in more than one jurisdiction.

Prior to any relevant taxable or tax withholding event, as applicable, the Participant will pay or make adequate arrangements satisfactory to the Company and/or the Employer to satisfy all Tax-Related Items. In this regard, the Participant authorizes the Company and/or the Employer, or their respective agents, at their discretion, to satisfy their withholding obligations with regard to all Tax-Related Items by: (i) requiring a cash payment from the Participant; (ii) withholding from the Participant's wages or other cash compensation paid to the Participant by the Company and/or the Employer, (iii) withholding from the proceeds of the sale of Shares acquired pursuant to the Special Retention Awards, either through a voluntary sale or through a mandatory sale arranged by the Company (on the Participant's behalf pursuant to this authorization without further consent); and/or (iv) withholding from the Shares subject to Special Retention Awards.

Depending on the withholding method, the Company may withhold or account for Tax-Related Items by considering applicable minimum statutory withholding rates or other applicable withholding rates, including maximum applicable rates, in which case the Participant may receive a refund of any over-withheld amount in cash (with no entitlement to the Share equivalent) or, if not refunded, the Participant may seek a refund from the local tax authorities. If the obligation for Tax-Related Items is satisfied by withholding in Shares, the Participant is deemed, for tax purposes, to have been issued the full number of Shares subject to the vested Special Retention Awards, notwithstanding that a number of the Shares is held back solely for the purpose of paying the Tax-Related Items.

Finally, the Participant shall pay to the Company and/or the Employer any amount of Tax-Related Items that the Company and/or the Employer may be required to withhold or account for as a result of the Participant's participation in the Plan that

cannot be satisfied by the means previously described. The Company may refuse to issue or deliver the Shares or the proceeds of the sale of Shares if the Participant fails to comply with his or her obligations in connection with the Tax-Related Items.

C. *Nature of Award.* In accepting the Special Retention Awards, the Participant acknowledges, understands and agrees that:

a. the Plan is established voluntarily by the Company, is discretionary in nature and may be modified, amended, suspended, or terminated by the Company at any time, to the extent permitted by the Plan;

b. this Special Retention Award is exceptional, voluntary and occasional and does not create any contractual or other right to receive future Special Retention Awards, or benefits in lieu of Special Retention Awards, even if Special Retention Awards have been granted in the past;

c. all decisions with respect to future Special Retention Awards or other Awards, if any, will be at the sole discretion of the Company;

d. this Special Retention Award and the Participant's participation in the Plan shall not create a right to, or be interpreted as forming an employment or service contract with the Company and shall not interfere with the ability of the Employer to terminate the Participant's employment contract (if any) at any time;

e. the Participant's participation in the Plan is voluntary;

f. this Special Retention Award and the Shares acquired under the Plan, and the income from and value of the same, are not intended to replace any pension rights or compensation;

g. this Special Retention Award and the Shares acquired under the Plan, and the income and value of same, are not part of normal or expected compensation or salary for any purposes, including, without limitation, calculating any severance, resignation, termination, redundancy, dismissal, end-of-service payments, bonuses, long-service awards, pension or retirement or welfare benefits or similar payments;

h. the future value of the Shares subject to the Special Retention Award is unknown, indeterminable and cannot be predicted with certainty;

i. no claim or entitlement to compensation or damages shall arise from the forfeiture of any portion of this Special Retention Award resulting from the Participant's termination of employment and/or service relationship (for any reason whatsoever, whether or not later found to be invalid or in breach of employment or other laws in the jurisdiction where the Participant is employed or otherwise rendering services, or the terms of his or her employment or service agreement, if any);

j. unless otherwise agreed with the Company, Special Retention Awards and the Shares acquired under the Plan, and the income from and value of same, are not granted as consideration for, or in connection with, the service the Participant may provide as a director of any Subsidiary;

k. unless otherwise provided in the Plan or by the Company in its discretion, this Special Retention Award and the benefits under the Plan evidenced by these Award Terms do not create any entitlement to have this Special Retention Award or any such benefits transferred to, or assumed by, another company nor to be exchanged, cashed out or substituted for, in connection with any corporate transaction affecting the Shares; and

l. neither the Company, the Employer nor any other Subsidiary shall be liable for any foreign exchange rate fluctuation between the Participant's local currency and the United States Dollar that may affect the value of the Special Retention Awards or of any amounts due to the Participant pursuant to the Special Retention Awards or the subsequent sale of any Shares acquired under the Plan.

D. ***Data Privacy. The following Data Privacy consent only applies to Participants located outside the EU. Participants located in the EU should review the GDPR Notice in Appendix D.***

The Participant hereby explicitly and unambiguously consents to the collection, use and transfer, in electronic or other form, of the Participant's personal data as described in these Award Terms and any other grant materials by and among, as applicable, the Company, the Employer and any other Subsidiary for the exclusive purpose of implementing, administering and managing the Participant's participation in the Plan.

The Participant understands that the Company and the Employer may hold certain personal information about the Participant, including, but not limited to, the Participant's name, home address and telephone number, email address, date of birth, social insurance number, passport or other identification number, salary, nationality, job title, any shares of stock or directorships held in the Company, details of all Special Retention Awards or any other entitlement to shares of stock awarded, canceled, exercised, vested, unvested or outstanding in the Participant's favor ("Data"), for the exclusive purpose of implementing, administering and managing the Plan.

The Participant understands that Data may be transferred to the Broker, or such additional or other stock plan service providers as may be selected by the Company, which are assisting the Company with the implementation, administration and management of the Plan. The Participant understands that the recipients of Data may be located in the United States or elsewhere, and that the recipients' country (e.g., the United States) may have different data privacy laws and protections than the Participant's country. The Participant understands that the Participant may request a list with the names and addresses of any potential recipients of Data by contacting the Participant's local human resources representative. The Participant authorizes the Company, the Broker and any other possible recipients which may assist the Company (presently or in the future) with implementing, administering and managing the Plan to receive, possess, use, retain and transfer Data, in electronic or other form, for the sole purpose of implementing, administering and managing the Participant's participation in the Plan. The Participant understands that Data will be held only as long as is necessary to implement, administer and manage the Participant's participation in the Plan. The Participant understands that the Participant may, at any time, view Data, request additional information about the storage and processing of Data, require any necessary amendments to Data or refuse or withdraw the consents herein, in any case without cost, by contacting in writing the Participant's local human resources representative. Further, the Participant understands that the Participant is providing the consents herein on a purely voluntary basis. If the Participant does not consent, or if the Participant later seeks to revoke the Participant's consent, the Participant's employment and career with the Employer will not be affected; the only consequence of refusing or withdrawing the Participant's consent is that the Company would not be able to grant this Special Retention Award or other Awards to the Participant or administer or maintain such Awards. Therefore, the Participant understands that refusing or withdrawing the Participant's consent may affect the Participant's ability to participate in the Plan. For more information on the consequences of the Participant's refusal to consent or withdrawal of consent, the Participant understands that the Participant may contact the Participant's local human resources representative.

E. *Language*. If the Participant has received these Award Terms, or any other document related to this Special Retention Award and/or the Plan translated into a language other than English and if the meaning of the translated version is different than the English version, the English version will control.

F. *Insider Trading Restrictions/Market Abuse Laws*. The Participant acknowledges that, depending on his or her country of residence, the Broker's country of residence, or where the Shares are listed, the Participant may be subject to insider trading restrictions and/or market abuse laws in applicable jurisdictions, which may affect his or her ability to accept, acquire, sell or attempt to sell or otherwise dispose of Shares or rights to Shares (*e.g.,* Special Retention Award), or rights linked to the value of Shares during such times as the Participant is considered to have "inside information" regarding the Company (as defined by applicable laws or regulations in the applicable jurisdictions). Local insider trading laws and regulations may prohibit the cancellation or amendment of orders the Participant placed before possessing inside information. Furthermore, the Participant may be prohibited from (i) disclosing the inside information to any third party including colleagues of the Participant (other than on a "need to know" basis) and (ii) "tipping" third parties or causing them otherwise to buy or sell securities. Any restrictions under these laws or regulations are separate from and in addition to any restrictions that may be imposed under any applicable Company insider trading policy. The Participant acknowledges that it is his or her responsibility to comply with any applicable restrictions, and the Participant should consult his or her personal advisor on this matter.

G. *Foreign Asset/Account Reporting Requirements, Exchange Controls and Tax Requirements*. The Participant acknowledges that his or her country may have certain foreign asset and/or account reporting requirements and exchange controls which may affect his or her ability to acquire or hold Shares under the Plan or cash received from participating in the Plan (including from any dividends received or sale proceeds arising from the sale of Shares) in a brokerage or bank account outside his or her country. The Participant understands that he or she may be required to report such accounts, assets or transactions to the tax or other authorities in his or her country. The Participant also may be required to repatriate sale proceeds or other funds received as a result of the Participant's participation in the Plan to his or her country through a designated bank or broker and/or within a certain time after receipt. The Participant acknowledges that it is his or her responsibility to be compliant with all such requirements, and that the Participant should consult his or her personal legal and tax advisors, as applicable, to ensure the Participant's compliance.

APPENDIX B
TO THE ALCOA CORPORATION
2016 Stock Incentive Plan
Terms and Conditions for Special Retention Awards
For Non-U.S. Participants

Capitalized terms used but not defined in this Appendix B have the meanings set forth in the Plan and the Terms and Conditions for Special Retention Awards (the "Terms and Conditions").

Terms and Conditions

This Appendix B includes special terms and conditions that govern Special Retention Awards if the Participant resides and/or works in one of the countries listed below.

If the Participant is a citizen or resident of a country other than the country in which the Participant is currently residing and/or working, or if the Participant transfers to another country after the grant of Special Retention Awards or is considered a resident of another country for local law purposes, the Committee shall, in its discretion, determine to what extent the special terms and conditions contained herein shall be applicable to the Participant.

Notifications

This Appendix B also includes information regarding exchange controls, tax and certain other issues of which the Participant should be aware with respect to participation in the Plan. The information is based on the securities, exchange control, tax and other laws in effect in the respective countries as of November 2021. Such laws are often complex and change frequently. As a result, the Company strongly recommends that the Participant not rely on the information in this Appendix B as the only source of information relating to the consequences of participation in the Plan because the information may be out of date at the time the Participant sells Shares acquired under the Plan.

In addition, the information contained herein is general in nature and may not apply to the Participant's particular situation and the Company is not in a position to assure the Participant of any particular result. Accordingly, the Participant should seek appropriate professional advice as to how the relevant laws in the Participant's country may apply to his or her situation.

Finally, if the Participant is a citizen or resident of a country other than the country in which the Participant currently works and/or resides, or if the Participant transfers to another country after the grant of the Special Retention Award, or is considered a resident of another country for local law purposes, the information contained herein may not be applicable to the Participant in the same manner.

Australia

Terms and Conditions

Australia Offer Document.

The grant of the Special Retention Award is intended to comply with the provisions of the Corporations Act, 2001, Australian Securities & Investments Commission ("ASIC") Regulatory Guide 49 and ASIC Class Order CO 14/1000. Additional details are set forth in the Offer Documents for the Special Retention Award to Australian resident employees, which is being provided to the Participant with the Award Terms.

Notifications

Exchange Control Information.

Exchange control reporting is required for cash transactions exceeding A$10,000 and for international fund transfers. If an Australian bank is assisting with the transaction, the bank will file the report on the Participant's behalf.

Tax Information.

The Plan is a plan to which Subdivision 83A-C of the Income Tax Assessment Act 1997 (Cth) applies (subject to conditions in the Act). The Restricted Share Units should satisfy the real risk of forfeiture test for deferral.

Belgium

Notifications

Stock Exchange Tax.

A stock exchange tax applies to transactions executed through a non-Belgian financial intermediary. The stock exchange tax will likely apply when Shares are sold. The Participant should consult with his or her personal tax advisor to determine the Participant's obligations with respect to the stock exchange tax.

Foreign Asset/Account Reporting Information.

Belgian residents are required to report any security (e.g., Shares acquired under the Plan) or bank account established outside of Belgium on their annual tax return. In a separate report, Belgian residents are also required to provide the National Bank of Belgium with certain details regarding such foreign accounts (including the account number, bank name and country in which any such account was opened). The forms to complete this report are available on the website of the National Bank of Belgium. Belgian residents should consult with their personal tax advisors to determine their personal reporting obligations.

Brazil

Terms and Conditions

Compliance with Law.

By accepting the Special Retention Award, the Participant acknowledges that he or she agrees to comply with applicable Brazilian laws and to pay any and all applicable taxes associated with the vesting of Special Retention Awards, the sale of the Shares acquired under the Plan and the receipt of any dividends or dividend equivalents.

Acknowledgement of Nature of the Grant.

This provision supplements paragraph C "Nature of Award" of Appendix A.

By accepting the Special Retention Awards, the Participant agrees that he or she is making an investment decision, the Shares will be issued to the Participant only if the vesting conditions are met and any necessary services are rendered by the Participant over the vesting period, and the value of the underlying Shares is not fixed and may increase or decrease in value over the vesting period without compensation to the Participant.

Notifications

Exchange Control Information.

If the Participant is a resident of or domiciled in Brazil, he or she will be required to submit an annual declaration of assets and rights held outside of Brazil to the Central Bank of Brazil if the aggregate value of the assets and rights is equal to or greater than US$1,000,000. If such amount exceeds US$100,000,000, the declaration must be submitted quarterly. Assets and rights that must be reported include Shares acquired under the Plan. Foreign individuals holding Brazilian visas are considered Brazilian residents for purposes of this reporting requirement and must declare at least the assets held abroad that were acquired subsequent to the date of admittance as a resident of Brazil.

Tax on Financial Transactions (IOF).

Repatriation of funds (*e.g.*, sale proceeds) into Brazil and the conversion of USD into BRL associated with such fund transfers may be subject to the Tax on Financial Transactions. It is the Participant's responsibility to comply with any applicable Tax on Financial Transactions arising from the Participant's participation in the Plan. The Participant should consult with his or her personal tax advisor for additional details.

Canada

Terms and Conditions

Payment.

Notwithstanding anything to the contrary in paragraphs 2 and 5 of the Terms and Conditions, any vested Special Retention Award will be paid to the Participant by no later than the end of the calendar year in which the vesting date specified in paragraph 2 occurs (*i.e*., by the end of the calendar year in which the third anniversary of the grant date occurs).

Notwithstanding anything to the contrary in the Terms and Conditions, a Participant will receive one Share upon the vesting and payment of a Restricted Share Unit. Notwithstanding paragraph 4 of the Terms and Conditions, the Company shall not have discretion to substitute a cash payment in lieu of Shares.

Further, in no event will the Restricted Share Units carry any right to receive payment of any dividend equivalents in cash. To the extent the Board of Directors authorizes that dividend equivalents be accrued and paid on vesting of Restricted Share Units, such dividend equivalents shall be paid in such whole number of Shares with a fair market value at the time the Restricted Share Units vest equal to the amount of dividend equivalents accrued on the Restricted Share Units at that time. Any fractional Shares attributable to dividend equivalents shall be rounded down to the nearest whole Share, and the Participant shall not be entitled to any consideration for such fractional Shares, or any other amount in respect of the accrued dividend equivalents.

Withholding.

Notwithstanding anything to the contrary in the Terms and Conditions, the number of Shares otherwise required to be issued to a Participant on vesting and payment of a Restricted Share Unit shall not be reduced to satisfy the payment of Tax Obligations, except for at the election of a Participant, in the Participant's sole discretion. A Participant who is not a Section 16 Insider shall be permitted to make such an election only if the Company has established procedures for doing so.

Termination of Service.

The following provision replaces paragraph A "Termination" of Appendix A.

For purposes of the Special Retention Award, the Participant's employment relationship will be considered terminated (regardless of the reason for such termination and whether or not later found to be invalid or in breach of Canadian laws or the terms of the Participant's employment agreement, if any) effective as of the date that is the earlier of (i) the date the Participant receives notice of termination, or (ii) the date the Participant is no longer actively providing service (the "Termination Date"), except, in either case, to the extent applicable employment standards legislation requires the Special Retention Award to continue through any minimum termination notice period applicable under the legislation. In such case, the Termination Date will be the last day of the Participant's minimum statutory termination notice period.

Unless otherwise expressly provided in these Award Terms or determined by the Company, or explicitly required by applicable legislation, the Participant's right to vest in the Special Retention Awards, if any, will terminate on the Termination Date and the Participant will not earn or be entitled to (i) any pro-rated vesting for that period of time before the Termination Date, (ii) any portion of the Special Retention Award that is thereby forfeited upon termination, or (iii) any payment of damages in lieu thereof. Unless otherwise expressly provided in these Award Terms or determined by the Company, there shall be no vesting of the Special Retention Award during any applicable common law or civil law reasonable notice period following the Termination Date or any payment of damages in lieu thereof. Subject to application legislation, in the event the Termination Date cannot be reasonably determined under the terms of the Award Terms and/or the Plan, the Committee shall have the exclusive discretion to determine the Termination Date for purposes of the Special Retention Award (including whether the Participant may still be considered to be providing services while on a leave of absence).

The following provision supplements section C "Nature of Award" of Appendix A:

Subsections C(b), C(g) and C(i) of this Appendix A are subject to such explicit and minimal requirements set forth under local employment standards or pension-related legislation.

The Following Provisions Apply for Participants Resident in Quebec:

Consent to Receive Information in English.

The Participant acknowledges that it is the express wish of the parties that these Award Terms, as well as all documents, notices and legal proceedings entered into, given or instituted pursuant hereto or relating directly or indirectly hereto, be written in English.

Les parties reconnaissent avoir exigé la rédaction en anglais de Conditions d'attribution, ainsi que de tous documents, avis et procédures judiciaires, exécutés, donnés ou intentés en vertu de, ou liés directement ou indirectement à, la présente convention.

Authorization to Release and Transfer Necessary Personal Information. The following provision supplements paragraph D "Data Privacy" of Appendix A.

The Participant hereby authorizes the Company and the Company's representatives to discuss with and obtain all relevant information from all personnel, professional or not, involved in the administration and operation of the Plan. The Participant further authorizes the Company, any Subsidiary and the administrator of the Plan to disclose and discuss the Plan with their advisors. The Participant further authorizes the Company and any Subsidiary to record such information and to keep such information in the Participant's Employee file.

Notifications

Securities Law Information.

The Participant acknowledges that he or she is permitted to sell the Shares acquired under the Plan through the Broker, provided the sale of the Shares takes place outside of Canada through facilities of a stock exchange on which the Shares are listed (*i.e.*, the NYSE).

Foreign Asset/Account Reporting Information.

Canadian residents are required to report to the tax authorities any foreign property held outside of Canada (including Special Retention Awards and Shares acquired under the Plan) annually on form T1135 (Foreign Income Verification Statement) if the total cost of the foreign property exceeds C$100,000 at any time in the year. The form must be filed by April 30 of the following year. Special Retention Awards must be reported--generally at a nil cost--if the C$100,000 cost threshold is exceeded because of other foreign property the Participant holds. If Shares are acquired, their cost generally is the adjusted cost base ("ACB") of the Shares. The ACB would normally equal the fair market value of the Shares at vesting, but if the Participant owns other Shares, this ACB may have to be averaged with the ACB of the other Shares. The Participant should consult with his or her personal legal advisor to ensure compliance with applicable reporting obligations.

China

Terms and Conditions

The following terms and conditions will apply to Participants who are subject to exchange control restrictions and regulations in the People's Republic of China ("PRC"), including the requirements imposed by the State Administration of Foreign Exchange ("SAFE"), as determined by the Company in its sole discretion:

Termination of Employment.

Due to exchange control laws in PRC, the Participant agrees that the Company reserves the right to require the sale of any Shares acquired at vesting of the Special Retention Awards upon the termination of the Participant's employment for any reason. If the Company, in its discretion, does not exercise its right to require the automatic sale of Shares issuable upon vesting of the Special Retention Awards, as described in the preceding sentence, the Participant understands and agrees that any Shares acquired by the Participant under the Plan, must be sold no later than six (6) months after termination of the Participant's employment, or within any other such time frame as permitted by the Company or required by SAFE. The Participant understands that any Shares acquired under the Plan that have not been sold within six (6) months of the Participant's termination of employment will be automatically sold by a designated broker at the Company's discretion, pursuant to this authorization by the Participant.

The Participant agrees that the Company is authorized to instruct its designated broker to assist with the mandatory sale of such Shares (on the Participant's behalf, pursuant to this authorization) and the Participant expressly authorizes the Company's designated broker to complete the sale of such Shares. The Participant also agrees to sign any agreements, forms, and/or consents that may be reasonably requested by the Company (or the designated broker) to effectuate the sale of the Shares (including, without limitation, as to the transfers of the proceeds and other exchange control matters noted below) and shall otherwise cooperate with the Company with respect to such matters, provided that the Participant shall not be permitted to exercise any influence over how, when or whether the sales occur. The Participant acknowledges that the Company's designated broker is under no obligation to arrange for the sale of the Shares at any particular price. Due to fluctuations in the Share price and/or applicable exchange rates between vesting and (if later) the date on which the Shares are sold, the amount of proceeds ultimately distributed to the Participant may be more or less than the market value of the Shares upon vesting (which is the amount relevant to determining the Participant's liability for Tax-Related Items). The Participant understands and agrees that the Company is not responsible for the amount of any loss the Participant may incur and the Company assumes no liability for any fluctuations in the Share price and/or any applicable exchange rate.

Upon the sale of the Shares, the Company agrees to pay the cash proceeds from the sale (less any Tax-Related Items, brokerage fees or commissions) to the Participant in accordance with the applicable exchange control laws and regulations, including but not limited to the restrictions as set forth in this Appendix B for China below under "Exchange Control Restrictions."

Exchange Control Restrictions.

The Participant understands and agrees that, pursuant to local exchange control requirements, the Participant will be required to immediately repatriate any cash payments or proceeds obtained with respect to participation in the Plan to the PRC. The Participant further understands that such repatriation of any cash payments or proceeds may need to be effectuated through a special exchange control account established by the Company or any Subsidiary, and the Participant hereby consents and agrees that any payment or proceeds may be transferred to such special account prior to being delivered to the Participant.

Any payment or proceeds may be paid to the Participant in U.S. dollars or local currency at the Company's discretion. If the payments or proceeds are paid to the Participant in U.S. dollars, the Participant will be required to set up a U.S. dollar bank account in the PRC (if the Participant does not already have one) so that the payments or proceeds may be deposited into this account. If the payments or proceeds are paid to the Participant in local currency, the Company is under no obligation to secure any particular exchange conversion rate and the Company may face delays in converting the payments or proceeds to local currency due to exchange control restrictions. The Participant agrees to bear any currency exchange conversion rate fluctuation risk between the time the cash proceeds are received and the time the cash proceeds are distributed to the Participant through the special account described above.

The Participant further agrees to comply with any other requirements that may be imposed by the Company in the future to facilitate compliance with exchange control requirements in the PRC.

Hungary

There are no country-specific provisions.

Iceland

There are no country-specific provisions.

Italy

Terms and Conditions

Plan Document Acknowledgement.

By accepting the Special Retention Award, the Participant acknowledges that the Participant has received a copy of the Plan and the Award Terms and has reviewed the Plan and the Award Terms, including the Appendices, in their entirety and fully understands and accepts all provisions of the Plan and the Award Terms, including the Appendices. The Participant further acknowledges that the Participant has read and specifically and expressly approves the following paragraphs of the Award Terms: paragraphs 2-5: Vesting and Payment; paragraph 15: Repayment and Forfeiture; paragraph 16: Stock Exchange Requirements and Applicable Laws; paragraph 20: Severability and Judicial Modification; paragraph 22: Appendices;

paragraph 23: Imposition of Other Requirements; paragraph 27: Governing Law and Venue; paragraph A of Appendix A: Termination; Appendix D: GDPR Notice.

Notifications

Foreign Asset/Account Reporting Information.

Italian residents who, during the fiscal year, hold investments abroad or foreign financial assets (*e.g.*, cash, Shares) which may generate income taxable in Italy are required to report such on their annual tax returns (UNICO form, RW Schedule) or on a special form if no tax return is due. The same reporting obligations apply to Italian residents who, even if they do not directly hold investments abroad or foreign financial assets (*e.g.*, cash, Shares), are beneficial owners of the investment pursuant to Italian money laundering provisions. The Participant should consult with his or her personal tax advisor to ensure compliance with the applicable reporting obligations.

Tax on Foreign Financial Assets.

The value of the financial assets held outside of Italy by Italian residents is subject to a foreign asset tax at an annual rate of 2 per thousand (0.2%). The taxable amount will be the fair market value of the financial assets (including Shares) assessed at the end of the calendar year and is subject to pro-ration for the portion of the year that the Participant holds the Shares received at vesting.

Netherlands

There are no country-specific provisions.

Norway

There are no country-specific provisions.

Saudi Arabia

Notifications

Securities Law Information.

This document may not be distributed in the Kingdom of Saudi Arabia except to such persons as permitted under the Offers of Securities Regulations issued by the Capital Market Authority.The Capital Market Authority does not make any representation as to the accuracy or completeness of this document, and expressly disclaims any liability whatsoever for any loss arising from, or incurred in reliance upon, any part of this document. The Participant should conduct his or her own due diligence on the accuracy of the information relating to the Special Retention Awards and the underlying Shares. The Participant should consult with his or her authorized financial advisor in this regard.

Singapore

Terms and Conditions

Sale Restriction.

The Participant agrees that any Shares received upon vesting will not be offered for sale or sold in Singapore prior to the six-month anniversary of the grant date, unless such sale or offer is made pursuant to the exemption under Part XIII Division (1) Subdivision (4) (other than Section 280) of the Securities and Futures Act (Chapter 289, 2006 Ed.) ("SFA").

Notifications

Securities Law Information.

The grant of the Special Retention Awards is being made in reliance on the "Qualifying Person" exemption under section 273(1)(f) of the SFA under which it is exempt from the prospectus and registration requirements under the SFA and the grant

of the Special Retention Awards is not made to the Participant with a view to the Shares being subsequently offered for sale to any other party. The Plan has not been lodged or registered as a prospectus with the Monetary Authority of Singapore.

Director Notification Obligation.

Directors, associate directors or shadow directors of a Singapore Subsidiary are subject to certain notification requirements under the Singapore Companies Act. Specifically, such directors must notify the Singapore Subsidiary in writing of an interest (*e.g.*, Special Retention Awards, Shares, etc.) in the Company or any related company within two business days of (i) its acquisition or disposal, (ii) any change in a previously-disclosed interest (*e.g.*, upon vesting of Special Retention Awards or when Shares acquired under the Plan are subsequently sold), or (iii) becoming a director.

Spain

Terms and Conditions

No Entitlement for Claims or Compensation. The following provisions supplement paragraph A "Termination" of Appendix A.

By accepting the Special Retention Award, the Participant consents to participation in the Plan and acknowledges that Participant has received a copy of the Plan.

The Participant understands and agrees that, as a condition of the grant of the Special Retention Award, if the Participant's employment terminates, unless otherwise provided in the Award Terms or by the Company, any unvested Special Retention Awards shall be forfeited without entitlement to the underlying Shares or to any amount as indemnification in the event of a termination, including, but not limited to: resignation, disciplinary dismissal adjudged to be with cause, disciplinary dismissal adjudged or recognized to be without cause, individual or collective layoff on objective grounds, whether adjudged to be with cause or adjudged or recognized to be without cause, material modification of the terms of employment under Article 41 of the Workers' Statute, relocation under Article 40 of the Workers' Statute, Article 50 of the Workers' Statute, unilateral withdrawal by the Employer, and under Article 10.3 of Royal Decree 1382/1985.

The Participant understands that the Company has unilaterally, gratuitously and in its sole discretion decided to grant Special Retention Awards under the Plan to individuals who may be Employees of the Company or a Subsidiary. The decision is limited and entered into based upon the express assumption and condition that any Special Retention Awards will not economically or otherwise bind the Company or any Subsidiary, including the Employer, on an ongoing basis, other than as expressly set forth in the Award Terms. Consequently, the Participant understands that the Special Retention Awards are granted on the assumption and condition that the Special Retention Awards shall not become part of any employment or service agreement (whether with the Company or any Subsidiary, including the Employer) and shall not be considered a mandatory benefit, salary for any purpose (including severance compensation) or any other right whatsoever. Furthermore, the Participant understands and freely accepts that there is no guarantee that any benefit whatsoever shall arise from the grant of Special Retention Awards, which is gratuitous and discretionary, since the future value of the Special Retention Awards and the underlying Shares is unknown and unpredictable. The Participant also understands that the grant of Special Retention Awards would not be made but for the assumptions and conditions set forth hereinabove; thus, the Participant understands, acknowledges and freely accepts that, should any or all of the assumptions be mistaken or any of the conditions not be met for any reason, the Special Retention Award and any right to the underlying Shares shall be null and void.

Notifications

Securities Law Information.

No "offer of securities to the public", as defined under Spanish law, has taken place or will take place in the Spanish territory with respect to the Special Retention Award. No public offering prospectus has been nor will be registered with the Comisión Nacional del Mercado de Valores (Spanish Securities Exchange Commission) ("CNMV"). Neither the Plan nor the Award Terms constitute a public offering prospectus and they have not been, nor will they be, registered with the CNMV.

Exchange Control Information.

The Participant may be required to declare electronically to the Bank of Spain any securities accounts (including brokerage accounts held abroad), any foreign instruments (*e.g.*, Shares) and any transactions with non-Spanish residents (including any payments of cash or Shares made to the Participant by the Company or Broker) if the balances in such accounts together with

the value of such instruments as of December 31, or the volume of transactions with non-Spanish residents during the prior or current year, prior tax year exceed €1,000,000. Once the €1,000,000 threshold has been surpassed in either respect, the Participant will generally be required to report all of his or her foreign accounts, foreign instruments and transactions with non-Spanish residents, even if the relevant threshold has not been crossed for an individual item.

Share Reporting Information.

It is the Participant's responsibility to declare the acquisition, ownership and disposition of Shares to the Spanish Direccion General de Comercio e Inversiones (the "DGCI") of the Ministry of Economy and Competitiveness on a Form D-6. Generally, the declaration must be made in January for Shares owned as of December 31 of the prior year and/or shares acquired or disposed of during the prior year; however, if the value of the Shares acquired or disposed of or the amount of the sale proceeds exceeds a designated threshold, the declaration must be filed within one month of the acquisition or disposition, as applicable. The Participant should consult with his or her personal advisor to determine the Participant's obligations in this respect.

Foreign Asset/Account Reporting Information.

To the extent that the Participant holds Shares and/or has bank accounts outside Spain with a value in excess of €50,000 (for each type of asset) as of December 31, the Participant will be required to report information on such assets on his or her tax return (tax form 720) for such year. After such Shares and/or accounts are initially reported, the reporting obligation will apply for subsequent years only if the value of any previously-reported Shares or accounts increases by more than €20,000 or if the Participant sells or otherwise disposes of any previously-reported Shares or accounts.

Suriname

There are no country-specific provisions.

Switzerland

Notifications

Securities Law Information.

Neither this document nor any other materials relating to the Special Retention Award (i) constitute a prospectus according to articles 35 et seq. of the Swiss Federal Act on Financial Services (FinSA), (ii) may be publicly distributed nor otherwise made publicly available in Switzerland to any person other than an Employee of the Company or other Participant or (iii) has been or will be filed with, approved or supervised by any Swiss reviewing body according to article 51 FinSA or any Swiss regulatory authority, including the Swiss Financial Market Supervisory Authority (FINMA).

Exhibit 21.1

SUBSIDIARIES OF THE REGISTRANT

Name	State or Country of Organization
Alcoa Alumínio S.A.	Brazil
Alcoa Australian Holdings Pty Ltd	Australia
Alcoa Nederland Holding B.V.	Netherlands
Alcoa of Australia Limited[1]	Australia
Alcoa USA Corp.	Delaware
Alcoa USA Holding Company	Delaware
Aluminerie Lauralco S.À.R.L.	Luxembourg

The names of particular subsidiaries have been omitted because, considered in the aggregate as a single subsidiary, they would not constitute, as of the end of the year covered by this report, a "significant subsidiary" as defined in Regulation S-X under the Securities Exchange Act of 1934, as amended.

[1] Part of the AWAC joint venture.

Exhibit 23.1

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We hereby consent to the incorporation by reference in the Registration Statement on Form S-8 (Nos. 333-214420, 333-214423, 333-218038, and 333-228258) of Alcoa Corporation of our report dated February 24, 2022 relating to the financial statements and the effectiveness of internal control over financial reporting, which appears in this Form 10-K.

/s/ PricewaterhouseCoopers LLP

PricewaterhouseCoopers LLP
Pittsburgh, Pennsylvania
February 24, 2022

SLR International Corporation
22118 20th Ave SE, Suite G202, Bothell, WA 98021 USA

February 24, 2022

CONSENT OF QUALIFIED PERSON

Re: Form 10-K of Alcoa Corporation (the "Company")

SLR International Corporation ("**SLR**"), in connection with the Company's Annual Report on Form 10-K for the year ended December 31, 2021 (the "**Form 10-K**"), consents to:

- the public filing by the Company and use of the technical report summaries titled "Technical Report Summary for Darling Range, Western Australia" and "Technical Report Summary for Juruti, Brazil" (the "**Technical Report Summaries**"), each with an effective date of December 31, 2021 and dated February 24, 2022, that were prepared in accordance with Subpart 1300 of Regulation S-K promulgated by the U.S. Securities and Exchange Commission, as exhibits to and referenced in the Form 10-K;

- the incorporation by reference of the Technical Report Summaries into the Company's Registration Statements on Form S-8 (Nos. 333-214420, 333-214423, 333-218038, and 333-228258) (collectively, the "**Registration Statements**");

- the use of and references to our name, including our status as an expert or "qualified person" (as defined in Subpart 1300 of Regulation S-K promulgated by the U.S. Securities and Exchange Commission), in connection with the Form 10-K, the Registration Statements, and the Technical Report Summaries; and

- any extracts from or a summary of the Technical Report Summaries in the Form 10-K and incorporated by reference in the Registration Statements and the use of any information derived, summarized, quoted, or referenced from the Technical Report Summaries, or portions thereof, that was prepared by us, that we supervised the preparation of, and/or that was reviewed and approved by us, that is included or incorporated by reference in the Form 10-K and the Registration Statements.

SLR is responsible for authoring, and this consent pertains to, the Technical Report Summaries. SLR certifies that it has read the Form 10-K and that it fairly and accurately represents the information in the Technical Report Summaries for which it is responsible.

SLR International Corporation

Per:

/s/ Richard J. Lambert

Richard J. Lambert, P.E., P.Eng.
Global Technical Director
Technical Director, Mining Advisory US

Exhibit 31.1

CERTIFICATIONS

I, Roy C. Harvey, certify that:

1. I have reviewed this annual report on Form 10-K of Alcoa Corporation;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:
    (a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
    (b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;
    (c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
    (d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):
    (a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and
    (b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: February 24, 2022

/s/ Roy C. Harvey

Name: Roy C. Harvey
Title: President and
Chief Executive Officer

Exhibit 31.2

CERTIFICATIONS

I, William F. Oplinger, certify that:

1. I have reviewed this annual report on Form 10-K of Alcoa Corporation;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:
    (a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
    (b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;
    (c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
    (d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):
    (a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and
    (b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: February 24, 2022

/s/ William F. Oplinger

Name: William F. Oplinger
Title: Executive Vice President and
Chief Financial Officer

Exhibit 32.1

CERTIFICATION PURSUANT TO
18 U.S.C. SECTION 1350
AS ADOPTED PURSUANT TO
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

In connection with the Annual Report of Alcoa Corporation (the "Company") on Form 10-K for the period ended December 31, 2021 as filed with the Securities and Exchange Commission on the date hereof (the "Report"), the undersigned, in the capacity and on the date indicated below, hereby certifies pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that to his knowledge:

1. The Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and
2. The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Date: February 24, 2022

/s/ Roy C. Harvey
Roy C. Harvey
President and Chief Executive Officer

A signed original of this written statement required by Section 906, or other document authenticating, acknowledging, or otherwise adopting the signature that appears in typed form within the electronic version of this written statement required by Section 906, has been provided to the Company and will be retained by the Company and furnished to the Securities and Exchange Commission or its staff upon request.

The foregoing certification is being furnished solely pursuant to 18 U.S.C. Section 1350 and is not being filed as part of this report.

Exhibit 32.2

CERTIFICATION PURSUANT TO
18 U.S.C. SECTION 1350
AS ADOPTED PURSUANT TO
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

In connection with the Annual Report of Alcoa Corporation (the "Company") on Form 10-K for the period ended December 31, 2021 as filed with the Securities and Exchange Commission on the date hereof (the "Report"), the undersigned, in the capacity and on the date indicated below, hereby certifies pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that to his knowledge:

1. The Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and
2. The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Date: February 24, 2022

/s/ William F. Oplinger
William F. Oplinger
Executive Vice President and
Chief Financial Officer

A signed original of this written statement required by Section 906, or other document authenticating, acknowledging, or otherwise adopting the signature that appears in typed form within the electronic version of this written statement required by Section 906, has been provided to the Company and will be retained by the Company and furnished to the Securities and Exchange Commission or its staff upon request.

The foregoing certification is being furnished solely pursuant to 18 U.S.C. Section 1350 and is not being filed as part of this report.

Exhibit 95.1

Mine Safety Disclosure

Until recently, Alcoa Corporation's alumina refinery in Point Comfort, Texas, was subject to regulation by the Mine Safety and Health Administration (MSHA) under the U.S. Federal Mine Safety and Health Act of 1977 (the "Mine Act"). The MSHA inspected this facility on a regular basis and issued various citations and orders when it believed a violation had occurred under the Mine Act.

In December 2019, Alcoa announced that the facility was being permanently closed. During the first quarter of 2020, MSHA notified Alcoa that it would no longer exercise jurisdiction over the facility. Following this notice, Alcoa no longer had any facilities subject to regulation by MSHA.

As of December 31, 2021, Alcoa had no matters pending before the Federal Mine Safety and Health Review Commission (the "Commission"), an independent adjudicative agency that provides administrative trial and appellate review of legal disputes arising under the Mine Act. In the first quarter of 2021, the Company closed its lone remaining matter concerning a retaliation complaint filed by an employee in 2015. On December 17, 2017, this matter was dismissed by an Administrative Law Judge after a trial on the merits. On January 22, 2020, the Commission affirmed the trial judgment. On February 21, 2020, the employee appealed the decision to the United States Court of Appeals for the District of Columbia, where the matter was denied further review by the Court in March of 2021.

Technical Report Summary on the Darling Range, Western Australia S-K 1300 Report

Alcoa Corporation

SLR Project No: 425.01184.00071

February 24, 2022



Technical Report Summary on the Darling Range, Western Australia

SLR Project No: 425.01184.00071

Prepared by
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for

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Effective Date – December 31, 2021
Signature Date - February 24, 2022

Distribution: 1 copy – Alcoa Corporation
1 copy – SLR International Corporation
1 copy – SLR Consulting Ltd

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2.0 EXECUTIVE SUMMARY

2.1 Summary

SLR International Corporation (SLR) was appointed by Alcoa Corporation (Alcoa) to prepare an independent Technical Report Summary on the Darling Range bauxite mines, located in Western Australia. The purpose of this report is to support the Mineral Resource and Mineral Reserve estimates for the mines as of December 31, 2021. This Technical Report Summary (TRS) conforms to the United States Securities and Exchange Commission's (SEC) Modernized Property Disclosure Requirements for Mining Registrants as described in Subpart 1300 of Regulation S-K, Disclosure by Registrants Engaged in Mining Operations (S-K 1300), and Item 601(b)(96) of Regulation S-K, Technical Report Summary.

2.1.1 Conclusions

2.1.1.1 Geology and Mineral Resources

- SLR is independently declaring the 31 December 2021 Mineral Resources for the defined bauxites located within Alcoa's Darling Range deposits. The Mineral Resource models were prepared by Alcoa using their in-house estimation procedures and reviewed extensively by SLR.
- As of December 31, 2021, exclusive of Mineral Reserves, as summarized in Table 11-4 at an appropriate level of precision reflecting confidence, the Measured Mineral Resources are estimated to be 48.0 Mt at a grade of 32.9% available alumina ($A.Al_2O_3$) and 1.11% reactive silica ($R.SiO_2$). Similarly the Indicated Mineral Resources are estimated to be 34.8 Mt at 31.9% $A.Al_2O_3$ and 1.12% $R.SiO_2$, and the Inferred Mineral Resources are estimated to be 320 Mt at 33.0% $A.Al_2O_3$ and 1.2% $R.SiO_2$.
- SLR considers that, because of the integrated process by which Measured and Indicated Mineral Resources translate to Mineral Reserves for Alcoa's Darling Range operation, there are no foreseeable risks associated with Modifying Factors (mining, processing, metallurgical, infrastructure, economic, marketing, legal, environment, social, or government) that materially affect the Mineral Reserve estimate at 31 December 2021.

Specific conclusions reached by the SLR QP and provided in the body of this report in Sections 6, 7, 8. 9, and 11 are aggregated here as follows:

- In the SLR QP's opinion, the drill sampling and sample control procedures at Alcoa's Darling Range Bauxite Operations are adequate and appropriate for use in the estimation of Mineral Resources. The defined volumes and grades of mineralization are not expected to be systematically impacted (biased) by errors in either the collar location or the 3D sample location.
- In the opinion of the SLR QP, the QA/QC of sample preparation and assaying is adequate and the assay results are suitable for use in Mineral Resource estimation.
- It is the opinion of the SLR QP that the analytical procedures used for the Alcoa Mineral Resource comprises part of conventional industry practice. FTIR is not widely used yet in the bauxite industry but is becoming more widely accepted and applied to more operations. At Alcoa the method has been consistently applied successfully for a decade and is routinely validated by industry standard XRF and wet chemical procedures as discussed in Section 8.3 and 8.4.

- It is the opinion of the SLR QP from the studies on FTIR repeatability discussed above that the overall precision and accuracy of the FTIR assaying is acceptable..
- The SLR QP is of the opinion that the database is adequate and the data is appropriate for the purpose of Mineral Resource estimation.
- In SLR's opinion the dry bulk density data is less well controlled than other analytes, but the long history of mining production and stockpile reconciliation means that the assumed values are adequate for resource estimation.
- In the SLR QP's opinion, the condition of Reasonable Prospects For Economic Extraction is met by constraining the Mineral Resource model using the ArcGIS system, by ensuring that the model defines key parameters for the refinery, and by sound reconciliation practices providing feedback at the modelling is appropriate for the purpose.

2.1.1.2 Mining and Mineral Reserves

- As of December 31, 2021, Proven Mineral Reserves are estimated to total 108.6 Mt at 32.4% A.Al_2O_3 and 1.01% R.SiO_2 and Probable Mineral Reserves are estimated to total 132.7 Mt at 32.2% A.Al_2O_3 and 1.38% R.SiO_2.
- SLR has used the December 31, 2021 Mineral Resource estimate as the basis for its Mineral Reserve estimate. The bauxite operations are operating mining projects with a long history of production for which establishment capital has been repaid and for which sustaining capital and supported operating costs have been observed to be applied in economic analysis. Consequently, the QP considers that support by a Feasibility Study is demonstrated by the demonstrable history of profitable operation and the level of technical support for the Modifying Factors. The QP has reviewed the operating and planning procedures and parameters for the operations.
- The QP considers that the accuracy and confidence in the Mineral Reserve estimate to be appropriate for the classification applied, which is supported by both the conservative operational processes and the long operational history.
- The QP is not aware of any risk factors associated with, or changes to, any aspects of the Modifying Factors such as mining, metallurgical, infrastructure, permitting, or other relevant factors that could materially affect the Mineral Reserve estimate.

2.1.1.3 Mineral Processing

- The operating data between 2010 to 2020 indicates that the product from the Darling Range operations consisted of an average A.Al_2O_3 grade of 33%, with R.SiO_2 below the target for refinery feed.
- SLR is of the opinion that the Darling range operation demonstrated that ore can be effectively crushed and supplied to a refinery for further upgrading to produce Alumina. The historical operational data confirmed that the ore consistently met refinery specifications without any deleterious elements.
    - Based on this, and additional information provided by Alcoa regarding the mine plan, it is reasonable to assume that the ore from Darling range can be economically processed for the next 10 years.

2.1.1.4 Infrastructure

- The Darling Range mining operations have established and operational infrastructure, with mining hubs that host administrative offices, as well as crushing facilities and maintenance facilities.
    - Hubs are relocated periodically as production moves away from the hub and transportation costs increase. These relocations are well-understood with planning and associated budgeting occurring well in advance of relocations; production restarted seven days after the shutdown.
- An extensive haul road network, rail, and overland conveyors transport crushed bauxite from the Hub to the refineries.
    - Bauxite is transferred from each mine to the refineries primarily via long distance conveyor belt, apart from the Kwinana refinery which receives bauxite via railway. The
    - Alumina produced by the three refineries is then shipped to external and internal smelter customers through the Kwinana and Bunbury ports.
- The Huntly and Willowdale mines are located near the towns of Pinjarra and Waroona respectively. These are easily accessible via the national South Western Highway, a sealed single carriageway road, spanning almost 400 km from the southern side of Perth to the southwest corner of Western Australia.
- Major haul roads have been established to each mining area, while secondary haul roads, cross-cut each individual mining plateau. Roads are unsealed and require continuous maintenance.
- The Darling Range's Pinjarra refinery receives power from the South West Interconnected System (SWIS), but also has internal generation capacity of 100 MW from four steam driven turbine alternators, with steam produced by gas fired boilers and a gas turbine Heat Recovery Steam Generator (HRSG).
    - The refinery supplies power to the Huntly Mine by a 33,000 volt power supply line and two 13,800 volt lines.
- The Wagerup refinery is a net exporter of power to the SWIS, with internal generation capacity of 108 MW from three steam driven turbine alternators and one gas turbine; steam being generated by gas fired boilers.
    - The refinery supplies power to the Willowdale Mine by a single 22,000 volt power supply.
- Water is used on the mines for dust suppression, dieback washdown, vehicle washdown, workshops, conveyor belt wash, construction, and domestic purposes.
    - The water supplies for mining consist of licensed surface water sources supplemented with treated wastewater from vehicle washdowns, stormwater runoff and maintenance workshops.
    - In 2020, water abstraction comprised approximately 15% of the total Department of Water and Environmental Regulation license allocation (for those sites where abstraction occurred). An additional 534,975 kL was also abstracted from South Dandalup Dam under the agreement with Water Corporation.

- On site facilities include offices, ablutions, crib-rooms, and workshops, however there are no Alcoa accommodation facilities, as the Huntly and Willowdale mining areas are close to established population centers.
- No tailings are generated within the boundaries of the mining operations. The management of tailings generated downstream at the refineries is beyond the boundaries of the Darling Range mining operations and are therefore not considered in this TRS. Waste rock is used to backfill shallow completed before covering with topsoil and reforesting.

2.1.1.5 Environment

- Alcoa has established processes to facilitate conformance with environmental requirements, while identifying sensitive areas ahead of time enables them to be managed ahead of disturbance.
- Overburden is carefully segregated for later contouring and rehabilitation of adjacent, completed mining operations. Caprock and other non-viable rock is used to backfill these shallow, completed pits and the viable topsoil spread on top, contoured, and revegetated.
- Bauxite processing residue is only generated at the Refineries, with no tailings generated within the boundaries of the mining operations. Absence of mine waste prevents the need for waste dump construction and monitoring.
- Site monitoring is completed in accordance with conditions of government authorizations and operational licenses at Huntly and Willowdale.
- Alcoa implements a comprehensive water management and monitoring program in accordance with the requirements of its abstraction and operational licenses.
- The Darling Range operations have no groundwater monitoring programs associated with legislation, licenses or approvals.
    - Additional groundwater monitoring may be required if groundwater quality or quantity has been identified as potentially at risk due to mining activities, or potential exists for mining to impact offsite/private groundwater supply quantity or quality.
    - Alcoa has a long-term groundwater research project within the Intermediate Rainfall Zone to evaluate potential impacts of clearing on groundwater salinization.
- Outcomes of and compliance with the management and monitoring programs are tracked and reported within a Triennial Environmental Review report.
    - Review of the most recent report, published for the period from 2018 to 2020 largely reported compliance with environmental commitments and success of operational controls to managed environmental objectives.
- Only a small number of non-compliances were noted; none of which represent a risk that could adversely affect its license to operate.

2.1.2 Recommendations

2.1.2.1 Geology and Mineral Resources

It is apparent to the SLR QP that the long history of exploration, development and mining of Alcoa's Darling Range bauxite tenements have established sound knowledge and understanding of the geology and mineral endowment. The QP has not identified any fatal flaws in the current practices of mapping (based on the ArcGIS system), drill sampling (based on progressive continuous improvement), assaying (based on calibrated and validated FTIR, with reasonable Quality Control), estimation (3DBM), database management (using acQuire), the application of mining criteria that assure Reasonable Prospects for Economic Extraction (RPEE), and the application of Modifying Factors (again using the ArcGIS system to establish forestry, heritage and noise constraints). The following recommendations are offered as suggestions for further improvement, aligned with Alcoa's comprehensive approach to research and development (seen for example in the evolution of their drilling, sampling and assaying technologies). These recommendations are prioritized in terms of their perceived value to the overall operation:

- More effort on the 3D block modelling methodology, leading to a script-based semi-automated approach will enable more robust rapid model building over the Indicated and Inferred Resources. The validation of interpolation parameters using risk-based (conditional simulation) techniques to quantify confidence should be considered.
- More rapid infill drilling of the 60 by 60 m and 30 by 30 m drill grids.
- Further redrilling or where viable re-assaying of pulps
- Moving away from the having drill holes notionally at the centroids of the 15 by 15 m grid map sheet system would mean that the use of offset grids and more flexible grid spacings would be viable.
- Implementation of a mine wide reconciliation system should be considered as a way to overcome the issue of density estimation. This could be integrated with the extensive production tracking data already available from the current fleet management system and operational control system (covering the mining equipment, crushers, conveyors, sampling towers, stockpile stackers and reclaimers).
- Technology now becoming available, including volume surveys using drones and truck gantry scanning, wet mass measurement using weightometers on conveyors and LoadRite sensors on mining equipment, and infra-red moisture determination, mean that better in situ dry density estimation may become possible if the operation requires it for better refinery feedstock control.

Specific recommendations noted in previous Sections are reiterated here:

- The SLR QP considers that twinned hole studies are of limited value and should only be implemented once the sample splitting and preparation demonstrates good repeatability, using Field Duplicates (or the equivalent STE samples). They may be of value to investigate specific issues under closely supervised conditions.
- While the STE procedure could be retained for specific studies, in the SLR QP's opinion, the reintroduction of Field Duplicates using appropriate riffle splitters under supervision should be considered.

- The grade characteristics of the bauxite profile could be reproduced in the model, enabling optimization techniques to be used for the definition of mining floors and boundaries, better support for ore loss and dilution studies, and more accurate reconciliation studies.

2.1.2.2 Mining and Mineral Reserves

- Currently a dilution and mining recovery factor is applied to the final Reserves to reconcile the tonnes and grade. The SLR QP recommends applying dilution and ore loss at the re-blocked model level before performing the optimization and reporting these values independently.
- The life-of-mine scheduling requires further refinement with regards to sequencing of the different mining areas and assigning the scheduled years back to the orebest model.
- The SLR QP recommends detailed haulage analysis focusing on haulage profiles and cycle times to provide more accurate operating costs.
- The SLR QP noted the mining models were in both a 2D grid and 3D model system. Aligning all the mining models within the same 3D mining model system will provide clarity and consistency across Darling Range project with regards to evaluation and reporting processes.

2.1.2.3 Mineral Processing

As mentioned in Section 22.3, the historical operational data for the Darling Range demonstrate that ore consistently met refinery specifications. SLR make the following recommendations regarding processing:

- SLR recommends independent verification of the sample analysis by a certified laboratory, on a structured program to ensure the QA/QC aspects of the internal analysis.
- It is recommended that a proportion of samples from each batch could be sent to the independent laboratory for analysis and the results can be compared with the internal analysis.

2.1.2.4 Infrastructure

As mentioned in Section 22.4, the Darling Range mining operations have well established infrastructure, with mining hubs that are periodically moved to reduce transportation distances between mining operations and the hubs. SLR make no recommendations regarding infrastructure.

2.1.2.5 Environment

- As mentioned in Section 22.5, Alcoa has established systems to facilitate adherence to environmental commitments. SLR recommend that the following actions are taken to monitor previously enacted corrective actions, made in response to minor environmental incidents:
- Monitor efficacy of corrective actions made following drainage failures related to significant rainfall events, which resulted in surface water flow from dieback areas into dieback free areas.
- Monitor efficacy of corrective actions made following recordings of elevated turbidity for a period exceeding the compliance criteria (25 NTU).
- Monitor efficacy of Interim PFAS Water Management Strategy implemented in response to incidents involving PFAS and AFFF contamination.

2.2 Economic Analysis

2.2.1 Economic Criteria

An un-escalated technical-economic model was prepared on an after-tax discounted cash flow (DCF) basis, the results of which are presented in this subsection.

Annual estimates of mine production with associated cash flows are provided for years 2022 to 2028, based on Proven and Probable Reserves only.

Key criteria used in the analysis are discussed elsewhere throughout this TRS. General assumptions used are summarized in Table 1-1. All values are presented in United States Dollars ($) unless otherwise stated.

Table 1-1: LOM Technical-Economic Assumptions

Description	Value
Start Date	January 1, 2022
Mine Life based on Mineral Reserves	7 years
Price Assumption	$25.49
Total Operating Costs	$3,259.8 million
Sustaining Capital over next seven years	$349.3 million
Discount Rate	$867.4 million
Discounting Basis	9%
Inflation	End of Period
Corporate Income Tax Rate	0%

2.2.2 Cash Flow Analysis

The indicative economic analysis results, presented in Table 1-2, indicate an after-tax Net Present Value (NPV) of $1,315.2 million, using a 9% discount rate and an average bauxite price of $25.49/tonne.

Capital identified in the economics is for sustaining operations, haul roads, conveyor replacements and major mine moves.

The cashflow is presented on a 100% attributable basis.

The economic analysis was performed using the estimates presented in this TRS and confirms that the operations have a positive cash flow that supports the statement of Mineral Reserves.

Table 1-2: LOM Indicative Economic Results

Description	Units	Total LOM
LOM	Years	7
LOM Bauxite Production	Mt	241.3
Average LOM Price	$/t	25.49
Gross Revenue	$ million	**6,151.0**
Labor	$ million	969.9
Service	$ million	858.2
Other	$ million	536.0
PAE – Corporate Chargebacks	$ million	139.4
Energy	$ million	81.0
Fuel	$ million	118.8
Supplies	$ million	164.9
Maintenance	$ million	288.2
On-site Mine Operating Costs	$ million	**3,156.3**
Off-site Mine Operating Costs	$ million	**103.5**
Corporate Income Tax	$ million	867.4
Net Income after Taxes	$ million	**1,332.4**
Depreciation Tax Savings	$ million	691.5
Sustaining Capital (2021 to 2028 inclusive)	$ million	$349.3
Closure Costs	$ million	Included in ARO under operating costs
Free Cash Flow	$ million	**1,754.0**
NPV @ 9%	$ million	**1,315.2**

2.2.3 Sensitivity Analysis

Project risks can be identified in both economic and non-economic terms. Key economic risks were examined by running cash flow sensitivities. The operation is nominally most sensitive to operating costs followed by market prices (revenues).

2.3 Technical Summary

2.3.1 Property Description

The Mineral Resource estimates declared in this Report were derived for bauxite deposits located within the Darling Range in the southwest of Western Australia. The mining center of Huntly is located approximately 80 km to the southeast of Perth, and approximately 30 km east of the township of Pinjarra. Willowdale is located 100 km south-southeast of Perth, and approximately 15 km east of the township of Waroona.

The Pinjarra refinery is located adjacent to the east of the town of Pinjarra and is approximately 25 km southwest of the Huntly mining areas. The Kwinana refinery, also supplied by Huntly, is approximately 50 km northwest of Huntly in the city of Kwinana, a suburb approximately 40 km south of Perth. The Wagerup refinery, supplied by Willowdale, is located immediately adjacent to the east of the South Western Highway, approximately 8 km south of Waroona and 20 km west of the Willowdale mining area.

2.3.2 Land Tenure

The bauxite deposits are all located within ML1SA. The Agreement permits the exploration and mining of bauxite within the tenement boundaries. ML1SA was granted on 24 September 1961, for four 21-year periods, and the current lease expires on 24 September 2024, with provision for renewal extending beyond 2045. The current lease covers an area of 7,022.61 km^2, and extends from just north of Perth, to Collie in the south. The legislation under which Alcoa operates is overseen by the Mining and Management Program Liaison Group, which comprises representatives from several State Government departments.

A number of environmental and statutory constraints exist within ML1SA, and Alcoa is not permitted to access bauxite from the areas covered under these constraints. Mineral Resources have not been defined in the constrained areas. In August 2001, Alcoa entered a sub-lease arrangement with a consortium referred to as the Worsley Participants. This arrangement permits the Worsley Participants to mine and process bauxites within the sub-lease area. Alcoa has not declared Mineral Resources within the sub-lease area.

2.3.3 Ownership

The mining rights and assets involved with bauxite mining and alumina refining in Australia are 100% owned by Alcoa of Australia Limited (AofA), an affiliate of Alcoa owned by Alcoa World Alumina and Chemicals (AWAC). AWAC is an unincorporated global joint venture between Alcoa and Alumina Limited, a company incorporated under the laws of the Commonwealth of Australia and listed on the Australian Securities Exchange. AWAC consists of a number of affiliated entities that own, operate or have an interest in bauxite mines and alumina refineries, as well as an aluminum smelter, in seven countries. Alcoa Corporation owns 60% and Alumina Limited owns 40% of these entities, directly or indirectly, with such entities being consolidated by Alcoa Corporation for financial reporting purposes.

2.3.4 History

Bauxite occurrences were first recorded in the Darling Range in 1902. Bauxite was detected as a result of analysing laterite from Wongan Hills, and subsequently through examination of lateritic road gravels from several localities in the Darling Range. The Geological Survey of Western Australia (Geological Survey) produced studies and publications, driving the bauxite exploration, though most attention was focused

on localities in the Darling Range close either to Perth or to railway lines servicing towns such as Toodyay and York. By 1938 bauxite deposits were known to be common throughout the Darling Range over an area of 560 km long by 40 km to 80 km) wide. The Geological Survey maintained interest in Darling Range laterite as an economic source of aluminum until the 1950s. However, by the late 1950s exploration had been taken over by mining companies. The earliest non-government exploration for bauxite was carried out in 1918 by the Electrolytic Zinc Co. of Australia Pty Ltd, deeming the deposits to be generally low grade and not of commercial value, though like earlier explorers, did not focus upon the underlying friable units.

No further private exploration took place until 1957 when Western Mining Corporation Ltd (WMC) began to explore for bauxite in the Darling Range. Following a regional reconnaissance, a joint venture company, Western Aluminium NL (WANL), formed by WMC with North Broken Hill Ltd and Broken Hill South Ltd, explored temporary reserves over a large portion of the southwest. These areas were part of a Special Mineral Lease (ML1SA) granted to WANL in 1961.

By 1961, WANL had delineated 37 Mt of bauxite at an average grade of 33% A.Al_2O_3. Also in 1961, WANL joined with the Aluminum Company of America Ltd (Alcoa US), allowing additional systematic exploration of lease ML1SA. Commercial mining was finally started in 1963 at Jarrahdale and continued until 1998, supplying bauxite to the Kwinana refinery.

The Huntly and Willowdale mines commenced commercial production in 1972 and 1984 respectively. In 1977 WANL became Alcoa. As of 2021, the Huntly and Willowdale mining operations remain active. Huntly supplies bauxite to the Kwinana and Pinjarra refineries (approximately 27 Million tonnes per annum) while Willowdale supplies the Wagerup refinery (approximately 10 Mtpa).

2.3.5 Geological Setting, Mineralization, and Deposit

The Mineral Resource estimates declared in this Report were derived for bauxite deposits located within the Darling Range in the southwest of Western Australia. The Darling Range comprises a low incised plateau formed by uplift along the north-south trending Darling Fault, which is a major structural lineament that separates the Pinjarra Orogen to the west, from the Yilgarn Craton to the east. The range extends for over 250 km, from Bindoon in the north to Collie in the south.

Bauxite deposits have been identified throughout the Darling Range and generally occur as erratically distributed alumina-rich lenses within the eroded laterites that mantle the granites to the east of the scarp line. The bauxites are thought to have formed from the lateritization of the peneplained surface of the Western Gneiss Terrane rocks. Lateritization is thought to have commenced during the Cretaceous and continued through to the Eocene, with the subsequent periodic activity of the Darling Fault resulting in the current landform of scarps and deeply incised valleys on the western edge of the Darling Range.

Most of the bauxites display a typical profile comprising the following sequence, from the top down:

- Overburden: A mix of soils, clays, rock fragments and humus that is typically 0.5 m deep, but deeper pockets are common.
- Hardcap: An indurated iron-rich layer that is usually 1 m to 2 m thick. It is generally high in available alumina (A.Al_2O_3) and low in reactive silica (R.SiO_2).
- Friable Zone: A partially leached horizon that usually contains a mix of caprock fragments, clasts, nodules, pisolites, and clays. It is usually a few meters thick but can exceed several meters in places. It is generally high in A.Al_2O_3 and low in R.SiO_2.

- Basal Clay: A kaolinitic clay horizon that represents the transition zone between the Friable Zone and the underlying saprolitic material. It is generally high in R.SiO_2 and low in A.Al_2O_3.

The Hardcap and Friable Zone are targeted as the ore horizon. Selective mining practices are applied to minimise the inclusion of Overburden, because of its elevated organic carbon levels, and Basal Clay because of its elevated R.SiO_2 concentrations. Within the Hardcap and Friable Zone, the dominant minerals, in order of abundance, are gibbsite, quartz, goethite, kaolinite, and haematite, with lesser amounts of anatase and muscovite.

2.3.6 Exploration

Systematic exploration for bauxite within the region commenced in the 1960s and is conducted on a continuous basis to maintain sufficient Resources and Reserves to meet refinery supply. Alcoa systematically drills the laterite areas on a regular grid spacing of 60 × 60 m, followed by successive infill programs in selected areas that reduce the spacing to 30 × 30 m, and finally to 15 × 15 m. The 2021 Mineral Resource estimates were derived from data acquired from a total of 310,906 holes, drilled between 1981 and 2020, with almost 80% of the holes drilled after 2009.

The planned drill hole collar locations are pegged by Alcoa surveying staff using real time kinematic differential global positioning system (RTK DGPS). Prior to mid-2015, theodolite/ total stations and DGPS were used to position the 60 m spaced holes, and the 30 m and 15 m grids were positioned by taping and optical square sighting between the 60 m pegs. If the drill rig cannot be setup within 2 m of the peg, the offset distance is measured and marked on the driller's log. Alcoa has recently introduced the practice of resurveying all drill hole locations after drilling. However, the planned coordinates are used for subsequent modelling activities.

All holes are assumed to be vertical. However, the drill rigs have limited levelling capability, and most holes are orthogonal to the local surface gradient, resulting in deviations of several degrees from vertical.

A digital elevation model representing the natural surface was prepared from a combination of collar survey data, LiDAR data, and satellite imagery.

The drilling is conducted using a fleet of tractor-mounted vacuum rigs, which have been modified to operate in forested areas with minimal clearing or ground preparation. In 2015, Alcoa added aircore drilling rigs to the fleet. These rigs are also tractor-mounted and are fitted with a similar sample collection system to that used on the vacuum rigs. The rigs are fitted with hollow-bladed bits that have a nominal cutting diameter of 45 mm and an internal retrieval tube diameter of 22–25 mm.

All samples are collected on 0.5 m intervals, with the material extracted via the hollow drill stem into a collector flask attached to the cyclone underflow. Each sample, which weighs approximately 1.5 kg, is repeatedly passed through a riffle splitter to yield a retained split weighing approximately 200 g. This material is placed into barcode-labelled sample packets for despatch to the test laboratory. The remaining material is discarded.

For each hole, the drillers prepare a log sheet that contains survey, drilling, geological logging, and sample submission information.

2.3.7 Mineral Resource Estimates

The long production history of Alcoa's ML1SA operations has resulted in the development of an integrated approach for data collection, bauxite delineation, and production planning, aimed at providing feedstock that meets the technical specification requirements of the local refineries. In the past few years, Alcoa

recognized that some of its procedures required optimization and updating to be more consistent with best practice approaches within the industry. They commenced a process of investigation and revision of many of these procedures but recognized that this must be implemented in a staged manner to ensure that the Mineral Resources and Mineral Reserves delineation procedures remain consistent with, and do not result in significant disruption to, current mining practices. In 2019, they began introduction 3D block modelling techniques to replace the polygon and gridded seam modelling resource estimation procedures. Approximately 30% of the tonnages that contribute to the current Mineral Resource inventory have been prepared using the new 3D block modelling procedures.

The majority of the estimates that make up the current Mineral Resource inventory were prepared using techniques that Alcoa has developed since the commencement of mining in 1963. Over the period, Alcoa developed an integrated approach to data collection, resource definition, and mining that has proven effective in meeting the refineries' feedstock requirements.

The development of the resource estimation procedures largely predates the wider industry move to block modelling and geostatistical estimation techniques that occurred in the 1990s. Although there have been numerous changes and refinements to Alcoa's procedures, these systems are essentially a semi-automated implementation of the traditional 2D polygonal estimation techniques.

A legacy of the development history of the resource estimation system is that different procedures were used to delineate Mineral Resources using the 30 m and 60 m spaced data, termed the ResTag procedures, compared to those defined using the 15 m spaced data, termed the Gridded Seam Model (GSM) procedures.

The estimates defined using the 15 m spaced data are limited to the material that is planned to be mined. The parameters used by Alcoa meant that the resultant estimates were essentially nearest neighbor polygonal estimates.

In 2019, Alcoa introduced 3D block modelling and geostatistical estimation techniques, which they term the 3D Block Model (3DBM) procedures, to replace the polygonal and gridded seam modelling techniques.

In essence, all techniques largely rely upon the definition of a resource floor based on $A.Al_2O_3$ and $R.SiO_2$ cut-off grade criteria applied to both individual and accumulated sample grades (for the traditional approaches) or individual and accumulated model grades (for the 3DBM approach). Minimum thickness criteria are also considered. For the models defined using the 15 m spaced data, practical mining constraints are also included in floor definition, including stripping ratios, and the floor heights in surrounding holes. The sample grades in each drill hole or column of model cells are composited over the interval between the base of overburden and the resource floor.

The lateral constraints are initially defined using $A.Al_2O_3$ and $R.SiO_2$ grade thresholds, and then modified to include minimum area, minimum composite numbers, and maximum internal waste criteria. Additional constraints are applied for the resources defined using 15 m spaced data. These include maintaining equipment transit corridors and including minimum buffer distances around environmental exclusion zones and bedrock outcrop.

The resource outlines are divided into resource blocks that delineate sub-regions containing material with similar grade characteristics, and contain tonnages that can be used for long-term, medium-term, and short-term scheduling activities (80 kt to 100 kt for 60 m spacing, down to 20 kt to 40 kt for 15 m spacing). For the 30 m and 60 m areas, the resource blocks are assigned the length-weighted average grades of the enclosed composites.

The model contains estimates for a range of constituents that are of prime importance for Bayer processing including A.Al_2O_3, R.SiO_2, oxalate, sulphate, boehmite, and iron. Validation included visual and statistical checks between the input data and resource block estimates, comparisons of the estimates derived from different data spacings, and comparisons of the estimates with production data.

The annual reconciliation data for the past 19 years indicate the presence of grade and tonnage biases which, although some show long-term trends, appear to be relatively consistent and predictable on a year-to-year basis. The As Mined tonnage estimates are consistently biased high by approximately 5%. The As Mined A.Al_2O_3 is biased low but has shown a gradual improvement from 5% to 1%, relative over the past decade. The As Mined R.SiO_2 is biased low but has shown a gradual improvement from around 30% to 10% relative over the past decade. Most other constituents exhibit similar bias reductions over the past decade.

The Mineral Resource classifications have been applied to the resource estimates based on consideration of the confidence in the geological interpretation, the quality and quantity of the input data, the confidence in the estimation technique, and the likely economic viability of the material.

There are limited quality assurance data to enable a thorough assessment of the reliability of the estimation datasets, and the majority of the Mineral Resource estimates have been prepared using traditional 2D estimation techniques which have known limitations when used to prepare local estimates. However, the long production history and significant amount of reconciliation data indicate that past estimates prepared using these techniques have been relatively reliable and predictable.

Based on the above considerations, the main controlling factors for Mineral Resource classification are deemed to be sample spacing and data quality.

2.3.8 Mineral Reserve Estimates

A Mineral Reserve has been estimated for Alcoa's Darling Range bauxite mining operations in accordance SEC S–K 1300 which are consistent with the guidelines of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Mineral Reserves (The JORC 2012 Code).

The SLR QP inspected the Alcoa Huntly and Willowdale operations on October 14, 2021, and Alcoa's Mine Planning department on October 27, 2021, interviewing relevant personnel on these dates and on other occasions. The QP has had prior exposure to Alcoa's Darling Range operations earlier in his career.

The Mineral Reserve is classified with reference to the classification of the underlying Mineral Resource and with reference to confidence in the informing Modifying Factors. The QP considers the Proven and Probable classification to be appropriate to the deposit and associated mining operations.

The reference point for the Mineral Reserve is prior to the processing plant at the refinery.

The Proven Mineral Reserve is a subset of Measured Resources only. The Proven Mineral Reserve is legally permitted for mining and is included in the Ten-Year Mine Plan.

The Probable Mineral Reserve is estimated from that part of the Mineral Resource that has been classified as Indicated.

Variable cut-off grades are applied in estimation of the Mineral Reserve and these are related to operating cost and the nature of the Mineral Resource in relation to blending requirements. The Mineral Reserve estimate is expressed in relation to available aluminum oxide (A.Al_2O_3) and reactive silica (R.SiO_2), this being the critical contaminant in relation to the Refinery.

2.3.9 Mining Methods

The Huntly and Willowdale mines employ conventional open pit mining practices and equipment. The fleet is mixed between contract and owner-operator, depending on the nature of the task at hand. Owner operator equipment is used for mining the bulk of the Mineral Reserve, operating in areas away from those subject to environmental restrictions. Contract mining operates smaller equipment, day shift only, in environmentally (noise) sensitive areas and at the perimeter of the mining area.

Following definition of Mineral Reserve blocks, vegetation is cleared ahead of mining by the Western Australian State Forest Products Commission (FPC), saleable timber being harvested for use. On receipt of clearance to proceed from the FPC, Alcoa operations commence stripping topsoil and secondary overburden removal (SOBR) using small excavators, scrapers, and trucks. Soil is stockpiled at the site, away from the proposed pit, for rehabilitation purposes.

Mining progresses on 4 m benches, utilizing a contour-mining sequence, cutting benches across the topography, working from top to bottom, maintaining the flattest floor obtainable to a maximum gradient of 1:10. This is most pronounced in steep areas. Most of the mineralization lies beneath a gently undulating topography and contour mining is minimal.

After completion of mining, overburden is progressively backfilled into adjacent exhausted pits, topsoiled and rehabilitated by re-establishment of native vegetation, creating a stable post-mining landform that replicates the pre-existing environment.

2.3.10 Processing and Recovery Methods

SLR understands that, according to the mine plan, total ($T.SiO_2$) and $R.SiO_2$ contents, on an annual average basis, remaining below the target for refineries for the next 10 years. This means, there are no evidence of any deleterious element's presence in the Darling Range ore within the next 10 years of production.

The process plant for the Darling Range operations consists of two separate crushing facilities at the Huntly and Willowdale mines. Both facilities crush the Run-of-Mine (ROM) and convey the crushed ore to three separate refineries located at Pinjarra, Kwinana and Wagerup.

The power consumption of the Huntly operation is approximately 8,000 Megawatt-hour (MWh) to 9,000 MWh per month. The Willowdale power consumption is approximately 2,000 MWh per month.

The process plant is a dry crushing operation and therefore water is only required for dust suppression and is included as part of mine water consumption. Water is not required as a consumable for the plant.

2.3.11 Infrastructure

The infrastructure for the mining operations is established and operational. In 2021, the infrastructure hub for Willowdale was relocated 16 km southwards from Orion (after having been based there for 21 years) to the Larego Hub which is located about 20 km north-east of the town of Harvey. The hub hosts administrative offices, as well as crushing facilities and maintenance facilities. The Orion Hub site is currently being decommissioned.

An extensive haul road network, rail, and overland conveyors transport crushed bauxite from the Hub to the refineries (namely Kwinana, Wagerup and Pinjarra). Bauxite is transferred from each mine to the refineries primarily via long distance conveyor belt, apart from the Kwinana refinery which receives bauxite via railway. The Alumina produced by the three refineries is then shipped to external and internal smelter customers through the Kwinana and Bunbury ports.

The Darling Range's Pinjarra refinery receives power from the South West Interconnected System (SWIS). The refinery also has internal generation capacity of 100 MW from 4 steam driven turbine alternators, with steam produced by gas fired boilers and a gas turbine Heat Recovery Steam Generator (HRSG). The refinery supplies power to the Huntly Mine by three different power supply lines (a single 33 kV and two 13.8 kV). Willowdale Mine has a single 22 kV power supply fed from the Wagerup refinery. The Wagerup refinery is a net exporter of power to the SWIS, with internal generation capacity of 108 MW from three steam driven turbine alternators and one gas turbine. The steam is produced by gas fired boilers.

The WA mines are licensed by the Department of Water and Environmental Regulation (DWER) to draw surface water from five locations to meet their water supply requirements. The Huntly mine draws water from Banksiadale Dam and Boronia Waterhole. Huntly mine also holds a license to draw water from Pig Swamp and Marrinup, however these resources are retained as a backup water supply and have not been utilized in recent years. Huntly mine is also permitted to draw water from South Dandalup Dam under an agreement with the Water Corporation. A pumpback facility from South Dandalup Dam to Banksiadale Dam is used to raise levels in Banksiadale Dam during periods of low rainfall runoff. Willowdale Mine draws water from Samson Dam.

There are no Alcoa accommodation facilities within the Darling Range. As described above, the Huntly and Willowdale mining areas are within proximity to established population centers including Pinjarra approximately 25 km to the West of Huntly and Waroona approximately 20 km West of Willowdale. On site facilities includes offices, ablutions, crib-rooms and workshops, all of which were observed to be in excellent condition.

No tailings are generated within the boundaries of the mining operations. The management of tailings generated downstream at the refineries is beyond the boundaries of the Darling Range mining operations and are therefore not considered in this TRS. Alcoa's Darling Range mining operations do not produce mine waste or "mullock" in the same manner as conventional mining operations and waste dumps are not constructed.

2.3.12 Market Studies

Alcoa Corporation is a vertically integrated aluminum company comprising bauxite mining, alumina refining, aluminum production (smelting and casting), and energy generation.

Through direct and indirect ownership, Alcoa Corporation has 28 operating locations in nine countries around the world, situated primarily in Australia, Brazil, Canada, Iceland, Norway, Spain, and the United States. Governmental policies, laws and regulations, and other economic factors, including inflation and fluctuations in foreign currency exchange rates and interest rates, affect the results of operations in these countries.

There are three commodities in the vertically integrated system: bauxite, alumina, and aluminum, with each having their own market and related price and impacted by their own market fundamentals. Bauxite, which contains various aluminum hydroxide minerals, is the principal raw material used to produce alumina. Bauxite is refined using the Bayer process to produce alumina, a compound of aluminum and oxygen, which in turn is the raw material used by smelters to produce aluminum metal.

Alcoa obtains bauxite from its own resources and processes over 85% of its combined bauxite production into alumina. The remainder is sold to the third-party market. In 2021, total Alcoa production was 47.6 million dmt (dry metric tonne) of bauxite.

China is the largest third-party seaborne bauxite market and accounts for more than 90% of all bauxite traded. Bauxite is sourced primarily from Australia, Guinea, and Indonesia on the third-party market. In the long run, China is expected to continue to be the largest consumer of third-party bauxite with Guinea expected to be the majority supplier. Further, third-party traded bauxite is expected to be in surplus over the next decade, with most new mining projects announced recently being located in Guinea.

Bauxite characteristics and variations in quality heavily impact the selection of refining technology and refinery operating cost. A market bauxite with high impurities could limit the customer volume an existing refinery could use, resulting in a discount applied to the value-in-use price basis.

Besides quality and geography, market fundamentals, including macroeconomic trends – the prices of raw materials, like caustic soda and energy, the prices of Alumina and Aluminum, and the cost of freight – will also play a role in bauxite prices.

In 2016, Darling Range entered into a 5-year third-party sales contract with a major alumina producer in China. The volume exported was immaterial compared to the total production of the two mines and was immaterial to the overall operation. In 2021, less than 4% of the Darling Range bauxite was sold externally. Following the expiration of the third-party sales contract at the end of 2021, all bauxite production from Huntly and Willowdale will be consumed internally by the Darling Range refineries and there are no current plans for further bauxite export.

The pricing mechanism of the third-party sales contract was based on a value-in-use methodology (as described in Section 16-1) that was anchored to the customer's other bauxite sources at the time of execution, with a market adjustment factor linked to the Alumina price.

As discussed in Section 16.2.1, all Western Australia bauxite production will be sold internally to Western Australia refineries following the expiration of the third-party sales contract in 2021. In 2021, the Western Australia internal bauxite transfer price referenced this third-party sales contract as a three-year trailing average.

2.3.13 Environmental Studies, Permitting and Plans, Negotiations, or Agreements with Local Individuals or Groups

Alcoa has established practices and processes for ensuring conformance to environmental requirements. Sensitive areas are identified and managed ahead of disturbance. Environmental factors are taken into account prior to infill drilling; hence, mining blocks carrying environmental risks do not feature in the Mineral Reserves (for example, areas around granite outcrops and water courses have a buffer applied and are essentially no-go areas from a mining perspective).

Additional baseline studies are understood to be in progress to support the Environmental Protection Act 1986 (WA) and the Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth) approvals for future extensions to the mining footprint. Baseline studies are guided by the requirements of the Environmental Protection Authority (WA) and are well understood.

No tailings are generated within the boundaries of the mining operations as bauxite processing residue is only generated at the Refineries. Similarly, Alcoa's Darling Range mining operations do not produce mine waste or "mullock" in the same manner as conventional mining operations and as such waste dumps are not constructed. Overburden from Darling Range ore blocks is carefully segregated for later contouring and rehabilitation of adjacent, completed mining operations. Caprock and other non-viable rock is used to backfill these shallow, completed pits and the viable topsoil spread on top, contoured, and revegetated.

As such, there is no requirement for the monitoring of any tailings or mine waste dumps associated within the mining operations as all tailings are processed outside the mine lease boundary.

Alcoa's mine sites are monitored in accordance with the conditions of Government authorizations and its operational licenses at Huntly (L6210/1991/10) and Willowdale (L6465/1989/10). Outcomes of and compliance with the management and monitoring programs are tracked within Alcoa's Environmental Management System and reported within the Annual Environmental Review report.

The environmental reviews and approvals form part of the Mining and Management Program Liaison Group (MMPLG) approvals process. Compliance with the MMPLG is demonstrated through an annual report submitted to the Department of Jobs, Tourism, Science and Innovation (DJTSI). Operational matters at the Willowdale and Huntly mines are licensed by the Department of Water and Environmental Regulation via instruments L6465/1989/10 and L6210/1991/10, respectively. These licenses condition the processing of ore and reporting is required annually to DWER describing the total volume of bauxite crushed and any non-compliance. The latest available reporting at the time of writing is for calendar year 2020. Compliance with the Alcoa ISO14001 accredited Environmental Management System (EMS) was audited in December 2021, with results expected in April 2022.

Alcoa has established systems and processes for maintaining its social license to operate and was admitted to ICMM in 2019, aligning to its social performance requirements. Related to the requirements of the MMPLG, Alcoa's actions in relation to social performance include an annual consultation process aligned with the 5 Year Mine Plan. The consultation process involves engaging with affected landowners. Alcoa's consultation extends to shires, as well as state and local government members. Where appropriate, the mine plan accommodates community requirements, in particular, concerns related to noise, dust, etc., and allows for buffer zones and modified working hours.

Alcoa's Closure Planning group for Darling Range (located within the Global Planning Team) is responsible for developing the closure planning process as well as the subsequent Long-Term Mine Closure Plans (LTMCPs) of Alcoa's WA Mining Operations (Huntly and Willowdale). Closure Strategies, Schedules and Cost Estimates are being developed across organizational divisions and includes multidisciplinary inputs from Operations, Mid- and Short-term Planning, Finance, Centre for Excellence, Environment and Asset Management (both Fixed and Mobile Plant). The agreed closure requirements for Darling Range centres around the return of Jarrah Forest across the site. End land uses are required to comply with the State's Forest Management Plan and include water catchment protection, timber production and biodiversity conservation.

The Alcoa procurement system defines "local" as the localities of Dwellingup, Harvey, Pinjarra, Waroona, Coolup, North Dandalup and Yarloop. Within Alcoa's guidelines of safe, ethical and competitive business practices, they state they will:

- Invite capable local business to bid on locally supplied or manufactured goods or services.
- Give preference to local business in a competitive situation.
- Work with local business interest groups to identify and utilize local suppliers.
- Where possible, structure bids to enable local supplier participation.

2.3.14 Capital and Operating Cost Estimates

Alcoa forecasts its capital and operating costs estimates based on annual budgets and historical actuals over the long life of the current operation.

2.3.14.1 Capital Costs

The operation is well-established and since the LOM plan does not envisage any significant change of the production rate. Anticipated future major capital expenditure is related to major mine moves and sustaining the on-going operations.

Projected capital expenditure over the next seven years of mine life is estimated to total $349.3 million. Of this total, $160 million is associated with the completion of the mine move to the Myara North site . Capital for the Holyoake move will be incurred from 2027 to 2030 and is not include in this TRS cashflow.

A breakdown of the major expenditure areas and total expenditure over the full Ten-Year Mine Plan is shown in Table 1-3

Table 1-3: 10 Year LOM Sustaining Capital Costs by Area

Project	Cost $ Million	Percentage of Total
Myara North Mine Moves	160	62%
Conveyor Belt Replacements	25	7%
Haul Road Improvements	51	15%
Other Sustaining Capital	113	32%
Total	**349**	**100%**

Other capital costs are for replacement of conveyors, haul road improvements and other sustaining capital needed to continue the operations.

Alcoa's sustaining capital estimates for Darling Range are derived from annual budgets and historical actuals over the long life of the current operation. According to the American Association of Cost Engineers (AACE) International, these estimates would be classified as Class 1 with an accuracy range of -3% to -10% to +3% to +15%.

2.3.14.2 Operating Costs

The main production mining operations are primarily Owner-operated using Alcoa equipment and employees. Contractors are also used for certain activities on site.

Operating costs for the current LOM of seven years are based on the 2022 budget.

No items have been identified that would significantly impact operating costs either positively or negatively over the life of mine. Minor year-to-year variations should be expected based upon maintenance outages and production schedules. Forecast costs for 2022 and average mine operating costs the seven-year LOM are shown below in Table 1-4.

Table 1-4: LOM On-site Mine Operating Costs by Category

Cost Centre	2022 ($/wmt)	Average LOM ($/wmt)	%age of Operating Cost
Direct Labour	$3.44	$4.50	30%
Services	$1.56	$4.26	31%
Other	$1.73	$3.80	27%
Corporate Chargebacks for support services	$0.53	$2.37	17%
Energy	$0.30	$0.61	4%
Fuel	$0.35	$0.36	3%
Operating Supplies and Spare Parts	$0.61	$0.53	4%
Maintenance (fixed plant and mobile fleet	$1.08	$0.72	5%
On-site Mine Operating Cash Cost ($/wmt)	**$9.63**	$1.26	9%
Off-site Costs			
G & A, selling and other expenses	$0.20	0.18	
R & D Corporate Chargebacks	$0.22	0.22	
Other Costs of Goods Sold	0.03	0.03	
Total Cash Operating Costs	**$0.20**	**0.18**	

Services costs includes contractor costs for certain mining activities such as in noise sensitive areas and for haul road construction services, in select areas of pit development, and during landscaping activities for rehabilitation after mining.

As of Q4 2021, the Huntly and Willowdale operations together employ a total of 890 employees consisting of 92 Technical, 132 Management and 634 operations employees. Additionally, 32 employees are centrally employed on the combined operations.

3.0 INTRODUCTION

SLR International Corporation (SLR) was appointed by Alcoa Corporation (Alcoa) to prepare an independent Technical Report Summary (TRS) on the Darling Range bauxite mines, located in Western Australia. The purpose of this report is to support the Mineral Resource and Mineral Reserve estimates for the mines as of December 31, 2021. This Technical Report Summary conforms to the United States Securities and Exchange Commission's (SEC) Modernized Property Disclosure Requirements for Mining Registrants as described in Subpart 1300 of Regulation S-K, Disclosure by Registrants Engaged in Mining Operations (S-K 1300), and Item 601(b)(96) of Regulation S-K.

Alcoa is one of the world's largest aluminum producers and is a publicly traded company on the New York Stock Exchange (NYSE). The company owns and operates integrated bauxite mining, alumina refining and aluminum smelting operations at numerous assets globally including in Australia, Brazil, Canada, and the United States. Alcoa is also a Joint Venture partner for several other integrated operations in Brazil, Canada, Guinea, and Saudi Arabia.

The Darling Range, located south of Perth in Western Australia, comprises two active bauxite mining areas – the Huntly and Willowdale mines – owned and operated by Alcoa of Australia Limited, which is 60% owned by Alcoa Corporation and 40% owned by Alumina Limited. The Huntly and Willowdale operations collectively represent one of the world's largest bauxite mines which supplies Alcoa's three aluminum refineries in the region: Kwinana, Pinjarra, and Wagerup. On the basis that both mining areas supply ore to the same local refineries which are also operated by Alcoa, and that both mining areas are located within the same mining lease boundary, SLR considers the mines a single property for the purposes of this report.

Alcoa has a long history of mining in the Darling Range with Huntly and Willowdale commencing commercial production in 1972 and 1984 respectively. These mining areas were preceded by the Jarrahdale bauxite mine which was operational between 1963 and 1998. The Huntly mine currently supplies bauxite to the Pinjarra and Kwinana refineries, while the Willowdale mine supplies the Wagerup refinery. The mines collectively produce approximately 37 Mtpa of bauxite, with approximately 27 Mtpa from Huntly and 10 Mtpa from Willowdale.

3.1 Site Visits

SLR Qualified Persons (QPs) visited the site on October 14, 2021. The SLR Mining Geologist QP and SLR Mining Engineer were accompanied by Alcoa's Principal Geologist Global Planning to undertake site visits and inspections of various aspects of the Huntly and Willowdale mining areas.

The site visit commenced with a general induction overview at Alcoa's Pinjarra office (Bindjareb). The group then visited the Willowdale mine site (specifically, the new mine office near the Larego crusher) as well as various locations on Larego accompanied by Alcoa's Short Term Planning Superintendent.

The QPs then inspected the Darling Scarp including the covered downhill conveyor, sampling station, ore stockpile stacker/reclaimer, and Wagerup refinery.

The mine office at Huntly situated near the Myara crusher was visited with Alcoa's Short-Term Planner, then the QP group proceeded to various mining locations around that operation. As it was a maintenance day, the crusher and conveyor were not operating.

The Digital fleet management system (FMS) was reviewed at the Myara site.

The SLR QPs interviewed several senior Alcoa staff at the operation sites.

Alcoa provided permission to document the site visit with video, photos and audio which were shared with the other SLR team members. Some interviews were also carried out using remote video access.

SLR QPs visited the Alcoa's Mine Planning department at Booragoon on October 27, 2021, for discussions about Alcoa's planning systems. One of SLR's QPs carried out inspections of the Kwinana laboratory facilities, in particular the FTIR assaying procedures on November 01, 2021. Drilling methods were inspected on site on November 8, 2021, along with an examination of the database management procedures. The stockpile sampling, stacking, and reclaiming at Pinjarra refinery was inspected on November 12, 2021.

The SLR Metallurgist QP did not visit the site, since travel restriction related to the COVID-19 pandemic made this impractical, however the site was visited by others who reviewed all Modifying Factors.

3.2 Sources of Information

During the preparation of this Technical Report Summary, discussions were held with personnel from Alcoa Corporation and the Huntly and Willowdale Mines, including:

- Mr Alex Hatch, Principal Geologist, Alcoa
- Mr Gary Johnson, Short Term Planning Superintendent Willowdale Mine, Alcoa
- Mr Damien Brown, Short Term Planner, Huntly mine, Alcoa
- Mr John Greenwood, Director of Bella Analytical Services
- Mr Neylor Aguiar, Principal Mining Engineer - Global Planning
- Ms Beth Butler, Community Relations Advisor – WA Mining, Alcoa
- Ms Suellen Jerrad, Corporate Affairs Manager, Alcoa
- Mr Andrew Richardson, Senior Environmental Scientist – Approvals and Compliance – WA Mining, Alcoa

This Technical Report summary was prepared by SLR QPs. The documentation reviewed, and other sources of information, are listed at the end of this report in Section 24.0 References.

3.3 List of Abbreviations

Units of measurement used in this report conform to the metric system. All currency in this report is United States dollars (US$), unless otherwise noted.

Abbreviation	Description
°C	degree Celsius
°F	degree Fahrenheit
2D	2-dimensional
3D	3-dimensional
3DBM	3D Block Model
a	annum
A	ampere
A.Al_2O_3	available alumina
AACE	American Association of Cost Engineers
AFFF	Aqueous Film Forming Foams
AGD	Australian Geodetic Datum
Alcoa	Alcoa Corporation
Alcoa US	Aluminum Company of America Ltd
AMG	Australian Map Grid
AMPD	Absolute Mean Percentage Difference
AMSL	above mean sea level
AMWU	Australian Metal Workers Union
AofA	Alcoa of Australia Ltd
API	Alumina Price Index
ARO	Asset Retirement Obligations
AWAC	Alcoa World Alumina and Chemicals
AWU	Australian Workers Union
B&P	Bias and Precision
bbl	barrels
BD	Bomb digest
BD-GC	bomb digest gas chromatography
BD-ICP	bomb digest inductively coupled plasma
BD-NDIR	bomb digest non-dispersive infrared
Bella	Bella Analytical Systems
Btu	British thermal units
BV	Bureau Veritas
C$	Canadian dollars
cal	calorie
CalVal	calibration and validation for FTIR
cfm	cubic feet per minute
CIM	CIM (2014)
cm	centimeter
cm^2	square centimeter

CRM	certified reference material
CV	Coefficient of Variation
d	Day
DBCA	Water Corporation, Department of Biodiversity, Conservation and Attractions
DCF	Discounted Cash Flow
DEM	Digital Terrain Model
DG	Discrete Gaussian
DGPS	(Differential) Global Positioning System
dia	Diameter
DIBD	dry in situ bulk density (t/m3)
DJTSI	Department of Jobs, Tourism, Science and Innovation
DMIRS	Department of Mines Industry Regulation and Safety
dmt	dry metric tonne
DWER	Department of Water and Environment Regulation
dwt	dead-weight ton
EMS	Environmental Management System
ETU	Electrical Trades Union
EWR	Ecological water requirements
FMS	Fleet Management System
FPC	Forest Products Commission
ft	foot
ft/s	foot per second
ft^2	square foot
ft^3	cubic foot
FTIR	fourier transform infrared spectrometry
g	gram
G	giga (billion)
g/L	gram per liter
g/t	gram per tonne
Gal	Imperial gallon
GC	gas chromatography
Geological Survey	Geological Survey of Western Australia
GIS	Geographical Information System
Gpm	Imperial gallons per minute
gr/ft^3	grain per cubic foot
gr/m^3	grain per cubic meter
GSM	gridded seam model
ha	hectare
HARD	Half Absolute Relative Difference
hp	horsepower
hr	hour
HRSG	Heat Recovery Steam Generator
Hz	Hertz

ICP-OES	inductively coupled plasma optical emission spectrometry
IDW	inverse distance weighting
in.	inch
in^2	square inch
IRM	internal reference material
IRR	Internal Rate of Return
ISO	International Standardization Organization
J	Joule
JORC	JORC Code (2012)
k	kilo (thousand)
kcal	kilocalorie
kg	kilogram
km	kilometer
km/h	kilometer per hour
km^2	square kilometer
kPa	kilopascal
kV	kilovolt
kVA	kilovolt-amperes
kW	kilowatt
kWh	kilowatt-hour
KWI	Kwinana Mining Laboratory
L	liter
L/s	liters per second
lb	pound
LiDAR	Light Detecting and Ranging
LIMS	laboratory information management system
LME	London Metal Exchange
LOM	Life of Mine
LTMCPs	Long-Term Mine Closure Plans
m	micron
m	meter
M	mega (million); molar
m^2	square meter
m^3	cubic meter
m^3/h	cubic meters per hour
Ma	Million years ago
MALSI	microwave available alumina (AL) and reactive silica (SI)
MASL	meters above sea level
MD	microwave digest
MD-ICP	microwave digest inductively coupled plasma optical emission spectrometry
mg	microgram
mi	mile
min	minute

mL	milliliters
ML	Mineral Lease
mm	millimeter
MMPLG	Mining and Management Program Liaison Group
MMPs	Mining and Management Programs
mph	miles per hour
MS	Ministerial Statement or Magnetic Susceptibility
Mtpa	Million tonnes per annum
MVA	megavolt-amperes
MW	megawatt
MWh	megawatt-hour
NATA	Australian National Association of Testing Authorities
NI 43-101	National Instrument 43-101 (2014)
NPC	Net Present Cost
NPV	Net Present Value
NTU	Nephelometric Turbidity Units
NYSE	New York Stock Exchange
OK	ordinary kriging
oz	Troy ounce (31.1035g)
oz/st, opt	ounce per short ton
PFAS	per- and polyfluoroalkyl substances
ppb	part per billion
ppm	part per million
psia	pound per square inch absolute
psig	pound per square inch gauge
QA	Quality Assurance
QA/QC	Quality Assurance / Quality Control
QC	Quality Control
QP(s)	Qualified Person(s)
R.SiO_2	reactive silica
RC	Reverse Circulation
REF	reference method
ResTag	mineral resource estimation system
RL	relative elevation
ROM	Run of Mine
RTK	real time kinematic
s	second
SEC	Securities and Exchange Commission
S-K 1300	Subpart 1300 of Regulation S-K
SLR	SLR International Corproation
Snowden	Snowden Mining Consultants
SOBR	stripping topsoil and secondary overburden removal
SPU	sample presentation unit

SRK	SRK Consulting (Australasia) Pty Ltd
st	short ton
STE	sample to extinction
stpa	short ton per year
stpd	short ton per day
SWIS	South West Interconnected System
t	metric tonne
T.Al2O3	Total Alumina
T.SiO2	Total silica
TICTOC	Total Inorganic Carbon and Extractable Organic Carbon
tpa	metric tonne per year
tpd	metric tonne per day
TRS	Technical Report Summary
US$	United States dollar
USg	United States gallon
USgpm	United States gallon per minute
V	volt
W	watt
WA	Western Australia
WANL	Western Aluminium NL
WMC	Western Mining Corporation Ltd
wmt	wet metric tonne
wt%	weight percent
XRD	x-ray diffraction
XRF	x-ray fluorescence
Xstract	Xstract Resources
yd3	cubic yard
yr	Year

4.0 PROPERTY DESCRIPTION

4.1 Location

The Darling Range is located in the southwest of Western Australia and comprises an extensive uplifted plateau of bauxite deposits which is host to several mining operations including the Huntly and Willowdale mining areas, approximately 80 km and 100 km southeast of Perth, respectively. The nearest towns to the mining centers are North Dandalup (approximately 15 km west of Huntly) and Waroona (approximately 15 km west of Willowdale). Both towns are within the Peel Region of southwest Western Australia and are on the route of the South Western Highway, a major national road connecting Perth with the south coast.

All spatial data used for Mineral Resource estimation are reported using a local grid based on Australian Map Grid 1984 (AMG84) system (Zone 50) and using Australian Geodetic Datum 1984 (AGD84) coordinate set. The approximate coordinates of the mining areas are 410000 m East and 6390000 m North (Huntly) and 410000 m East and 6365000 m North (Willowdale). The Huntly and Willowdale mining areas are separated by approximately 35 km (Figure 3-1).

The Pinjarra refinery is located adjacent to the east of the town of Pinjarra and is approximately 25 km southwest of the Huntly mining areas. The Kwinana refinery, also supplied by Huntly, is approximately 50 km northwest of Huntly in the city of Kwinana, a suburb approximately 40 km south of Perth. The Wagerup refinery, supplied by Willowdale, is located immediately adjacent to the east of the South Western Highway, approximately 8 km south of Waroona and 20 km west of the Willowdale mining area.

4.2 Land Tenure

The Huntly and Willowdale bauxite mines are covered by a single mineral concession referred to as Mineral Lease (ML) 1SA. The concession was originally granted on September 25, 1961, by the State Government of Western Australia under the Alumina Refinery Agreement Act, 1961, permitting the exploration and extraction of bauxite. ML1SA was granted for a period of four, 21-year periods the third period of which is due to expire on September 24, 2024. Prior to September 24, 2024, Alcoa will notify the State Government of Western Australia of its intention to exercise its right to renew for a further 21-year period to extend the concession to 2045. Subject to Alcoa having complied with the Alumina Refinery Agreement Act, 1961, the State Government will grant Alcoa the renewal. The State Government concession agreement includes the potential for conditional renewal beyond 2045. This will require negotiation between Alcoa and the State Government prior to this date to agree on an extension of the agreement, and is therefore not guaranteed.

Conditions which must be fulfilled by Alcoa to retain ML1SA include annual reporting requirements under several State Agreement Acts, Ministerial Statements, and Environmental Protection Acts. These are described in Section 3.6 below.

The current concession of ML1SA covers an area of 7,022.61 km^2, extending from the north of Perth on the eastern side to the town of Collie in the south (Table 3-1). Alcoa has the exclusive right to explore for and mine bauxite on all Crown Land within the ML1SA. This area includes sub-lease arrangements made between Alcoa and the Worsley Alumina joint venture participants which include South32, Japan Alumina Associates (Australia) Pty Ltd and Sojitz Alumina Pty Ltd (Worsley Participants). The agreements, made in August 2001 and September 2016, provide bauxite mining concessions to the Worsley Participants. No

Mineral Resources or Mineral Reserves attributable to the Darling Range mining areas have been declared within these sub-lease areas.

Table 3-1: ML1SA license details

Concession Name	Title Holder	Expiry Date	Area (km²)
ML1SA	Alcoa of Australia	24/09/2024	7,022.61

Alcoa pays rental for each square mile of ML1SA in accordance with the Alumina Refinery Agreement Act 1961 (WA). In 2021 this amounted to A$13,560.

The boundary of the ML1SA concession area, including the limit of the Worsley Participants' area, is illustrated in Figure 3-1. The contained Mining Regions are shown in Figure 3-4, while the extents of the mined areas and Mineral Resources and Mineral Reserves are shown in Figure 3-3:

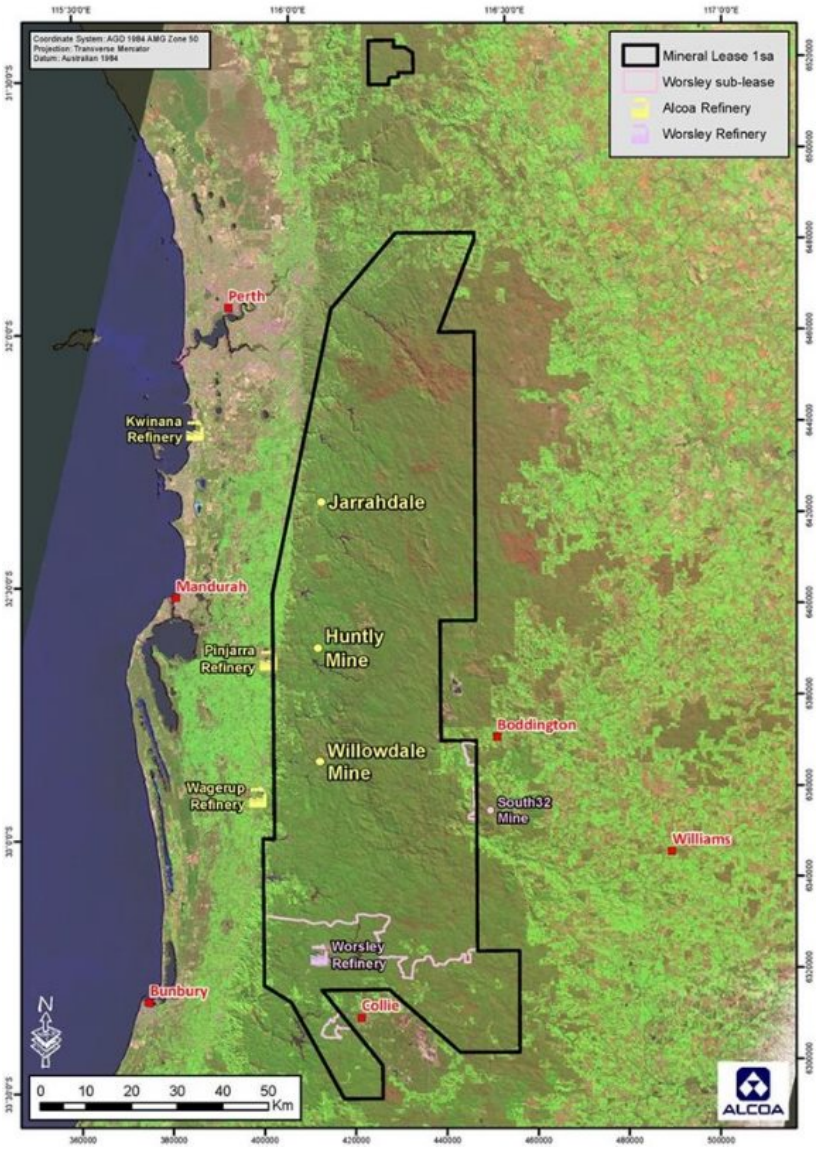


Figure 3-1: ML1SA lease extents (Alcoa, 2022)

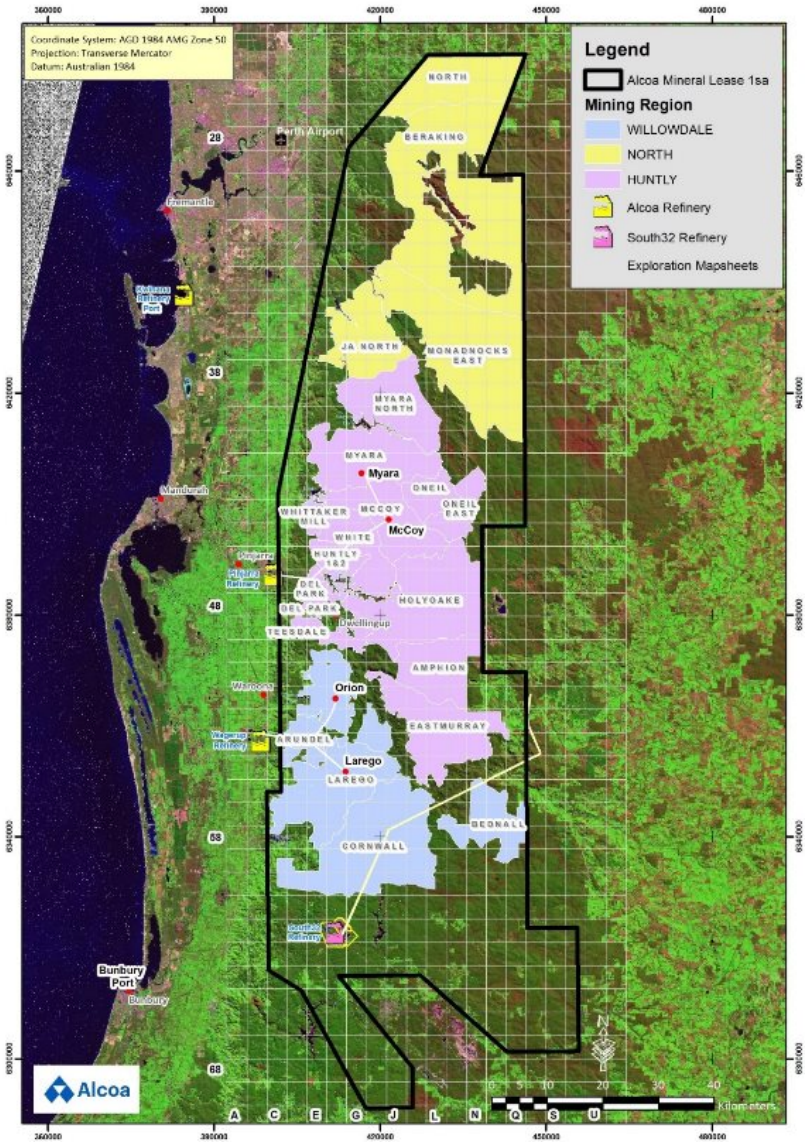

Coordinate System: AGD 1984 AMG Zone 50
Projection: Transverse Mercator
Datum: Australian 1984
Legend
Alcoa Mineral Lease 1sa
Mining Region
WILLOWDALE
NORTH
HUNTLY
Alcoa Refinery
South32 Refinery
Exploration Mapsheets
NORTH
BERAKING
JA NORTH
MONADNOCKS EAST
MYARA NORTH
MYARA
Myara
ONEIL
ONEIL EAST
WHITTAKER MILL
MCCOY
McCoy
WHITE
HUNTLY 1&2
DEL PARK
HOLYOAKE
TESSDALE
AMPHION
Orion
EASTMURRAY
ARUNDEL
Laregg
LAREGG
CORNWALL
BEDNALL
Perth Airport
Fremantle
Mandurah
Bunbury Port
Bunbury
Alcoa
Kilometers

Figure 3-2: Map of Mining Reporting Centers, Mining Regions, and Production Sheets (Alcoa, 2022)

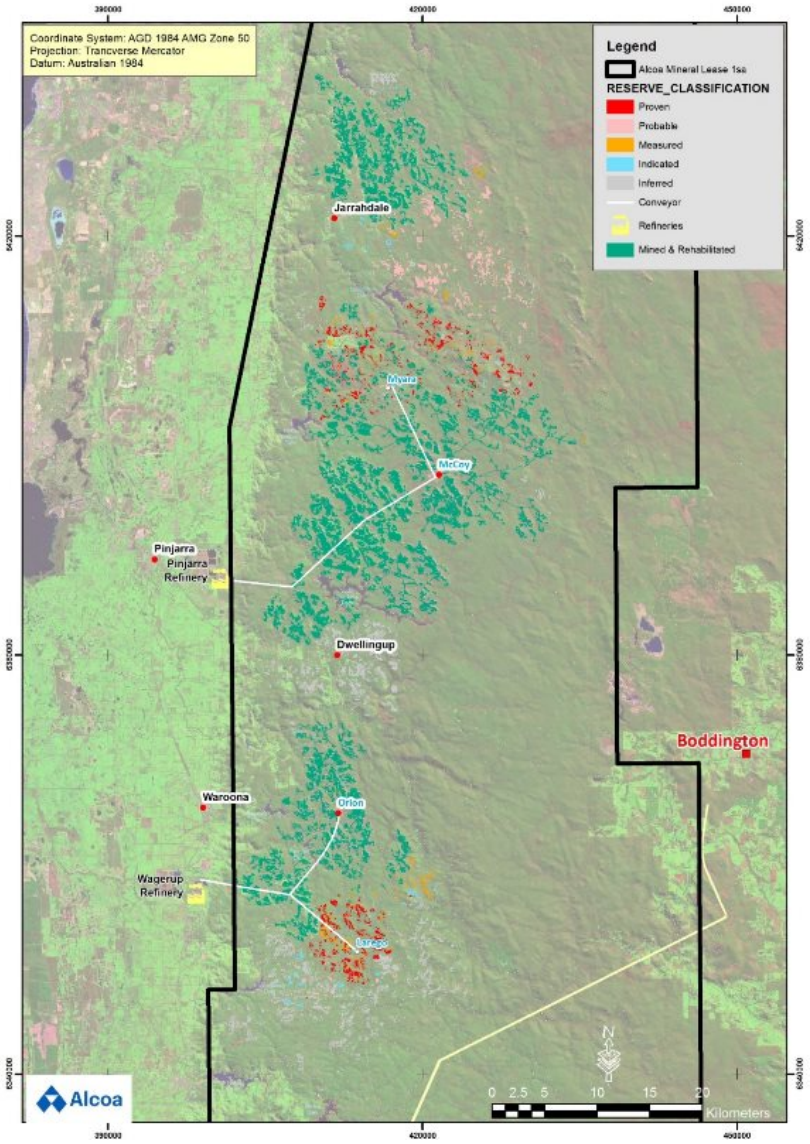


Figure 3-3: Map of current Mineral Resource and Mineral Reserve extents (Alcoa, 2022)

4.3 Naming Conventions

Alcoa has developed a terminology to refer to various parts of the Mineral Lease. There are three major Mining Reporting Centers exist in ML1SA: North (previously Jarrahdale), Huntly in the central area, and Willowdale in the south. The boundaries are nominal and may change to match the planned ore destination. The southernmost region of the North mining center was reallocated to Huntly in 2017 and named Myara North.

Mining Regions subdivisions of the Reporting Centers that cover several years of mining activities, focused on a specific crusher location. The boundaries are named after forestry blocks. A total of 12 Mining Regions are represented in the current resource estimate: 1 in North, 7 in Huntly, and 4 in Willowdale.

Mining Pits are named based on their sequence along haul roads. These names are used by the mining fleet when referring to local short-term production. The map reference system outlined below is used for drilling, estimation, and long-term planning.

The Mineral Lease is divided into a grid of Exploration Sheets being rectangles 4.2 km (north) by 3.6 km (east). Each 15.12 km^2 Exploration Sheet is assigned a name and coded using letters A to V (west to east), and numbers 10 to 80 (north to south), e.g. G45.

Each Exploration Sheet is divided into 28 Production Sheets 900 m (east) by 600 m (north), an area of 0.54 km^2. The Production Sheets are assigned a number (1 to 28), sequentially 4 across (towards the east) and 7 down (towards the south), e.g. G4520.

Each Production Sheet is divided using a 15 m by 15 m grid resulting in 2,400 grid cells (40 north by 60 east). Each of these is regarded as a point, and assigned a numeric code 1 to 40 towards the south and 1 to 60 towards the east. These are appended to the Production Sheet name to provide a grid point label, e.g. G4520 1430 and used on 1:1000 Map Sheets to define drill hole locations.

The Exploration Sheet, Production Sheet, and Map Sheet conventions are shown in Figure 3-4:

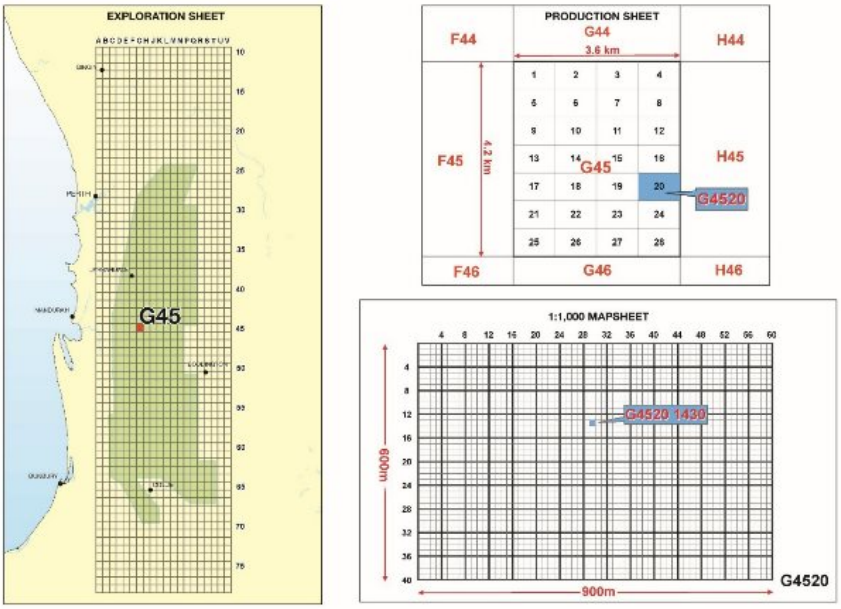


Figure 3-4: Exploration Sheet, Production Sheet, and Map Sheet conventions (SRK, 2021)

4.4 Encumbrances

Constraints on mining activities within the ML1SA concession are in place which prevent bauxite mining in these areas including:

- Within 200 m from the Top Water Level of Drinking Water Reservoirs
- National Parks
- Aboriginal Heritage Sites
- Old Growth Forest
- Formal Conservation Areas
- Within a 50 m buffer of Granite Outcrop (greater than 1 ha).

Mineral Resources and Mineral Reserves have not been defined in these restricted areas. Operating rights are obtained by Alcoa through annual submission and approval of the Mining and Management Programs (MMPs) which include mining schedules and the authorizations provided by the Mining and Management Program Liaison Group (MMPLG).

Mining on a day-only basis is conducted in “noise zones” where noise from the mining operations will potentially exceed allowable levels. The operation actively seeks to maintain lower noise levels than those

mandated, thus mining in these areas is undertaken by contract miners using smaller equipment on day shifts only.

4.5 Royalties

Alcoa is the holder of ML1SA. For bauxite that is mined and processed in Alcoa's Western Australian alumina refineries, Alcoa pays royalties on the alumina produced in accordance with the Alumina Refinery Agreement Act 1961 (WA). For bauxite that is mined and exported, Alcoa pays royalties in accordance with the Mining Act 1978 (WA).

4.6 Required Permits and Status

Alcoa operates under several State Agreement Acts as well as Ministerial Statements and environmental operating licenses issued under the Environmental Protection Act 1986 (WA) including:

- Alumina Refinery Agreement Act 1961 (WA)
- Alumina Refinery (Pinjarra) Agreement Act 1969 (WA)
- Alumina Refinery (Wagerup) Agreement Act 1978 and Acts Amendment Act 1978 (WA), which provided for the creation of the MMPLG
- Alumina Refinery Agreements (Alcoa) Amendment Act 1987 (WA)
- Ministerial Statement 728 (as amended by Ministerial Statements 897, 1069 and 1157) (MS728)
- Ministerial Statement 646
- Environmental Protection (Alcoa – Huntly and Willowdale Mine Sites) Exemption Order 2004 (Exemption Order)
- Environmental licenses L6210/1991/10 and L6465/1989/10 granted under Part V of the Environmental Protection Act 1986 (WA)

The MMPLG is chaired by the Department of Jobs, Tourism, Science and Innovation. The MMPLG was first established in 1978 and consists of representatives of the Department of Jobs, Tourism, Science and Innovation (DJTSI), Department of Water and Environment Regulation (DWER), Water Corporation, Department of Biodiversity, Conservation and Attractions (DBCA), and the Department of Mines Industry Regulation and Safety (DMIRS). The MMPLG is recognized by the Minster for Environment in Ministerial Statements (95, 390, 564, 728, 897 and 1069) regarding expansion of Alcoa operations. The management and oversight of all Darling Range operations by the MMPLG involves:

- Provide oversight to mining, infrastructure, processing and related operations within ML1SA
- Advise on the environmental and social adherence of the 5-year MMPs developed by Alcoa on a recurring annual basis.
- Provide six-monthly authorizations for ground clearance for mining in accordance with the submitted and approved MMPs.
- Provide oversight to ongoing rehabilitation of mined areas

The permitting and approval processes, as provided by Alcoa, are summarized below:

- Clause 9 (1) of the 1961 State Agreement provides Alcoa the sole rights to explore and mine the bauxite deposits within ML1SA.
- Clause 5 of the Wagerup State Agreement specifies that Alcoa must consult with the DBCA in relation to the requirement to submit annual mine plans for mining associated with the Wagerup refinery.
- Under Clause 6 (1) of the Wagerup State Agreement, Alcoa has submitted several environmental review documents to the State Government for subsequent approvals of the Wagerup refinery construction and expansions. Within these environmental assessment documents, significant information on Alcoa's bauxite mining operations associated with the Wagerup refinery was included, resulting in several conditions in relation to Alcoa's bauxite mining operations associated with the Wagerup refinery being incorporated in the Ministerial Statements of which the current one is Ministerial Statement 728 (as amended). Procedure 3 of MS728 outlines Alcoa's requirements to have a publicly available Completion Criteria document for its bauxite mining operations, developed in consultation with the MMPLG. Procedure 4 of MS728 outlines the MMPLG's authority to review and approve Alcoa's mining operations through the five-year Mine Plan process. To the extent the conditions on bauxite mining operations in Ministerial Statement 728 and the predecessor Ministerial Statements did not cover bauxite mining unrelated to the Wagerup refinery, Alcoa agreed to extend the conditions to the rest of its bauxite mining.
- Through the Wagerup State Agreement, MS728, and agreement between the State Government and Alcoa, the MMPLG is responsible for reviewing and providing a recommendation to the Minister for Environment and the Minister for State Development to approve Alcoa's five-year Mine Plans.
- Alcoa's mining operations within ML1SA are also conducted in accordance with the Environmental Protection (Alcoa – Huntly and Willowdale Mine Sites) Exemption Order 2004 (Exemption Order) made by the Minister for the Environment. The Exemption Order is consistent with the Wagerup State Agreement that established the MMPLG and MMP processes and it also reflects the procedures of MS728 that sets out the MMPLG's responsibility to review annual rolling 5-year mine plans for Alcoa's operations.

Alcoa reports that all licenses and permissions for the mining operations are currently valid. However, Alcoa is seeking formal environmental impact assessment and approval from the State and Federal Government, which is required prior to mining within the Myara North region of the Huntly mine. These approvals will be through the current process under the Environmental Protection Act 1986 (WA) and the Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth). Alcoa is seeking these approvals to facilitate an increase in production at the Pinjarra refinery and additional bauxite mining for export as well as to modernize aspects of the regulatory framework for the Huntly mine.

4.7 Other Significant Factors and Risks

SLR is not aware of any environmental liabilities on the property. Alcoa has all required permits to conduct the proposed work on the property. SLR is not aware of any other significant factors and risks that may affect access, title, or the right or ability to perform the proposed work program on the property.

5.0 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

5.1 Accessibility

As described in previous sections, the Darling Range Huntly and Willowdale operations are located approximately 150 km south of Perth. The Darling Range is readily accessible via road from Perth and surrounding areas. The mines are near the towns of Pinjarra and Waroona. Both towns are easily accessible via the national South Western Highway, a sealed single carriageway road, which starts on the southern side of Perth and continues for almost 400 km to the southwest corner of Western Australia.

Huntly is accessible from the South Western Highway via Del Park Road, a sealed single carriageway road which connects the town of North Dandalup in the north with Dwellingup in the south. From Del Park Road, a 3km sealed road following the route of the bauxite conveyor to the Pinjarra refinery provides access to the Huntly site administration offices.

Willowdale is similarly accessible 19 km from the South Western Highway via Nanga Brook Road, a sealed single carriageway road to the east of Waroona.

There are several airstrips in the region, although the closest major airport is in Perth, approximately 70 km north of North Dandalup. The nearest commercial port is at the Kwinana refinery, approximately 40 km south of Perth (as illustrated on Figure 15-1).

While an extensive haul road network and overland conveyors transport crushed bauxite from the main mining hub to the Wagerup and Pinjarra refineries, bauxite is also transferred to the Kwinana refinery via the Kwinana freight railway system, using the Kwinana–Mundijong line.

5.2 Climate

The southwest region of Western Australia exhibits a temperate climate, with very hot and dry summers (December to February) and mild winters (June to August). Rainfall is generally low and variable, ranging from an average rainfall of 25 mm during the three summer months and exceeding 200 mm during the three winter months (Australian Government, Bureau of Meteorology). Local climate conditions generally do not interrupt the mining schedule, which continues throughout the year. Occasionally however, significant rainfall inhibits access and can impact mining activities.

Table 4-1: Historical Climate Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
°C Mean Max	29.7	29.7	27.1	22.6	18.6	16.1	15.1	15.8	17.4	20.1	23.8	27.4
°C Mean Min	14.3	14.6	13.0	10.4	7.7	6.5	5.5	5.5	6.5	8.1	10.5	12.6
mm Mean Rainfall	16.5	22.0	26.8	65.1	156.4	233.7	234.9	193.4	130.1	79.2	46.2	20.6

Notes:

1. Temperature and rainfall data sourced from the Australian Government Bureau of Meteorology, collected from the weather station at Dwellingup http://www.bom.gov.au/climate/averages/tables/cw_009538.shtml

2. Data includes that collected from 1935 to 2021.

5.3 Local Resources

The Darling Range is located in an easily accessible region of southwest Western Australia with the Huntly and Willowdale mining areas both within 15 km of well-established towns which act as residential and commercial centers. Several other towns and smaller settlements are positioned along the South Western Highway which acts as a major connection for the Darling Range to the city of Perth where a far greater range of general services is available.

5.4 Infrastructure

The following section refers to several named mining areas within the Huntly and Willowdale mining centers, including Myara, Larego, Orion, and Arundel, each of which is illustrated in Figure 3-2 above.

Mining infrastructure in the Darling Range is generally concentrated in the Myara site in the northwest of the Huntly mining center, and at the Larego area in the center of the Willowdale mining area (20 km southeast of Wagerup) having been relocated 16 km southwards from the Orion Hub during 2021). Both operations include various ancillary facilities that are not listed exhaustively here, however both infrastructure areas include:

- Ore crushing and handling facilities
- Ore stockpile stacker/reclaimer
- Maintenance facilities
- Sampling stations
- Site offices including a production tracking room
- Haul road networks
- Overland conveyors, as illustrated on Figure 15-1.
- Water supplies consisting of abstraction from licensed surface water sources supplemented with treated wastewater from vehicle washdowns, stormwater runoff, and maintenance workshops. Water sources are illustrated on Figure 15-1.
    - The Huntly mine draws water from Banksiadale Dam and Boronia Waterhole. The mine also holds a license to draw water from Pig Swamp and Marrinup, although these are reported as being rarely utilized, and it is permitted to draw water from South Dandalup Dam under an agreement with the Water Corporation.
    - Willowdale Mine draws water from Samson Dam, approximately 10 km southeast of Waroona.

The Willowdale five-year mining plan recently included the relocation of the crusher from the former Orion infrastructure area in the north to Larego in the south. This included supporting infrastructure construction activities including:

- Overland conveyor construction from Arundel to Larego, as illustrated in Figure 15-1.
- Haul road development into new mining areas

- Establishment of production office facilities
- Access routes between gated mining areas and fire-fighting tracks
- Water offtake points for Larego (along the Samson Dam)

Personnel are sourced from the area around Perth, Western Australia, which benefits from a skilled workforce due to the relatively large number of operating mines in the region. Personnel typically have private accommodation in the nearby city of Mandurah (60 km from the mine) and towns (Waroona, Hamel, Yarloop, Harvey and Wagerup).

Huntly Mine has three power supplies fed from the Pinjarra refinery. A single 33 kilovolt (KV) supply and two 13.8 kV supplies. The Pinjarra refinery is a net importer of power from the South West Interconnected System (SWIS), with internal generation capacity of 100 Megawatt (MW) from 4 steam driven turbine alternators. The steam is produced by gas fired boilers and a non-Alcoa gas turbine Heat Recovery Steam Generator (HRSG).

Willowdale Mine has a single power supply fed from the Wagerup refinery. A single 22 kV supply. The Wagerup refinery is a net exporter of power to the SWIS, with internal generation capacity of 108 MW from three steam driven turbine alternators and one gas turbine. The steam is produced by gas fired boilers.

5.5 Physiography

The western edge of the Darling Range is characterized by scarps and incised valleys, landforms which are attributed to tectonic activity along the Darling Fault, the dominant structural feature in the region which acts as the western boundary of the deposits. This feature is observable in regional topographical survey information and satellite imagery to roughly follow the coastline of southwest Western Australia and is approximately demarcated by the extent of Jarrah Forest, a recognized bioregion.

The topography of the ML1SA concession generally comprises wide valleys and undulating hills separated by minor surface water drainage channels and streams. Vegetation across the ML1SA is dominated by several areas of State Forest including Dwellingup, Lane Poole, and Youraling. These include distinct areas of old growth forest within which mining is prohibited.

The typical elevation ranges from 300 m to 400 m in the mining areas, however the highest points of the region (outside of the mining areas) are approximately 550 m.

Topography data was acquired from:

- Drill hole collar survey data
- Light Detecting and Ranging (LiDAR) surveys
- Landgate satellite data.

6.0 HISTORY

6.1 Prior Ownership

Prior to 1961, there were no records of ownership of the Darling Range mines. A Special Mineral Lease (ML ISA) was granted to Western Aluminium NL (WANL) in 1961. In the same year WANL joined Aluminum Company of America Ltd (Alcoa US). In 1977 WANL became Alcoa.

6.2 Exploration and Development History

The following text is sourced and modified from Hickman, et al, 1992.

Bauxite occurrences were first recorded in the Darling Range in 1902. Bauxite was detected as a result of analysing laterite from Wongan Hills, and subsequently through examination of lateritic road gravels from several localities in the Darling Range. The Geological Survey of Western Australia (Geological Survey) produced studies and publications, driving the bauxite exploration, though most attention was focused on localities in the Darling Range close either to Perth or to railway lines servicing towns such as Toodyay and York. The Geological Survey mapped the extent of laterite in the Darling Range (close to Perth) to determine whether it contained commercial deposits of iron or aluminum ore.

The earliest non-government exploration for bauxite was carried out in 1918 by the Electrolytic Zinc Co. of Australia Pty Ltd, deeming the deposits to be generally low grade and not of commercial value, though like earlier explorers, did not focus upon the underlying friable units.

Of 46 early samples of laterite analyzed in 1919, 26 contained 35% or more available alumina. It was then assumed that bauxite in the Darling Range was confined to the duricrust part of the profile, and not considered in the underlying friable units. By 1938 bauxite deposits were known to be common throughout the Darling Range over an area of 560 km long by 40 km to 80 km) wide.

The Geological Survey maintained an interest in Darling Range laterite as an economic source of aluminum until the 1950s. However, by the late 1950s exploration had been taken over by mining companies.

No further private exploration took place until 1957 when Western Mining Corporation Ltd (WMC) began to explore for bauxite in the Darling Range. Following a regional reconnaissance, a joint venture company, WANL, formed by WMC with North Broken Hill Ltd and Broken Hill South Ltd, explored temporary reserves over a large portion of the southwest. Profiles were sampled from road cuttings, with samples collected at 400 m intervals along main roads. Selected lateritic ridges and plateaus were sampled at 90 m intervals. These areas were part of a Special Mineral Lease (ML1SA) granted to WANL in 1961.

By 1961, WANL had delineated 37 Mt of bauxite at an average grade of 33% A.Al_2O_3. Also in 1961, WANL joined with the Alcoa US, allowing additional systematic exploration of lease ML1SA (Figure 5-1). Holes were drilled initially on 370 m by 185 m centers. Progressive in-fill drilling down to a spacing of 45 m by 45 m blocked out the ore at Jarrahdale and was followed by grade-control drilling. Commercial mining was finally started in 1963 at the former Jarrahdale mining center and continued until 1998, supplying bauxite to the Kwinana refinery.

The Huntly and Willowdale mines commenced commercial production in 1972 and 1984, respectively. In 1977 WANL became Alcoa. As of 2022, the Huntly and Willowdale mining operations remain active. Huntly supplies bauxite to the Kwinana and Pinjarra refineries (approximately 27 Mtpa) while Willowdale supplies the Wagerup refinery (approximately 10 Mtpa).

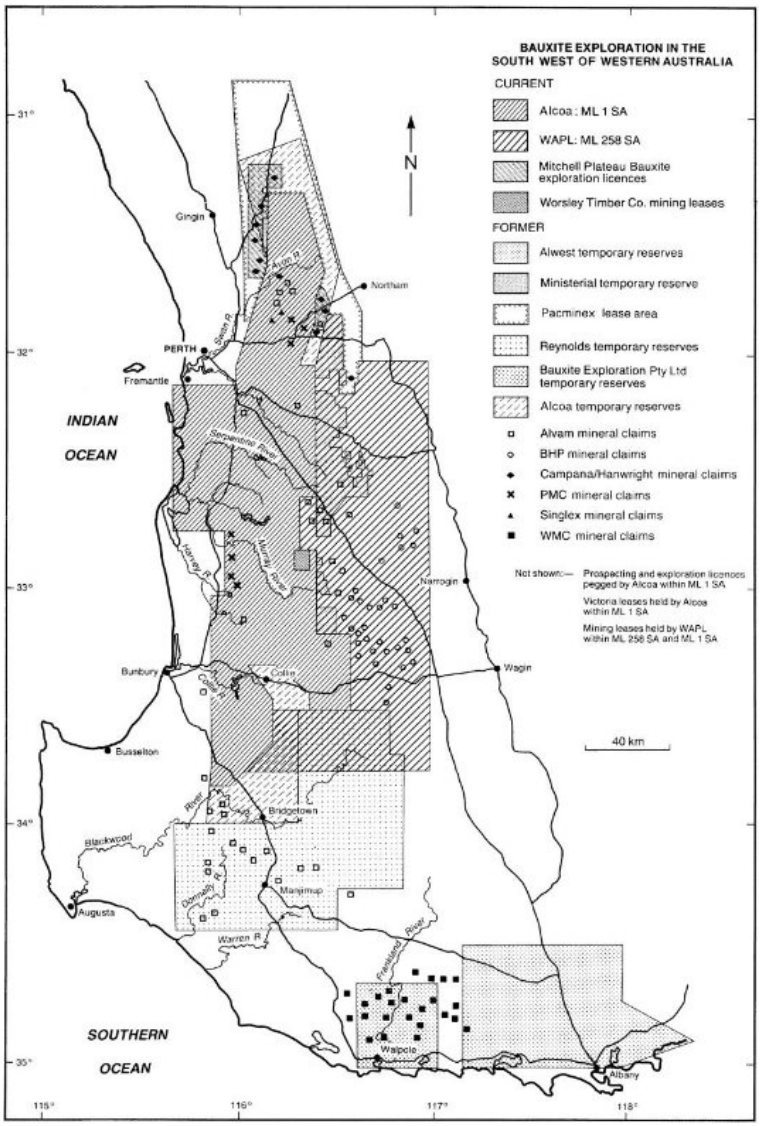


Figure 5-1: Bauxite exploration in the southwest of Western Australia 1961 (adapted from Hickman, 1992)

7.0 GEOLOGICAL SETTING, MINERALIZATION, AND DEPOSIT

7.1 Bauxite deposits

Bauxite deposits, economic concentrations of aluminum oxide, represent the world's major source of aluminum and consist primarily of the minerals gibbsite, boehmite, and diaspore. These are commonly found alongside iron oxide minerals including goethite and hematite, kaolinite clay minerals, and minor accessory minerals.

Lateritic bauxite deposits such as those in the Darling Range of WA generally formed in tropical (hot and humid) environments through chemical weathering. As a result, lateritic bauxite deposits are known to exist across Central and South America, West Africa, Central Asia, and Australia.

With its large available resources, access to a stable workforce, infrastructure (comprising conveyors, rail, road and port access), and three captive (mine-to-mill) dedicated alumina refineries, Alcoa's Darling Range Bauxite operations near Perth WA, has been one of the world's leading alumina producing regions for at least 30 years (Hickman *et al*, 1992), or almost 60 years as of 2021.

7.2 Regional Geology

The bauxite deposits of the Huntly and Willowdale operations are located in the Darling Range region of southwest Western Australia. The predominant topographic feature of the region is the Darling Range Fault, a north-south trending scarp which extends approximately 220 km from Bindoon (70 km north-northeast of Perth) to Collie (160 km south-southeast of Perth).

The Darling Range Fault is the structural boundary between two geological terranes: the Pinjarra Orogen to the west, now the sedimentary Swan Coastal Plain, and the Yilgarn Craton to the east, a gneissic granite complex with greenstones. To the east of the Darling Range Fault intense weathering and erosion of exposed Archean basement rocks of the Western Gneiss Terrane, the western portion of the Yilgarn Craton, formed widespread lateritic bauxite deposits by the intense weathering, accumulation and leaching of the aluminosilicate rich material of the bedrock granites (Hickman *et al*, 1992).

Alcoa's current bauxite mining areas of Huntly and Willowdale are on the eastern side of the Darling Range Fault, as low-lying plateaus separated by valleys in which alluvial deposits have accumulated. Figure 6-1 shows the regional geology of the southwest region of Western Australia and Alcoa's ML1SA lease boundary in relation to Perth, while Figure 6-2 shows the distribution of surficial deposits across the region.

The Jarrahdale, Del Park, Huntly and Willowdale areas that have been mined by Alcoa are on laterite within the Western Gneiss Terrane (Figure 6-2), formed over granites that have been intruded by numerous north trending tholeiitic, quartz dolerite dykes, of early to late Proterozoic age, with thicknesses ranging from 1 m to 200 m.

Lateritic bauxite developed from the Late Cretaceous (65 Million years ago, Ma) to the Eocene (40 Ma), with several periods of erosion and intense weathering of the basement granites and dolerites. Subsequent reactivation of the Darling Fault combined with periods of erosion led to the establishment of plateaus and incised valleys, trending to wider valleys and low hills to the east which now characterize the physiography of the region.

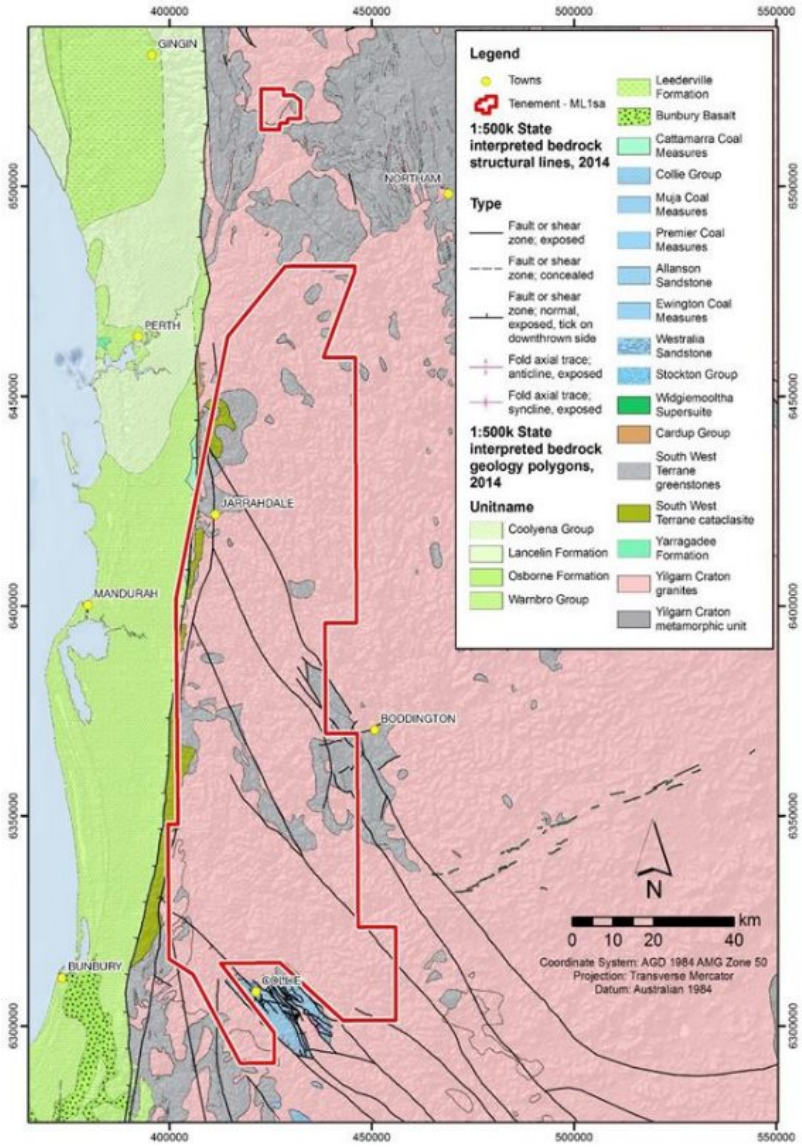


Figure 6-1: Regional Geology (adapted from SRK, 2021)

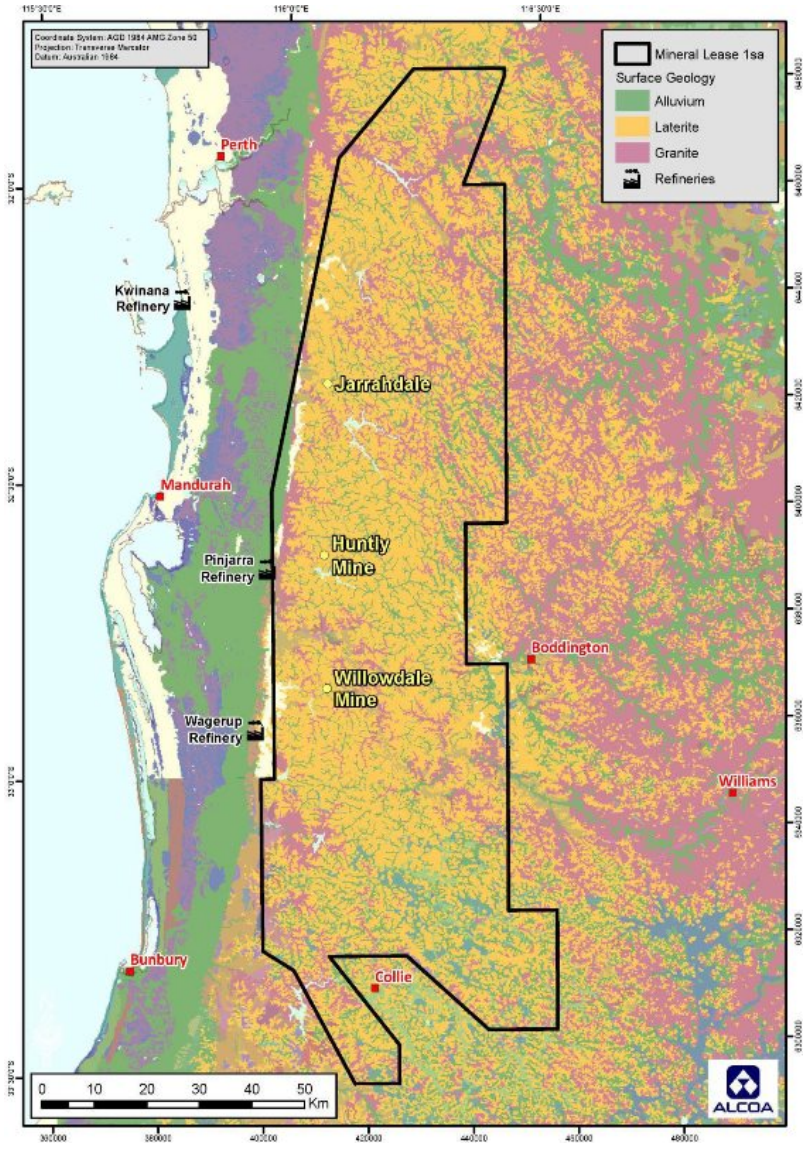


Figure 6-2: Surface geology showing laterite over granite (Alcoa, 2015)

7.3 Local Geology

Laterite remnants are thickest and most extensive over a 150 km long region between the Avon and Harris Rivers, and within about 50 km of the Darling Scarp. The laterite occupies gently sloping (3º to horizontal) upland areas with an average elevation of 280 to 300 meters above sea level (MASL), and high annual rainfall. Steeper slopes may have a thin cover of partly transported laterite with bedrock near the surface. Above 340 m the laterite is penetrated by bedrock which rises above the general topographic level. Below 200 m drainage has removed pre-existing laterite. Blocks of laterite, released by headward erosion of streams, decay to lateritic gravels on the lower slopes of valleys, which pass laterally into alluvial sands and silt in the valley floors (Hickman *et al*, 1992).

Bauxite deposits typically occur as irregularly shaped lenses on the flanks of plateaus. Critical to this is the laterite position on the slopes (Figure 6-3): erosion generally dominates on steeper slopes which prevent accumulation and effective bauxite formation, whereas flat areas lack the necessary sub-surface water flows which drive the removal of clays and the enrichment of soluble silicate minerals.

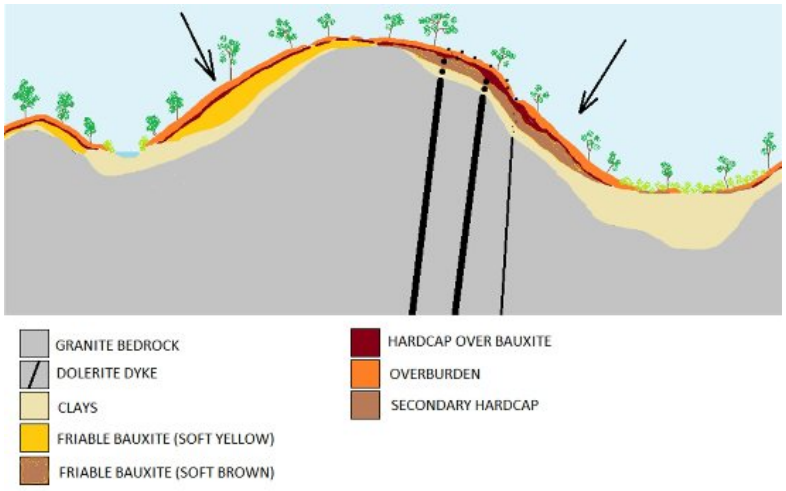


Figure 6-3: Bauxite deposit formation schematic – relief exaggerated (Alcoa, 2021)

7.4 Mineralization

Weathering, alteration and leaching of the granite bedrock has developed the bauxite mineralization which principally occurs as 65% microcrystalline gibbsite $Al(OH)_3$ with minor to rare boehmite AlO(OH), and accessory minerals of 18% goethite FeO(OH), 7% hematite Fe_2O_3, 9% quartz SiO_2, 1% kaolinite/halloysite $Al_2Si_2O_5(OH)_4$, and 0.5% anatase/rutile TiO_2.

Other minerals within the bauxite that may influence the alumina refinery performance include:

- Boehmite: generally occurring below 1%, this can cause premature precipitation of dissolved gibbsite resulting in alumina being lost to the red mud residues.
- Organic Carbon: as oxalate, typically less than 0.2%, (2.0 kg/t, measured as $Na_2C_2O_4$) this can result in reduced digestion efficiencies and cause crystal growth issues during precipitation.
- Sulphate: generally occurring at 0.25%, this can consume caustic soda during digestion resulting in lower yields.

7.5 Property Geology

Table 6-1 provides a summary of the typical stratigraphy defined by Alcoa across their Darling Range deposits. The Hardcap and Friable Zones represent the primary horizons of economic interest due to their concentrations of alumina. A generalized mineralogical profile through these horizons is provided in Figure 6-4 and a typical grade profile in Figure 6-5 showing the alumina and iron-rich Hardcap, with increasing silica and decreasing alumina through the Friable Zone.

Table 6-1: Alcoa's Darling Range deposit typical stratigraphic column

Stratigraphic horizon	Typical thickness range (m)	Description
Overburden	0 to 0.5	Mixed soils and clays, high in organic matter, generally forming a thin layer which can penetrate deeper if the underlying Hardcap surface is variable.
Hardcap (Caprock)	1 to 3	Ferricrete formed by the remobilization of iron into a layer comprising iron and alumina-rich nodules which can exhibit the highest alumina concentrations across the deposit. Highly variable in thickness but generally 1 m to 3 m with a sharp contact against the underlying Friable Zone.
Friable Zone	3 to 5	Leached horizon resulting in the accumulation and enrichment of bauxite minerals. The Friable Zone comprises a mixture of the overlying Hardcap, clasts, Al and Fe rich nodules, and clays. Upper contact with the Hardcap is variable, found as a sharp or transitional boundary in places. Available Alumina ($A.Al_2O_3$) typically reduces with depth as Reactive Silica ($R.SiO_2$) increases, defining the lower boundary with the Basal Clay.
Basal Clay	-	Kaolinitic clay horizon which, transitions into a saprolitic zone above unweathered basement. This horizon is typically used as a marker indicating the full bauxite zone has been intersected and where drilling is often stopped.

Alcoa's bauxite deposits across the Darling Range show high variability in both the thickness and relative proportion of each horizon. Table 6-2 provides an extract from the acQuire database for the Mining Centres of Huntly (in the north) and Willowdale (more southerly) showing the most common (modal) Depth To Top and Thickness of the four stratigraphic horizons, based on logged drill holes from 2016 to 2020.

Table 6-2: Summary of typical (modal) stratigraphic horizons within each area

Area	Description (m)	Overburden	Hardcap	Friable Zone	Basal Clay
Huntly	Depth to top	-	0.64	1.51	4.54
	Thickness	0.64	0.87	3.04	-
Willowdale	Depth to top	-	0.58	1.51	4.91
	Thickness	0.58	0.93	3.40	-
North	Depth to top	-	0.64	1.78	4.45
	Thickness	0.64	1.14	2.67	-

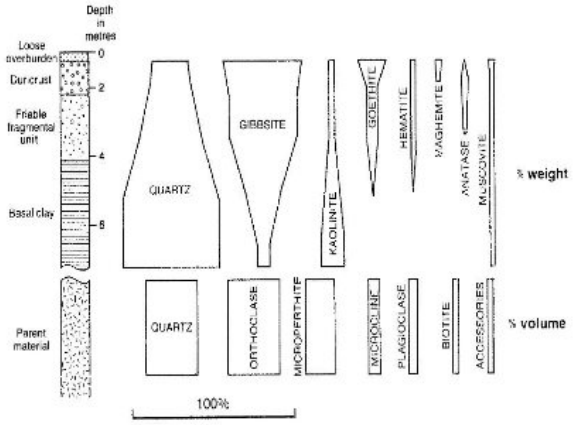


Figure 6-4: Typical Alcoa Darling Range mineralogy profile (Hickman et al, 1992)



Figure 6-5: Typical Alcoa Darling Range grade profile (Alcoa, 2015)

Typical photos of the bauxite profile in current mining areas observed on 14 October 2021 are provided in Figure 6-6.

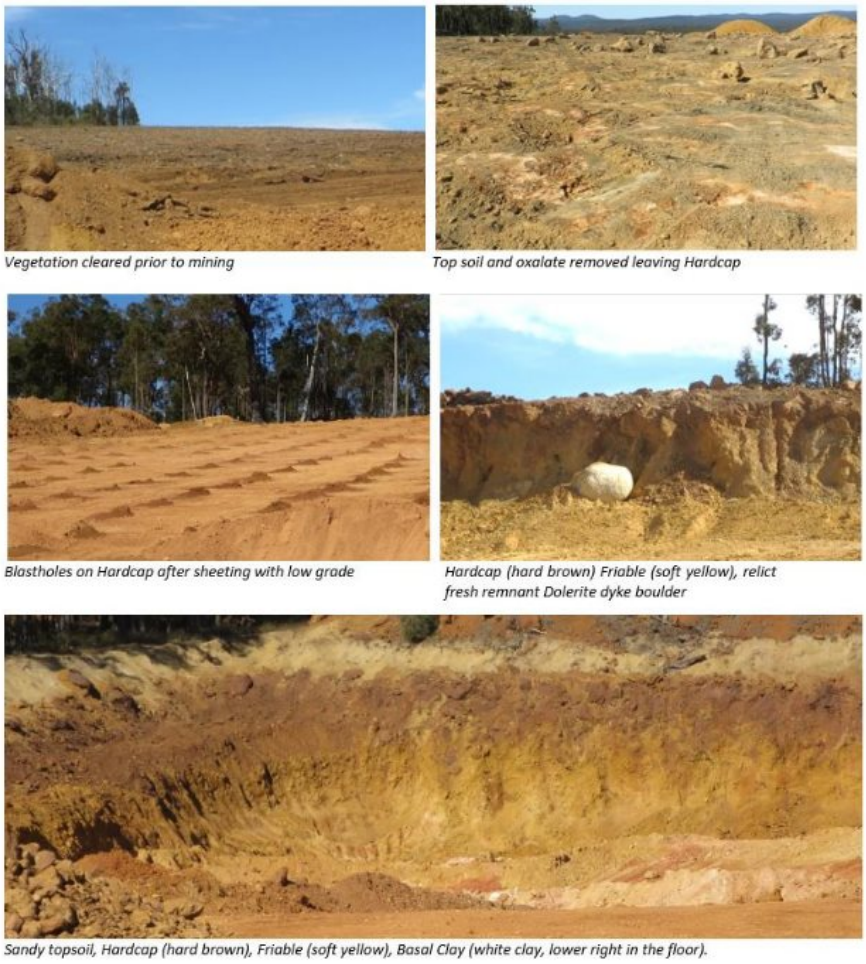


Figure 6-6: Typical Alcoa Darling Range mining sequence and vertical profile (SLR, 2021)

8.0 EXPLORATION

8.1 Exploration

WANL, which became Alcoa (in 1977), carried out exploration over much of the ML1SA lease area in the 1960s as mentioned in Section 5.2. Samples were assayed for Total Al_2O_3 only and the data, referred to as the Imperial Drilling, is still retained comprising approximately 104,400 holes and approximately 670,000 samples.

The Imperial Drilling has not been used to prepare the current Mineral Resource estimate because the sample collection, preparation, and assaying techniques were not consistent with current practices and can no longer be validated.

8.2 Resource Definition Drilling

Resource definition drilling is initially done on a nominal regular grid spacing of 60 by 60 m. Infill drilling programs are then scheduled as required to reduce the drill spacing to 30 by 30 m, and then 15 by 15 m.

The planned drill hole collars are assigned a hole identifier (Hole ID) using the code of the 15 by 15 m grid point on the 1:1,000 Map Sheets (Section 3.3).

The drilling and sampling database used for resource estimates contains data acquired from over 1.8 million holes drilled between the early 1970s and 2021. A total of 310,906 holes are located within approximately 30 m of the 2021 resource blocks and theses holes were drilled between 1981 to 2021, with approximately 80% drilled after 2009.

A tabulation of the drill quantities by year and location is presented in Table 7-1, and a graphical summary is shown in Figure 7-1.

Table 7-1: Drill quantities by year and location

Year	Holes				Meters				Assay			
	Huntly	North	Willowdale	Total	Huntly	North	Willowdale	Total	Huntly	North	Willowdale	Total
1981	613			613	5,216			5,216	9,748			9,748
1983	189			189	1,036			1,036	1,804			1,804
1984	941			941	6,711			6,711	11,456			11,456
1985	367			367	2,614			2,614	4,608			4,608
1990	251			251	1,620			1,620	2,955			2,955
1991	1,544		1,179	2,723	8,528		9,090	17,618	15,023		16,428	31,451
1992	5,269		1,760	7,029	29,335		12,706	42,041	51,432		22,986	74,418
1993	1,808		490	2,298	10,230		3,173	13,403	17,973		5,839	23,812
1994	5,838	632	1,145	7,615	32,694	4,019	6,348	43,061	56,873	7,103	11,010	74,986
1995	3,605	79	2,086	5,770	21,800	477	11,911	34,188	38,505	871	21,509	60,885
1996	5,036	336	836	6,208	28,387	1,522	5,125	35,034	49,934	2,667	9,274	61,875
1997	666		3,672	4,338	4,077		22,923	27,000	7,359		41,282	48,641
1998	372		912	1,284	2,495		5,411	7,906	4,603		9,784	14,387
1999	323		721	1,044	2,091		3,448	5,538	3,851		6,062	9,913
2000	232		213	445	1,530		1,266	2,796	2,773		2,287	5,060
2001	670		583	1,253	5,915		3,753	9,668	10,878		6,815	17,693
2002	1,087		214	1,301	9,886		1,190	11,076	18,293		2,110	20,403
2003	253		1,282	1,535	1,745		8,185	9,929	3,142		14,908	18,050
2004			264	264			1,354	1,354			2,459	2,459
2005	558		1,604	2,162	4,086		9,010	13,096	7,420		16,360	23,780
2006	1,090		794	1,884	8,113		4,736	12,849	14,973		8,680	23,653
2007	3,668		3,594	7,262	25,693		22,947	48,640	47,450		41,689	89,139
2008	2,036		556	2,592	12,723		3,248	15,970	23,072		5,865	28,937
2009	3,046		255	3,301	18,219		1,381	19,600	32,613		2,481	35,094

Year	Holes				Meters				Assay			
	Huntly	North	Willowdale	Total	Huntly	North	Willowdale	Total	Huntly	North	Willowdale	Total
2010	6,825		1,114	7,939	40,575		7,669	48,243	71,959		14,160	86,119
2011	10,600		880	11,480	60,565		6,172	66,737	106,091		11,236	117,327
2012	10,755		1,170	11,925	64,041		9,192	73,234	113,088		16,916	130,004
2013	14,006		2,600	16,606	88,290		21,940	110,230	155,854		40,472	196,326
2014	13,283		10,616	23,899	76,166		72,592	148,757	135,466		132,814	268,280
2015	21,215		10,752	31,967	121,628		65,444	187,072	215,338		118,527	333,865
2016	18,597		856	19,453	110,030		4,997	115,026	194,987		8,957	203,944
2017	9,464		9,110	18,574	51,789		55,021	106,809	90,914		97,972	188,886
2018	12,597		9,485	22,082	68,224		51,037	119,261	120,355		90,291	210,646
2019	16,144		13,287	29,431	95,715		90,153	185,868	170,082		163,143	333,225
2020	17,408		16,041	33,449	90,666		102,122	192,788	159,400		184,176	343,576
2021	11,021		10,411	21,432	69,545		79,810	149,355	123,076		146,100	269,176
Total	**201,377**	**1,047**	**108,482**	**310,906**	**1,181,977**	**6,018**	**703,351**	**1,891,346**	**2,093,349**	**10,641**	**1,272,592**	**3,376,582**

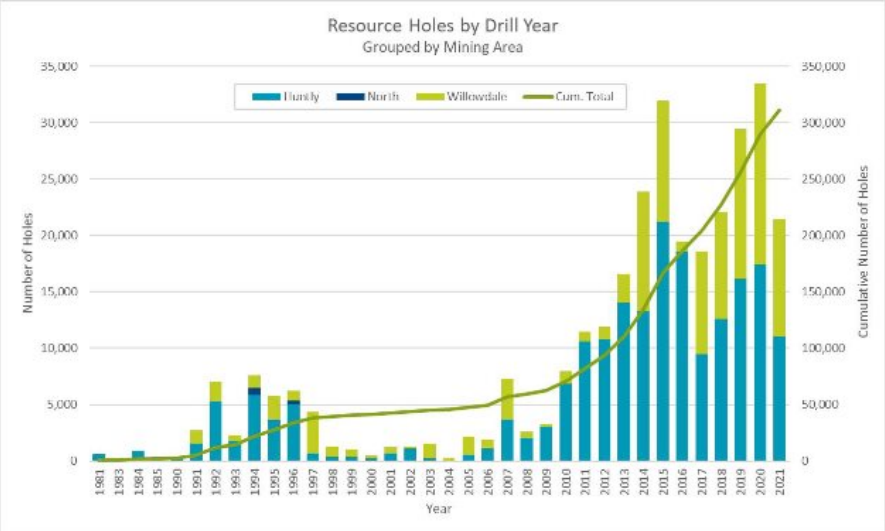


Figure 7-1: Chart of resource drill holes by year (Alcoa, 2021)

The Darling Range deposits contain more than 3 million drillholes distributed across a lease of over 7,000 km^2, making it unfeasible to show a plan view of the property with the locations of all drill holes and other samples. Figure 3-3, however, shows the lateral extent of Alcoa's mined areas and Mineral Resources and Mineral Reserves within the ML1SA lease. The Darling Range bauxite project is considered to be in the process of sustaining Mineral Reserve from already defined mineralisation, rather than in Exploration mode. Resource Definition drilling is planned to continue throughout all areas where Alcoa has mining permits as described, to sustain the Mineral Reserves and future production. Figure 7-2 shows a typical section through 30 m spaced Resource definition drillholes:

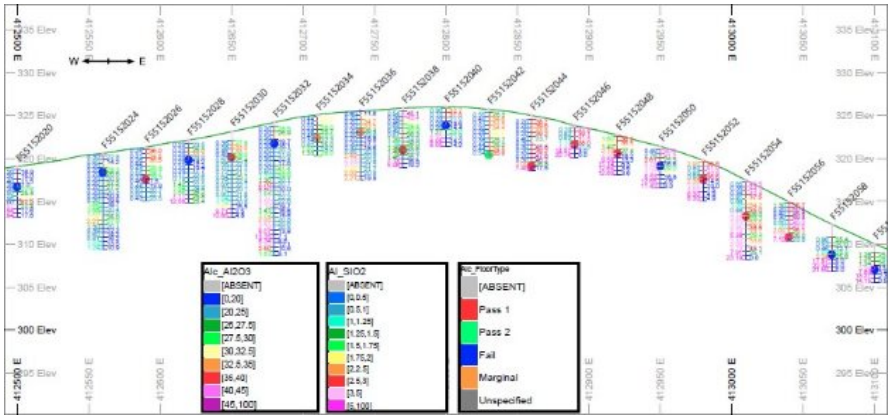


Figure 7-2: Example geological section – F55 N 6,325,500 (SRK, 2021)

8.3 Drilling methods



The methods currently used for drill sampling in the Darling Range by Alcoa have been consistently used since the 1980s. Drilling is done using dedicated drills mounted on a fleet of tractors which can be driven off tracks into the forest, causing minimal damage or disturbance and obviating the need to clear drilling pads. Planned hole positions are located by the driller using Global Positioning System (GPS). The articulated tractors are highly maneuverable and there is only minor disruption to groundcover vegetation and saplings which may be eased out of the way (Figure 7-3).

Figure 7-3: Resource drilling tractor accessing the forest (SLR, 2021)

Drilling is completed by; Alcoa using vacuum drill rigs, by contractor Wallis Drilling using their patented reverse circulation (RC) aircore rigs, and by contractor JSW using a similar RC method. Wallis and JSW holes are both referred to as aircore drilling. In 2021 there were 5 Alcoa rigs, 3 Wallis rigs, and 4 JSW rigs.

In recent years the drilling period has been extended from 9 to 10 months. More wet ground is now encountered and, where required, vacuum drilling is either deferred until the ground conditions improve, or is re-assigned for aircore drilling.

Drilling is rapid with holes typically completed every 15 minutes from locating the collar position to completing the drilling, cleaning the sampling equipment and readying the samples for despatch. While 12 rigs are currently used, the procedure is consistent across all rigs and virtually unchanged since the early 1990s at Jarrahdale. Minor modifications to the drilling procedures that have occurred include (in order of importance for their impact on the resource database):

- Drilling initially was done by vacuum rigs but this has been supplemented by the aircore rigs.
- GPS methods have been introduced to locate the drill hole collar positions in 3D space, providing more precision on the hole and sample locations (noting that hole positions are assigned to the planned position, see Section 7.6.
- The sample catching, splitting and logging procedures have been progressively upgraded, following review by various independent consultants (Holmes, 2018; Snowden, 2015; SRK, 2017, 2018, 2019b, 2021a; Xstract, 2016). The riffle splitting system has been enhanced through simple changes to provide a better, more robust method.
- The logging system has changed from manual paper plods to a completely digital recording system, albeit with paper backup where needed. Barcodes are now used on samples and matching these to the logs is now semi-automatic.
- The splitting and logging equipment on the drill rig has been progressively improved to make setup and pack-down more efficient and to protect the logging equipment during site moves.
- Rollover bars, guards, shields, lockouts and other safety protections have been added and safety procedures enhanced with industry norms.
- Environmental protections and reporting have been enhanced to best practice in SLR's opinion.

Samples used for Mineral Resource estimation are only acquired using vacuum drilling or aircore reverse circulation. Both methods generally drill dry holes in that water is not added. Water ingress into vacuum holes destroys the sample circulation and wet holes are abandoned. Alcoa commenced aircore drilling in 2015, with the initial plan being to phase out vacuum drilling. The prime advantage of aircore over vacuum is sample recovery when holes do encounter groundwater.

For the 2021 Mineral Resource inventory, 12% of the estimation dataset is derived from aircore holes. In the 2019-2021 drilling for which assay data is available, 79% was performed using aircore (71% for Huntly and 89% for Willowdale).

In vacuum drilling the sample is finely ground and sucked up from the bottom of the hole by a top-mounted vacuum pump. In aircore drilling, compressed air is blown down the annulus between the inner and outer drill string tubes, pushed out through ports on the face of the bit and then blows the sample through the centre of the bit and up the drill string.

In both methods, the sample material is extracted from inside the bit, avoiding sample delineation error (contamination), and carried up the centre of the drill string into the sampling container, avoiding sample extraction error (sample material left down the hole or lost as dust).

The aircore drilling uses a blade bit with a nominal cutting diameter of 45 mm and an internal retrieval tube diameter of 22 mm (Figure 7-4). Alcoa increased the internal diameter to 25 mm in 2018 to reduce blockages. The particle size of drilled material is sufficiently small (less than 10 mm) to promote good sample splitting in dry conditions.



Figure 7-4: Drill bits, reverse circulation drill string and particle size of the sample residue (SLR, 2021)
Scale pen diameter 13 mm

8.4 Drill sampling

8.4.1 Procedure

The sample catching, splitting and logging procedures are the same for both vacuum and aircore drilling (Figure 7-5).

The drilling and logging are controlled by the driller with minimal supervision by geologists. This has been observed and is deemed reasonable by the SLR QP due to the combination of very simple logging, experienced personnel, employment continuity and continual review by geologists.

Sampling commences at the base of the overburden and continues until the driller considers that the basal clays have been penetrated for at least 1 m or for infill holes at a 15 m spacing to the depth defined on the drill hole plan from surrounding data. Alcoa estimates that between 10% and 15% of the limited depth holes terminate in bauxite.

Samples are collected at 0.5 m intervals, measured using a laser gauge mounted on the rig. At the end of each 0.5 m interval, the drilling is paused and the sample passes from the cyclone (for aircore) into the collection flask. For vacuum drilling the collection flask is at the end of the vacuum system.

The sample, nominally 1.5 kg, is poured from the flask into a feed tray, distributed evenly, then on the vacuum rigs the tray is pivoted to feed a small 12-vane riffle splitter (the rotating tray is excellent but not

yet fitted to the aircore rigs). Where (usually) required, the splitting is repeated to give a retained split of 150 to 200 g, small enough to be collected into a 120 mL measuring cup with minimal spillage. The riffle split subsample is poured into a barcoded Kraft packet and boxed for despatch to the assay laboratory. The sample retrieval and splitting systems are cleaned with compressed air after each hole.

During the site inspection, the JSW RC sampling procedures were observed closely. It was found that the principles of correct sampling were understood by all personnel at the rig and the equipment and practices were observed to be satisfactory.

Over the period 2015 to 2021 the drill sampling procedures have been externally reviewed (Snowden, 2015; Holmes, 2018; and others) and various improvements have been made such as using riffle splitters with more vanes, using a pivoting tray to consistently feed the splitter, training in the correct splitting and retention of all the subsample, digital recording of logging, monitoring of accuracy with Standards, and monitoring of precision with duplicates.



Figure 7-5: Sample catching and riffle splitting practices (SLR, 2021)

8.4.2 Recording sampling data

The drill hole and sample information is recorded digitally onto a tablet at the rig during drilling (Figure 7-6). The data is automatically loaded into an acQuire database. In previous years the same information was all recorded in a ticket book and manually transferred to the database. This approach remains as a backup method when needed. Data recorded includes hole number, drill rig number, driller name, offsider name, depth of overburden, depth of Caprock, map reference, material type code, and comments on the reason for ending the hole, e.g. if bedrock or water was encountered.



Figure 7-6: Barcode reader and digital recorder mounted on the drill rig (SLR, 2021)

8.4.3 Sample logging

The geology of the Darling Range bauxite is well understood. The Material Type codes have been simplified to meet the production needs of the operation and the drill crew has been trained in their identification, which is primarily based on color and hardness.

This results in logging of a reasonably consistent regolith profile formed by surface weathering of the few bedrock types (granite or dolerite). A comprehensive geological log is not produced but the Material Type codes can be ratified by the assay results. The Material Type codes are provided in Table 7-2.

Table 7-2: Logging codes for Material Type

Material Type	Description	Comment
HB	Hard brown	Hardcap and Friable Zone
HSB	Hard / soft brown	
SB	Soft brown	
SY	Soft yellow	
CLB	Clayish brown	
CLY	Clayish yellow	Basal Clay Zone
BC	Brown clay	
YC	Yellow clay	
WC	White clay	
DOL	Dolerite	Intrusion

Material Type	Description	Comment
GR	Granite	
WET	Wet	Other
ROD	Broken rod	

8.5 Topography

Topography data was acquired from:

- Drill hole collar survey data and check surveys performed using Trimble R10 real time kinematic differential global positioning system (RTK DGPS) equipment
- LiDAR surveys conducted in April 2015, November 2016, and June 2018 (no further surveys have been required). A plan showing the LiDAR coverage for each survey is provided in Figure 7-7.
- Landgate satellite data collected in the late 1990s.

A digital elevation model representing the natural surface was prepared by combining (in order of priority) the collar survey data, the LiDAR data and the satellite data.

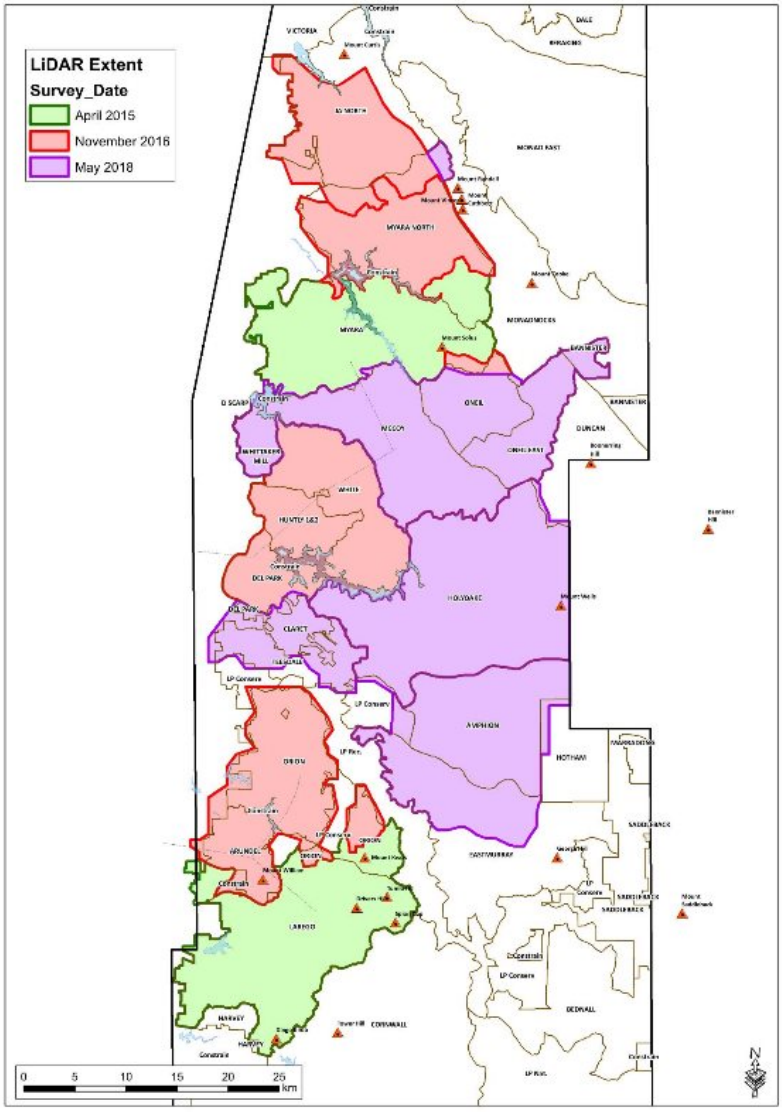


Figure 7-7: Topographic data coverage of the 2015, 2016 and 2018 LiDAR surveys (Alcoa, 2022)

8.6 Surveying

Alcoa has consistently drilled the Darling Range bauxite deposit on a 60 by 60 m grid (with infills to 30 by 30 m and 15 by 15 m) since the 1970s. Initially collar peg positions were surveyed using either a theodolite or Total Station. The 30 m and 15 m pegs were positioned between the 60 m pegs using tape and an optical square. Alcoa commenced using GPS survey control (RTK DGPS) in mid-2015.

Drilling is conducted before any forest clearing activities, which are only carried out for mine development. Positioning the drill rigs is thus imperfect. If the actual coordinates are within 2 m of the planned coordinates, the hole is considered to be correctly located, and the planned coordinates are used in in all subsequent processing. Holes that are collared more than 2 m away from the planned location are flagged accordingly in the database, but the planned coordinates are still used in preference to the actual locations. In 2015, Alcoa commenced check surveying of collar positions after drilling. Most of the holes drilled in 2016 and 2017 were check surveyed. Major discrepancies, such as large differences between the actual coordinates and the coordinates defined by the hole identifier, are investigated and corrected in the database.

The planned coordinates at the 15 by 15 m grid points on Map Sheets (see Section 3.3) are used in preference to the actual coordinates because the original resource delineation systems (Polygonal and GSM, see Section 11.3) were based on the use of regularly gridded data. The use of planned instead of actual coordinates does introduce some uncertainty in the local sample position and consequently the local estimates. However, it is noted that:

- The lateral error is random, small in magnitude compared to the smallest drill grid spacing (15 m), and monitored (Figure 7-8) with deviations from plan greater than 7 m redrilled.
- The error affects few holes (for 2020 of the 52,546 holes drilled, 65.0% were within 2 m, and 99.7% within 5 m).
- The long range of the grade continuity of mineralization as shown by the variograms is several hundred meters.
- The local small-scale variations on the grade of mineralization due to variations in the amount of lateralization are uncontrolled and unpredictable (see discussions of drill hole twinning in Section 8.5.3.3).
- The effect is a controlled ‘random stratified grid’, given that the nominal collar position is always used for estimation and there is no evident bias.

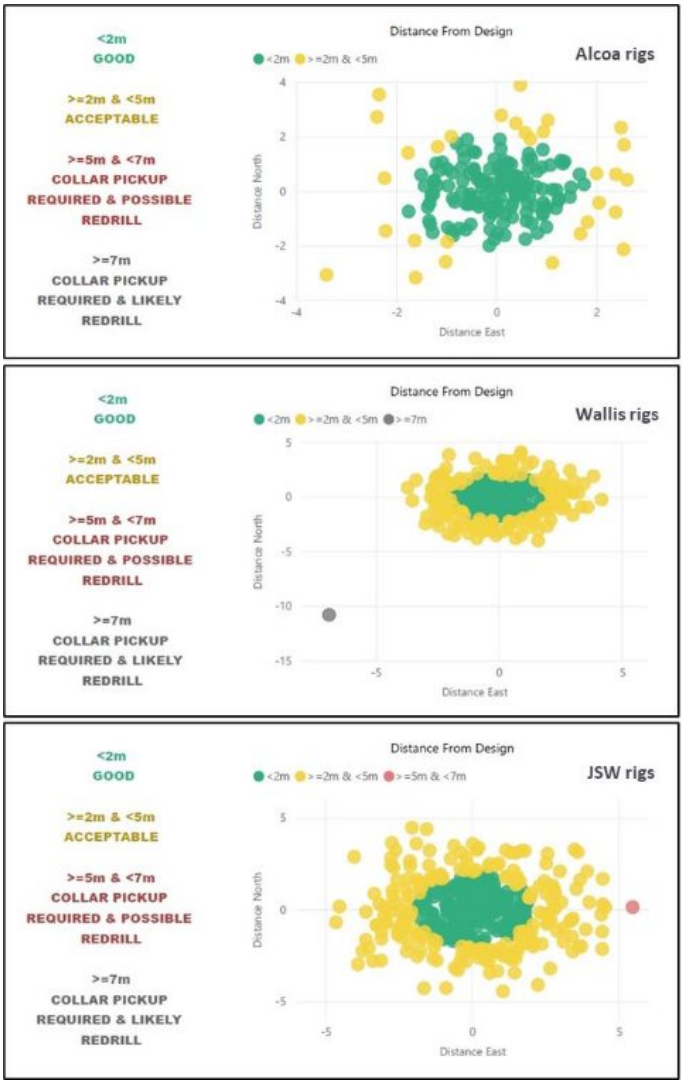


Figure 7-8: Error in actual collar location from the nominal (planned) position is monitored for the three drill rig types (Alcoa, 2021)

Downhole surveys are not performed in drill holes because of their generally shallow depth and narrow diameter, so all holes are assumed to be vertical.

The drill rigs have limited capacity to be levelled and cannot drill angled holes, so in some circumstances the holes may be drilled perpendicular to the natural surface. The rigs are designed to safely operate on gradients of up to 15°, so holes could be drilled up to 15° off the vertical. For a 6 m hole drilled at the planned collar position, the offset may be up to 1.55 m horizontally and 0.2 m vertically (Figure 7-8).

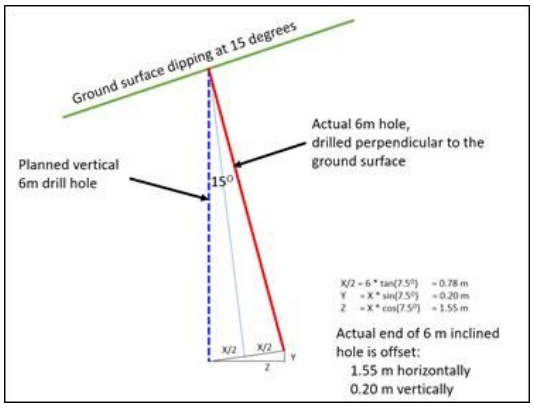


Figure 7-9: Possible lateral and vertical sample location error on 15° sloping ground (SLR, 2021)

The impact of differences between the actual locations of samples in 3D space compared to their nominal location on the mine plan is considered to not materially impact on the Mineral Resource because the errors in the spatial controls on mining are likely to be of the same magnitude as the spatial errors in mining (±2 m laterally and ±0.3 m vertically). Mining is locally controlled by DGPS on mining equipment to meet short-term plans and visually for indications of the base of ore (e.g., WC white clay).

8.7 Sampling conclusions

In the SLR QP's opinion, the drill sampling and sample control procedures at Alcoa's Darling Range Bauxite Operations are adequate and appropriate for use in the estimation of Mineral Resources. The defined volumes and grades of mineralization are not expected to be systematically impacted (biased) by errors in either the collar location or the 3D sample location.

8.8 Hydrogeology Data

No site-specific hydrogeological data is available; however, no hydrogeological considerations are required for the definition of mining plans in Alcoa's Darling Range operations.

8.9 Geotechnical Data

No site-specific geotechnical data is available; however, as the slopes are so shallow, no geotechnical considerations are required for the definition of mining plans in Alcoa's Darling Range operations.

9.0 SAMPLE PREPARATION, ANALYSES, AND SECURITY

Sample preparation is performed by Bella Analytical Systems (Bella). Although the laboratory is located within Alcoa's Kwinana Refinery complex and only processes Alcoa material, it is independently owned and operated by Bella. A link exists between the Bella and Alcoa Laboratory Information Management System (LIMS) for the two-way exchange of data. The laboratory does not have Australian National Association of Testing Authorities (NATA) accreditation.

All assays produced by Bella are monitored and controlled by Alcoa at the Kwinana Mining Laboratory (KWI), which, although it has a QA/QC system based on ISO 9001 protocols, only has one section of the laboratory certified to ISO 9001 for the purpose of certification of shipment assays of alumina.

A robotic processing system is used to prepare each sample for Fourier Transform Infrared Spectrometry (FTIR) and Reference Method (REF) testing. This entails pulverizing each sample in a flow-through ring mill to a nominal grind size of 85% passing 180 µm, and then splitting off sufficient material to fill a barcoded scanning flask (20 mm high with an 80 mm diameter). The material from the ring mill is discharged through a rotary splitter, with approximately 80–100 g of material retained for geochemical testing, and the remainder discarded. A duplicate sample is collected from 1% of the samples via a rotary splitter fitted with twin select chutes. These samples are used for Reference Methods testing.

9.1 Sample security

Subsamples are collected by the drillers, sealed into Kraft packets with barcodes and submitted for assay. Cardboard boxes holding 50 packets are delivered at the end of each shift, by the drilling crew, to secure sample storage facilities. Unfilled boxes are stored in the drill support vehicle and completed in the next shift.

The filled sample boxes are stacked onto pallets in batches of 40 (i.e., 2,000 samples), wrapped with plastic and despatched by courier to the Bella assay facility at the Kwinana Refinery.

9.2 Sample preparation

Upon receipt by Bella, the sample barcodes are scanned and checked against the submission data in the Bella LIMS. Each sample packet is then split open at the top, placed in a cardboard drying tray and oven-dried at 100°C for 10 hours. The packets are transferred to a customized holder in batches of about 60, with a control between each batch, and automatically fed to a bank of 10 Rocklabs flow-through ring mills, (Figure 8-1), each of which have three concentric milling rings. The barcode is read, the sample is pulverized, a subsample is rotary split, captured in a single-use plastic Petri dish with the barcode printed on the lid, then sent to the spectral analyzer for assay. The ring mills are air flushed and vacuumed between samples.

Each sample is pulverized to a nominal grind size of 85% passing 180 µm. The ring mill discharges through a chute and rotary splitter, retaining 80 to 100 g and discarding the rest. One of the ring mills is set up to take two splits and these are used for pulp duplicate assays and to generate the Reference (REF) samples. These are sent to the KWI for wet chemical assay checking of the spectral assay.

The robotic system can run 24 hours a day handling approximately 3,000 samples per day. Only the Mineral Resource estimation samples are processed at Bella with all other stockpile and processing control samples processed using the same methods as the REF samples.



Figure 8-1: The Bella robotic sample preparation using Rocklabs ring mills (SLR, 2021)



Figure 8-2: The pulverized sample is stored in a barcoded dedicated receptacle for assay (SLR, 2021)

A LIMS system controls the progress of the sample packet through the whole of the sample preparation and assay procedure enabling digital tracking of all stages (Figure 8-3). This ensures *inter alia* that the sample is valid, not previously assayed, and the assay looks like one for a bauxite sample. It also generates pulp duplicates at a frequency of 1 in 100 which are also the REF samples.

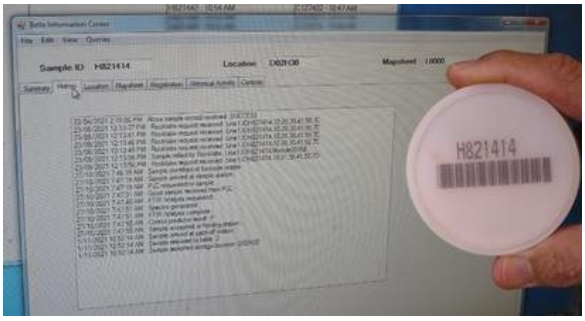


Figure 8-3: The pulverized sample is tracked digitally through the Bella preparation and assaying (SLR, 2021)

Grind size monitoring is carried out with the advantage of the robotic sample preparation being consistent grind size (see Section 8.5.1). A risk with all such systems is the possibility of contamination between samples. This is usually avoided by inserting blank samples of zero grade into the sample processing stream. The difficulty is that the blank samples may themselves contaminate the next sample being assayed. Blank sample submission is discussed in Section 8.5.2.1.

9.3 Assaying

Assaying of the drill samples is based on a spectral method, using a Nicolet 6700 FTIR Spectrometer with a robotic feeder (Figure 8-4). FTIR obtains an infrared absorption spectrum from the sample. The FTIR spectrometer simultaneously collects high-resolution spectral data over a wide spectral range. A

mathematical process (Fourier transformation) converts the raw data into the actual spectrum for subsequent determination of the component analytes.

All drill samples are currently assayed using a customized, bespoke FTIR method, with the final corrected results used for Mineral Resource estimation. Calibration and monitoring of the FTIR results are done using the Reference Method assay results.

Bella generates the raw FTIR spectral dataset for each sample, which is transferred to the Alcoa LIMS system for post-processing. Alcoa performs all the Reference Method analyses at KWI.

The FTIR spectra are determined using a robotic scoop arm that collects an approximately 5 g aliquot of the pulp from the Petri dish and presents it to a platinum crucible. The material in the crucible is pressed flat to ensure an even surface for scanning. The crucible is then rotated several times through the spectrometer and 20 scans are conducted on the aliquot. The scans are processed and validated by the Bella system and when accepted, they are then transferred to the Alcoa LIMS system for post-processing and further validation.

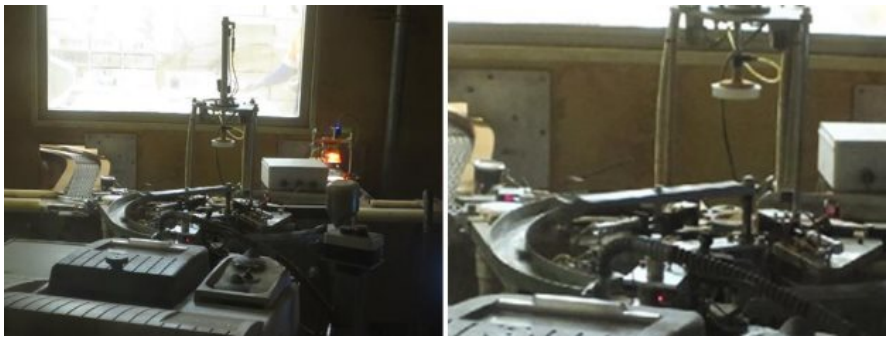


Figure 8-4: The robotic FTIR assaying equipment
(RHS shows the sampling scoop arm and pulp dish with the lid elevated) (SLR, 2021)

9.3.1 FTIR Method assays and the CalVal dataset

The FTIR Method for bauxite assay uses infrared absorption spectra to characterize the presented sample for multiple analytes as element, compound, or mineral percentages. The approach has been developed using an extensive calibration and validation (CalVal) dataset, constant monitoring of Reference samples and Standards, and periodic revision of the prediction algorithms.

In 1990, an initial set of approximately 2,300 CalVal samples was collected covering the Darling Range tenement. A subset of approximately 700 samples was used to develop the initial FTIR prediction model. Extra CalVal samples have been added to help predictions in areas of low Reactive Silica (less than 0.5% R.SiO_2) and high Total Iron (greater than 50% Fe). The CalVal samples are run randomly through the FTIR equipment in triplicate, under differing conditions (time of day, season, operator, order, etc.) to test for external factors. The FTIR results based on the prediction model algorithm are monitored using the REF assays (Franklin, 2019).

Initially some FTIR analytes (Available Alumina, Total Iron, Carbonate, Sulphate, Total Silica, Total Phosphorus and Magnetic Susceptibility) were all determined using a 'common' algorithm, whereas Reactive Silica, Oxalate, Extractable Organic Carbon, Total Alumina and Boehmite each used a specific algorithm. Since 2017 specific algorithms have been used for all analytes. The algorithms are periodically updated, typically if there has been a change in equipment or Reference Method. Retaining all FTIR spectra now means additional analytes can be determined using specific algorithms, with three new analytes being added to Method Set MIC#00005 in 2021 (Potassium, Titanium and Gallium).

9.3.2 Reference Method (REF) assays

The REF assaying is done by Alcoa in the KWI to validate and calibrate the FTIR assays. This is a suite of assays and tests that are carried out by wet chemical and other means and has included:

- XRFx-ray fluorescence spectroscopy
- ICP-OESinductively coupled plasma optical emission spectrometry
- XRDx-ray diffraction
- MSmagnetic susceptibility, a proxy for grindability
- BD-ICPbomb digest in a caustic solution, with an ICP-OES finish
- BD-GCbomb digest in a caustic solution, with a gas chromatography finish
- BD-NDIRbomb digest in a caustic solution, with a non-dispersive infrared finish
- MD-ICPmicrowave digest in a caustic solution, with ICP-OES finish

There are differences in the nature of these tests. Both XRF and ICP methods are instrument-based methods designed to replicate wet chemical analysis results, either total or partial assays depending on the digestion. Both XRD and MS methods are used to investigate mineralogy contents so are regarded as proxies for assays. Bomb digest (BD) methods have been developed by the alumina refining industry to determine the expected yield of bauxite ore during processing. They are the basis for 'metallurgical assays' that are designed to replicate the physicochemical reactions in the refinery and accordingly may be customized for a particular ore type or process plant. At Alcoa some BD assaying has been replaced with a microwave digest (MD) method.

9.3.2.1 REF assaying methods

A summary of the assaying used for the REF samples, which are used to calibrate and validate the FTIR Method, is provided in Table 8-1.

Table 8-1: Assaying methodologies for resource estimation samples

Name	Analyte	Code	Units	Reference Method
Available Alumina	A.Al_2O_3	AL	%	MD – ICP (MALSI)
Reactive Silica	R.SiO_2	SI	%	MD – ICP (MALSI)
Total Iron	Fe_2O_3	FE	%	XRF
Oxalate	NaC_2O_4	OX	kg/t	BD – GC

Name	Analyte	Code	Units	Reference Method
Carbonate	Na_2CO_3	CO	kg/t	BD – NDIR (TICTOC)
Extractable Organic Carbon	C	EO	kg/t	BD – NDIR (TICTOC)
Total Phosphorous	P_2O_5	PT	%	XRF
Sulphate	Na_2SO_4	SU	kg/t	XRF
Total Silica	SiO_2	ST	%	XRF
Magnetic Susceptibility	MagSus	MS	None	MS (CGS system)
Total Alumina	Al_2O_3	AT	%	XRF
Boehmite	AlO(OH)	BO	%	XRD

The bomb digest (BD) method involves adding a measured amount of carbonate free 52% caustic soda to the sample aliquot (1 g), sealing it in a small 10 mL pressure vessel and then cooking it at 145°C. After cooling, the solution is assayed by titration or other methods to determine the alumina and silica contents. As the digestion of these elements by the hot caustic solution is determined by the physical conditions during digestion (mainly temperature and pressure) the results provide a proxy for the expected performance of ore of that nature in the alumina refinery plant. The resulting assays are termed available alumina ($A.Al_2O_3$) and reactive silica ($R.SiO_2$), measured as percentages.

The MD method was introduced in 1996 to supplant the BD methods for assaying of the Mineral Resource drill samples. Atmospheric digestion is done in a microwave oven using a 13% caustic solution. The advantage of this is that it is faster, more repeatable and uses a bigger aliquot (0.5 g). The MD assays are collectively named 'microwave available alumina and reactive silica' (MALSI). The BD methods are still used for the refinery monitoring samples including those taken from the sampling towers prior to the feed stockpiles of crushed ore.

Following digestion using either MD, BD, or wet chemical methods, the analytes are assayed (Table 8-1) using the following methods (Figure 8-5):

- For ICP the digestion liquor is read using a PerkinElmer Optima 8300 machine.
- For XRF an aliquot of 0.7 g is combined with a lithium borate flux, fused in platinum crucibles on a dedicated Phoenix 8-bank burner, and batches are assayed on an Axios Max PW4400 machine.
- For gas chromatography (GC) a 1.00 g aliquot is used and assayed on an Agilent 7890B machine.
- For Total Inorganic Carbon and Extractable Organic Carbon (TICTOC) a 1.00 g aliquot is digested and assayed using an Analytical Aurora 1030 Total Organic Carbon Analyzer with carousel.



Figure 8-5: Digestion and assay equipment used for REF samples at the KWI Clockwise from top left: BD, MD, TICTOC, ICP, XRF, GC (SLR, 2021)

Details on the assaying method used for the final (Best) assay value for every sample interval are carried in the acQuire database.

For resource estimation, the Reference Method results are used to monitor the performance of the FTIR assaying, and to calibrate (adjust) the FTIR results on a batch-by-batch basis. The Reference Method is also used for all monitoring of the refinery performance including the grades of ore presented to the sampling towers at Pinjarra and Wagerup prior to stockpiling and reclaiming of the ore feed.

A consistent approach to sample collection, preparation and assaying for Mineral Resource estimation has been used since 1980. Refinements to the assaying methods have comprised:

- 1996 Microwave digestion was introduced instead of bomb digestion for the REF samples
- 1999 The collection of the FTIR spectral data was outsourced to Bella, with direct control of processing and prediction still done by Alcoa
- 2006 Robotic sample preparation was introduced at Bella
- 2006 Digital retention of all FTIR spectral data was introduced, enabling additional post-processing of assayed samples for new analytes
- 2017 The calibration sets were rescanned with FTIR and an updated Method Set (MIC#00005), was developed
- 2018 Original wet chemical assays were replaced by FTIR for approximately 73,000 samples (drilled in Myara North from 1992 to 2002)
- 2019 Original wet chemical or FTIR assays were replaced by FTIR for approximately 251,000 samples (drilled in Myara North from 1991 to 1997).

The impact of these changes and validation of the results were investigated by Alcoa personnel and independently by SRK (2021a). It was concluded that the assaying precision (i.e. repeatability) and accuracy (lack of bias, as demonstrated by quantile-quantile plots) did not show significant differences between the pre-2018 and post-2018 data sets. Accuracy and repeatability are further discussed in Sections 8.5.2 and 8.5.2.2.

Since completion of the previous 2020 Mineral Resource inventory, an additional 61,906 vacuum and aircore holes have been drilled and approximately 644,000 routine FTIR analyses performed. These represent holes drilled between September 2020 and June 2021.

9.4 Quality Assurance (QA)

The Quality Assurance (QA) component of a sampling and assaying program is defined by the presence of written procedures which are used to guide current practice, and by which changes to practices over time may be monitored. These procedures also specify the Quality Control (QC) data that should be collected to monitor the performance of the sampling, sample preparation and assaying.

The existing written procedures include:

- Franklin (2019) describing the FTIR process.
- Use of the customized in-house Exploration PowerApps digital module to record and document field inspections by the geologist at the drill rigs (documenting visible contamination, Sample ID, Hole ID, splitting, chip size of sample, split volume, depth measurement, collection of Sample To

Extinction (STE) samples discussed in Section 8.5.3.4, collection of further FTIR calibration and validation (CalVal) samples (discussed in Section 8.3.1), as well as other prestart, safety, risk and EHS inspections.

- Procedures for generating STE samples.
- Various PowerPoint presentations providing an overview of the laboratory procedures.

9.5 Quality Control (QC)

9.5.1 Sample preparation

QC procedures implemented to monitor the Bella robotic sample preparation system (Franklin, 2019) include:

- Temperature testing on the ovens. These are recorded between 2 and 5 times a year since 2017 at 8 positions for each of 4 ovens and demonstrate consistent safe drying temperatures below 100ºC (average 97.9ºC for 352 readings).
- Daily grind size checks. The percentage passing 180 microns and percentage exceeding 300 microns is recorded at Bella on all 10 ring mills at a rate of 1:200 for the resource drill samples, with independent checks by the KWI on a random selection of all samples milled for the week. These demonstrate satisfactory sample preparation, and the consistency of the Bella robotic system, which is critical for effective FTIR assaying (Figure 8-6).

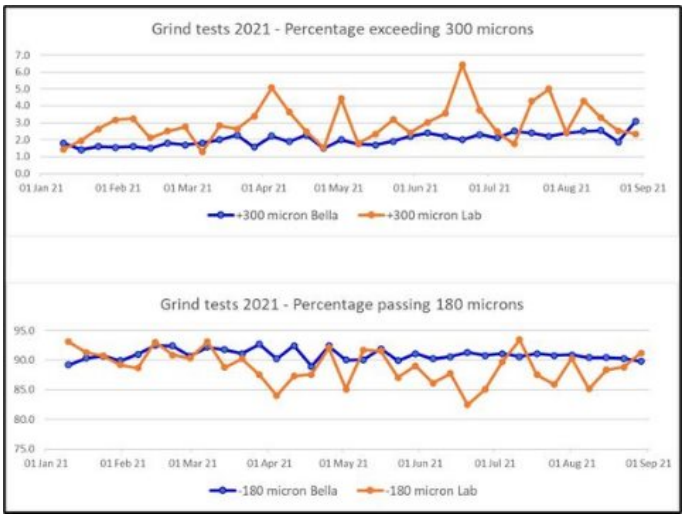


Figure 8-6: Sample preparation monitoring (Alcoa, 2021)

Grind sizes for the robotic sample preparation unit tested by Bella and by KWI.

9.5.2 Accuracy

Accuracy is determined by the difference (bias) between a result and the expected value. It is usually determined by assaying Standards (reference materials), blanks, and by comparing the means of datasets.

9.5.2.1 Blanks

Blank samples are routinely included in the FTIR submission batches after sample preparation, to prevent contamination of the mills by very low grade samples. Blanks are submitted with a frequency of 1 to 19 in the REF samples sets compiled by Bella and regularly despatched to KWI for Reference Method digestion and assay.

Blanks are not introduced into the robotic mills at Bella and there is no check on cross-contamination during sample preparation. Given the style of mineralization, the ore grades being assayed and the volume of material milled compared to the final aliquot assayed, the absence of sample preparation blanks is not considered material.

9.5.2.2 Standards

After the boxes of drill samples are received at Bella, packets of Reference Method samples (REF) are split out by the robotic sample preparation, based on a random selection by Alcoa LIMS, at a frequency of 1 in 100. These are submitted to the KWI in batches of 19 for REF assaying to calibrate and validate the Bella assays. Each batch of REF samples includes 1 Blank and 1 Standard.

Alcoa has used a series of specially prepared Internal Reference Material (IRM) samples derived from Darling Range bauxite, pulverized and homogenized by Gannet Holdings, labelled KH09 to KH18. Monitoring using these IRM samples provides arguably better assurance of assaying accuracy than commercial Certified Reference Material (CRM) samples. The IRMs have generally been sourced from stockpile material and used in both coarse-crushed and pulp form. IRMs are color coded as follows: pink for FTIR assay control, yellow for grain size, khaki for drill sampling. The IRMs have not been externally certified. A summary of the IRMs is provided in Table 8-2.

Table 8-2: Standards used for drilling and REF monitoring (IRMs)

Standard	Date	Comment
KH09	May 1999 to present	Boehmite analysis, FTIR, MD-ICP, and XRF analysis Mining reference analysis (IRM)
KH10	May 2012 to present	Mining reference analysis (IRM)
KH11	July 2008 to March 2015	FTIR analysis (IRM)
KH12	July 2008 to April 2014	Grind size control (IRM)
KH13	April 2014 to present	Grind size control (IRM)
KH14	March 2015 to present	FTIR analysis (IRM)
KH15	October 2015 to September 2017	Preparation and analytical control – introduced at the drill rig (IRM)

Standard	Date	Comment
KH16	September 2017 to December 2018	Preparation and analytical control – introduced at the drill rig (IRM)
KH17	September 2017 to December 2018	Preparation and analytical control – introduced at the drill rig (IRM)
KH18	September 2017 to December 2018	Preparation and analytical control – introduced at the drill rig (IRM)

From October 2015 to December 2018 the IRMs KH15 to KH18 were introduced by the driller at the drill rig to monitor sample preparation (grinding and cross-contamination) and assaying. This material was sourced from the Kwinana Refinery stockpile crushed to nominal 3 mm, homogenized, and split into 200 g lots by Gannet Holdings, a commercial preparer of Standards.

Control of the accuracy of batches of FTIR samples is monitored using IRMs KH10 and KH14. FTIR batches of approximately 60,000 samples are controlled using Priority Codes (e.g. P157 to P175 covered the period September 2018 to October 2020). Priority Codes represent batches assayed by the FTIR Method using the same batch correction factors.

The frequency of insertion of IRMs such as KH10 is 1 in every REF batch (19 samples, 1 KH10 and 1 blank). The frequency of re-assaying the FTIR results (if rejected by a REF assay) has an expected rate of less than 1.5%. Actual performance depends on the total number of FTIR assayed samples, the area where they were drilled and whether there were issues with the Sample Presentation Unit (SPU) in the FTIR process.

A summary of the performance of IRMs KH10 and KH14 for batches tested between September 2018 and October 2020 is provided in Table 8-3. The failure rates, using a criterion of Mean ±35 Standard Deviations, are generally low with failure rates above 0.1% highlighted. Performance overall is excellent for AL, good for SI and generally reasonable for all analytes. This Table indicates that KH10 demonstrates better homogenization than KH14 (which admittedly has many more assay results) and repeatability of CO (carbonate), EO (extractable carbon) and BO (boehmite) are more challenging than the other analytes.

Table 8-3: Summary of performance of IRMs KH10 and KH14 for the full analytical suite

*Pri**ority batches P157 to P175 for September 2018 to October 2020***
*Highlighted **cells indicate %Fail rate exceeded 0.1%***

IRM	Analyte	AL	SI	FE	OX	CO	EO	PT	SU	ST	MS	AT	BO
	Count	934	934	849	810	811	824	841	841	841	820	841	811
KH10	Fail	0	0	0	1	6	22	0	1	0	0	0	7
	% Fail	0.0%	0.0%	0.0%	0.1%	0.7%	2.7%	0.0%	0.1%	0.0%	0.0%	0.0%	0.9%
	Count	30,828	30,828	30,828	30,828	30,828	30,828	24,641	30,828	30,828	30,828	30,828	30,828
KH14	Fail	19	117	208	137	225	117	269	105	75	565	56	586
	% Fail	0.1%	0.4%	0.7%	0.4%	0.7%	0.4%	1.1%	0.3%	0.2%	1.8%	0.2%	1.9%

Alcoa uses CRMs for laboratory analytical control including NIST600 (used since June 1996), BXPA01 (used since December 2011) and SG11 (used February 1996 to May 1999) for XRF calibration. A commercial liquid CRM is used for monitoring the MD method for AL and SI referred to as MALSI (Figure 8-7).



Figure 8-7: Assaying Standards (left IRMs KH09 and KH10, right CRM for MALSI) (SLR, 2021)

9.5.3 Repeatability

9.5.3.1 Measures Of Precision

There are a number of approaches to defining the repeatability of an assay result, and they are generally controlled by a framework first developed by Pierre Gy, now referred to as the Theory Of Sampling. Accepted approaches used here for determining the repeatability of sampling and assay results are:

- Scatter plots with the same X and Y axes, showing the overall distribution of the paired samples, and obvious outliers, with perfect repeatability shown by the 45° line of equality.
- Measures based on the robust Half Absolute Relative Difference (HARD) bivariate statistic (Shaw, 1997; Abzalov, 2016). These include the precision (as Coefficient of Variation (CV) with a confidence interval of 68%) and the 90th percentile HARD limit.
- Other bivariate measures, that may be influenced by outliers, such as the slope of regression, variance and CV.

With all measures, trimming the data (excluding outliers, obvious errors, incorrect values, out of range values, and those near the Limit of Detection) can impact on statistical measures of precision, which is why scatter plots are helpful in interpreting results.

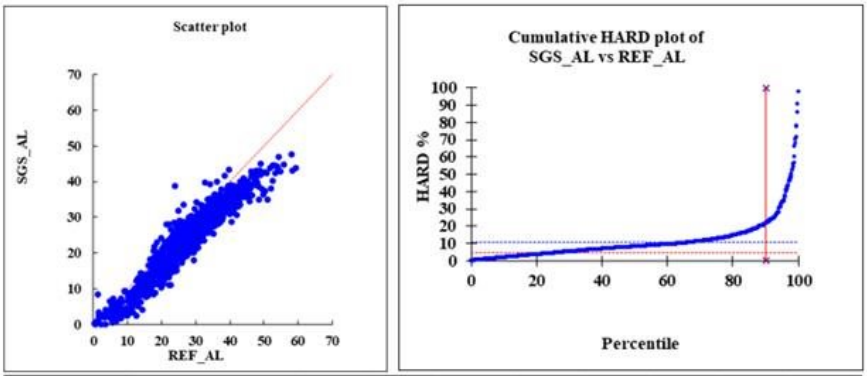
9.5.3.2 Umpire laboratory checks

Alcoa sends checks of REF samples assayed at the KWI to two independent laboratories, SGS and Bureau Veritas (BV). The Priority dataset P175 Bias and Precision (B&P) was examined by SLR. Results are provided in Figure 8-8 and Figure 8-9 for AL and SI results, and precisions for AL, SI, FE and OX are summarized in Table 8-4.

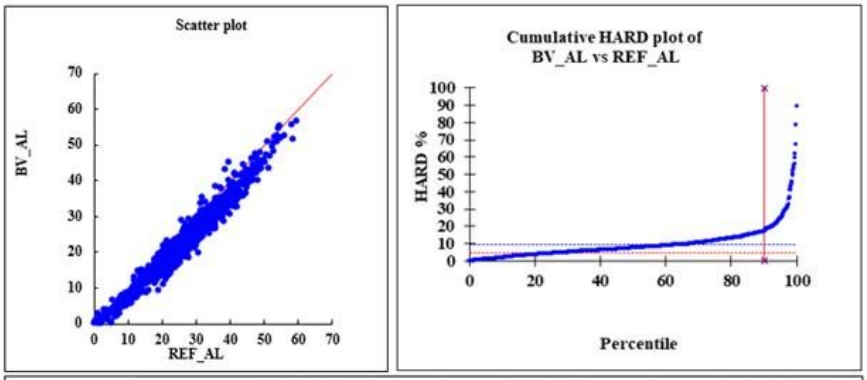
It is apparent that there is a consistent bias with the Alcoa KWI reporting higher (by 3 to 4%) for AL and by 0.4 to 0.6% for SI. Precision measures indicate KWI shows better repeatability with BV than with SGS. Results for FE and OX are similar. Note that the precisions in the figures and Table 8-4 are for untrimmed data, but the number of pairs vary due to some missing or zero values. The precisions are higher than expected, given the good repeatability of the REF assays at KWI (Section 8.5.3.6) and suggest that the KWI REF assays are better customized to the Alcoa bauxite than the umpire laboratories. Trimming the data

to ranges appropriate to expected ore grades in some cases improves the precision (e.g. for AL but not for SI).

These results indicate that the repeatability of the MALSI assays in particular, and suggestions of possible bias, are because these are proxy metallurgical tests, and may be subject to slight variations in the microwave digestion procedures prior to XRF, between and within all three laboratories. While the precision results themselves are moderate, the lack of outliers and overall scatter indicates that the REF assays are reasonable as the basis for calibrating and validating the FTIR Method.

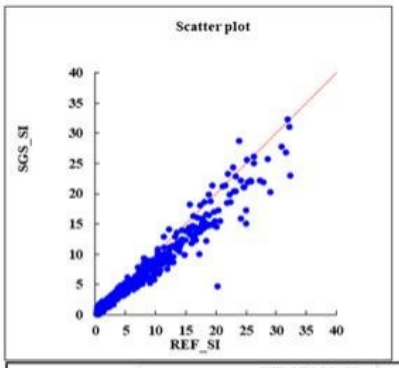


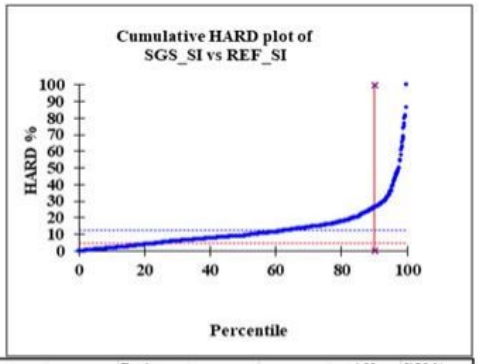
	REF_AL	SGS_AL				
				Total mean	25.75	AL %
Pairs	890	890		Average bias (-ve if original is lower)	3.86	AL %
Mean	27.67	23.82	AL %	Regression slope Y on X (not plotted)	0.90	
Minimum	0.33	0.04	AL %	Average HARD (= AMPD/2)	10.95	%
Maximum	59.43	47.61	AL %	Average HRD (Half Relative Diff.)	9.75	%
Variance	126.78	111.95	AL % sq.	Precision based on CV (CI 68%)	18.0	%
CV	0.41	0.44		Absolute error based on Precision ±	4.65	AL %
Trimmed	0 below 0 AL % or above 100 AL %			(HARD limits 0% to 100%)	21.51	90th percen



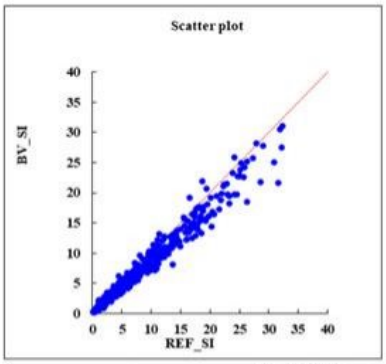
	REF_AL	BV_AL				
				Total mean	25.38	AL %
Pairs	911	911		Average bias (-ve if original is lower)	3.50	AL %
Mean	27.13	23.63	AL %	Regression slope Y on X (not plotted)	0.94	
Minimum	0.06	0.20	AL %	Average HARD (= AMPD/2)	9.53	%
Maximum	59.43	56.77	AL %	Average HRD (Half Relative Diff.)	8.74	%
Variance	136.57	126.64	AL % sq.	Precision based on CV (CI 68%)	14.0	%
CV	0.43	0.48		Absolute error based on Precision ±	3.56	AL %
Trimmed	0 below 0 AL % or above 100 AL %			(HARD limits 0% to 100%)	16.99	90th percen

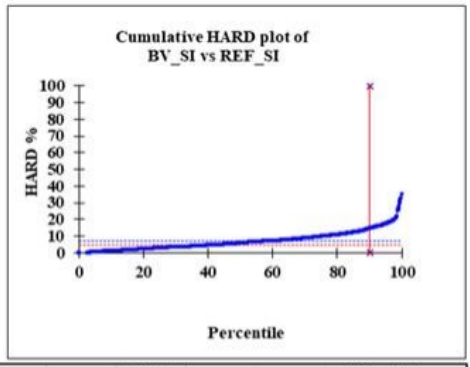
Figure 8-8: Umpire checks of REF A.Al_2O_3 at SGS and BV (SLR, 2021)





	REF_SI	SGS_SI				
Pairs	958	958		Total mean	4.23	SiO2 %
Mean	4.52	3.94	SiO2 %	Average bias (-ve if original is lower)	0.58	SiO2 %
Minimum	0.19	0.03	SiO2 %	Regression slope Y on X (not plotted)	0.84	
Maximum	40.96	32.28	SiO2 %	Average HARD (= AMPD/2)	12.51	%
Variance	38.23	28.15	SiO2 % sq.	Average HRD (Half Relative Diff.)	4.73	%
CV	1.37	1.35		Precision based on CV (CI 68%)	24.0	%
Trimmed	14 below 0.001 SiO2 % or above 100 SiO2 %			Absolute error based on Precision ±	1.02	SiO2 %
				(HARD limits 0% to 100%)	26.0	90th percen





	REF_SI	BV_SI				
Pairs	972	972		Total mean	4.24	SI %
Mean	4.46	4.02	SI %	Average bias (-ve if original is lower)	0.44	SI %
Minimum	0.19	0.17	SI %	Regression slope Y on X (not plotted)	0.87	
Maximum	40.96	31.45	SI %	Average HARD (= AMPD/2)	6.92	%
Variance	37.93	29.53	SI % sq.	Average HRD (Half Relative Diff.)	2.73	%
CV	1.38	1.35		Precision based on CV (CI 68%)	11.9	%
Trimmed	0 below 0 SI % or above 100 SI %			Absolute error based on Precision ±	0.50	SI %
				(HARD limits 0% to 100%)	14.4	90th percen

Figure 8-9: Umpire checks of REF R.SiO_2 at SGS and BV (SLR, 2021)

Table 8-4: Summary of precisions for umpire check results on assay dataset P175 AL, SI, FE and OX at SGS and BV compared to KWI

REF analyte	Check lab and analyte	Pairs	Precision	90th Percentile	Bias	Note
REF_AL	SGS_AL	890	18.0	21.5	3.86	
	BV_AL	911	14.0	16.99	3.50	
		713	6.3	12.61	3.71	Trimmed to AL > 15%
REF_SI	SGS_SI	958	24.0	26	0.58	
	BV_SI	972	11.9	14.4	0.44	
		824	12.2	14.7	0.16	Trimmed to SI > 0.05 and < 10%
REF_FE	SGS_FE	937	21.9	24.3	1.05	
	BV_FE	972	13.3	11.8	0.32	
REF_OX	SGS_OX	934	32.6	38.65	0.04	
	BV_OX	972	18.7	17.6	0.04	

Notes:

1. Precision is based on the CV of the HARD statistic at a confidence interval of 68%
2. 90th percentile is based on the ranked HARD statistic
3. Bias is the difference in the Means of Original and Duplicate sets, negative if REF is lower.

9.5.3.3 Twinned hole studies

Considering the long period of resource drilling since the 1970s, Alcoa has only relatively recently started the routine collection of QC data for drilling, sampling, and assaying.

The drillers carry out the logging and sampling of the resource estimation drill holes. In the past they have produced Field Duplicate samples, but these have now been replaced by STE samples (Section 8.5.3.4).

Various studies (Barnes, 2015, 2016, 2018a, 2018b; Crockford, 2011, 2012; Grigg, 2016; Hodgson, 2015) have been carried out and reported to determine the repeatability of the drill sampling and to compare the Alcoa vacuum drilling to the Wallis aircore and JSW reverse circulation drilling. These studies are of limited use in interpreting the quality of the different drilling methods and in comparing them. In these studies, the original vacuum hole (the parent) is twinned by a second hole (the twin) collared within approximately 30 cm. They may be summarized as follows:

- Barnes (2015) produced 841 pairs of samples, with the parent sampled at 0.5 m and the twin at 1 m.
- Grigg (2016) twinned 127 aircore holes (Huntly region, 862 paired samples), 34 vacuum holes (Huntly region, 185 paired samples), and 693 vacuum holes twinned with aircore holes (Huntly and Willowdale regions, 5,947 paired samples). As re-assessed by SLR, poor repeatability was demonstrated for all datasets, with 90% of the samples having a HARD measure of less than approximately 30% (good repeatability would have 90% less than 15%). Given the poor

repeatability, it is not possible to determine any bias between the methods, or whether the sampling is better for any analyte.

- SRK (2021a) presented results from 2018 for 21 pairs of vacuum holes and 6 pairs of aircore (Huntly region, 238 paired samples). The results show similar levels of poor precision for AL, SI, FE and TS (the ranked Absolute Mean Percentage Difference (AMPD) plots provide values twice those used in this report).

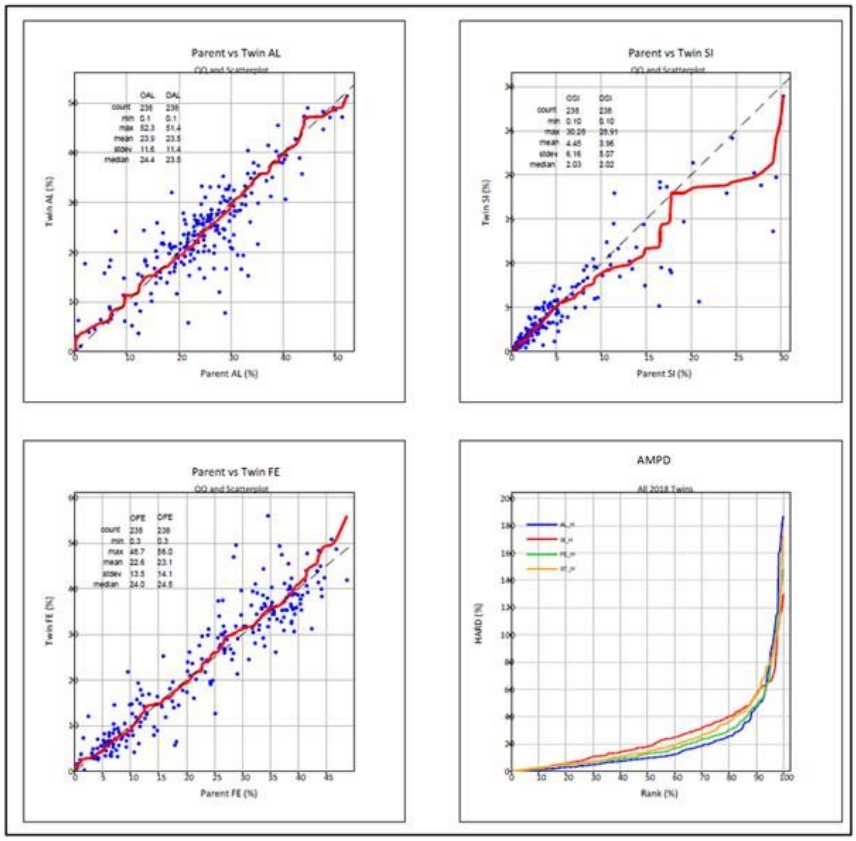


Figure 8-10: Twinned hole comparison for 238 data points from 2018 (after SRK 2021a)

*Scatter plots with overlayed Q-Q plot (in red), and ranked AMPD (HARD*2) plots*

The poor repeatability of the twinned hole programs, shown by the scatter plots and precision results, is not surprising and may be ascribed to:

- Short-range geological variability in the laterite profile
- Sample quality and recovery affected by splitting, moisture, seasonal effects, vertical control, and operator error at that time.

The SLR QP considers that twinned hole studies are of limited value and should only be implemented once the sample splitting and preparation demonstrates good repeatability, using Field Duplicates (or the equivalent STE samples). They may be of value to investigate specific issues under closely supervised conditions.

9.5.3.4 Field Duplicates

It is generally considered best practice to collect Field Duplicates in resource drill sampling programs. They should be a second split collected with the first split in exactly the same way (i.e. from the same drilled interval, using the same splitter, generally from the reject side of the splitter, sometimes by resplitting all of the reject a second time).

The routine collection of Field Duplicates by Alcoa has been intermittent and last commenced in February 2015, with duplicates collected at a nominal frequency of 1 in 200, with no more than one duplicate per hole. SRK (2021a) examined 5,885 sample pairs, from a mix of material types, locations and drilling types. They concluded that the Field Duplicates showed no evidence of significant grade bias but that the precision was lower than expected for this style of mineralization. From graphs they presented, the 90% threshold for the HARD statistic as a measure of precision (defined in Section 8.5.3.1) was between 12 and 20%. Precision was poorer for boehmite and oxalate. No significant precision differences were evident between the vacuum and aircore Field Duplicates, nor by year, nor between the Huntly and Willowdale Field Duplicates.

Alcoa and various independent reviewers (Holmes, 2018; SRK2021a) considered that there were some limitations to the benefit of collecting Field Duplicates because the sample splitting procedure was problematic (the small sample volume of 150 mL, and some poor splitting equipment and procedures). Work on implementing recommendations has resulted in procedures which were adequate during the site inspection by SLR (Figure 7-5). There are still some limitations:

- Field Duplicates are not routinely taken and have been replaced by a single Sample To Extinction sample per rig per shift (see Section 8.5.3.5).
- The resulting sampling frequency may be lower than the usual industry practice of between 1 in 20 (5%) and 1 in 50 (2%).
- The data is not regularly reviewed, documented, or systematically reported as a KPI.
- The data does not cover the full resource estimation dataset.
- Reverse circulation sampling of bauxite remains a significant risk in wet conditions (whether due to groundwater, or rain).

Alcoa discontinued the routine collection of Field Duplicates in January 2018.

9.5.3.5 Sample To Extinction (STE) samples

In September 2018 an alternative procedure, termed Sample To Extinction (STE), was introduced. This involves taking the normal 0.5 m drill sample (referred to as the Parent) and collecting all the residue from that drilled interval (i. e. the riffle split reject, and previously any material left in the sampling cup). This residue is collected once per shift from each rig under supervision by the geologist. The residue is pulverized and homogenized, then two equal splits (referred to as the Daughters) are assayed.

Studies in 2016 (112 Parent-Daughter sets, reported by SRK 2021a) and 2018 (63 Parent-Daughters, reported by Barnes 2018b) showed good repeatability for the residue pulp repeats (i.e. between the Daughters) indicating acceptable pulverizing and correct splitting of the residue offsite. However generally poor repeatability was reported between the residue results (the average of the Daughters) and the normal drill sample (the Parent), with a suggestion of bias for some analytes.

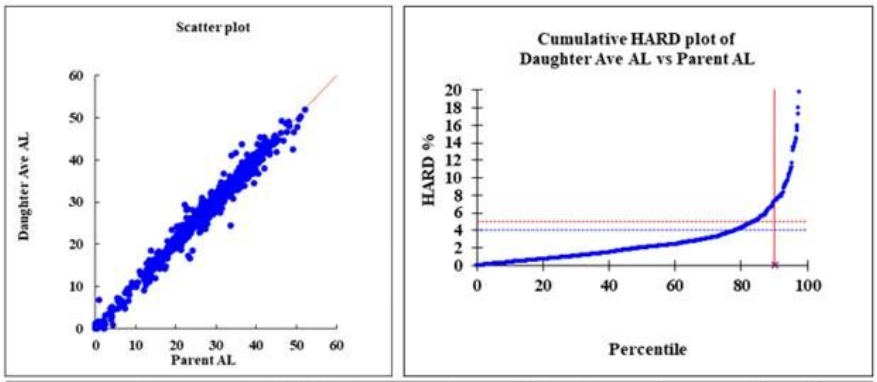
This demonstrated that perhaps the splitting at the drill rig was incorrect, and also illustrated the sampling principle that pulverizing (reducing the particle size) before splitting will always reduce the error. On the basis of these studies and external review, modifications to the splitting procedure at the rig were carried out.

In 2020, Alcoa refined the STE sampling procedure to now collect one sample per shift from each drill rig and assay three Daughters after pulverizing and splitting. The 2020 STE dataset examined by SLR contained results for 745 intervals tested between February 2019 and June 2020. After eliminating some blank values for some analytes, a total of 678 intervals remained which all had valid values for the Parent and three Daughters. SLR has used this data set to prepare bivariate statistics, scatter plots and precision plots.

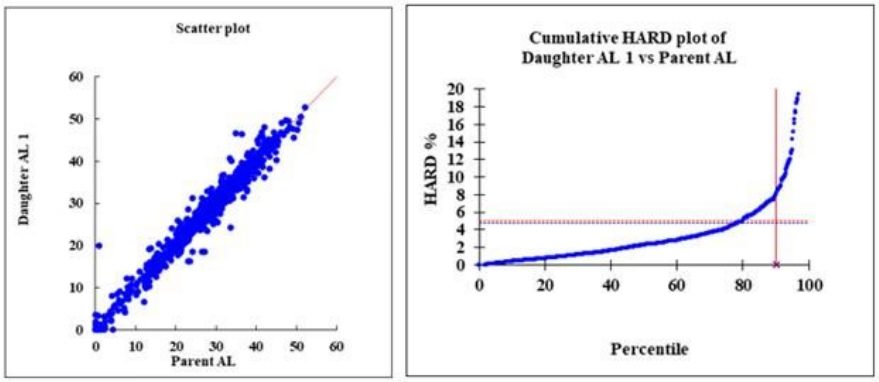
Comparisons were carried out for the analytes AL, SI, FE and ST between:

- The average of the Daughters vs the Parent
- Daughter 1 vs the Parent
- Daughter 2 vs Daughter 1

Examples are provided in Figure 8-11 for AL and Figure 8-12 for SI. Precisions and means are summarized in Table 8-5 for all analytes.

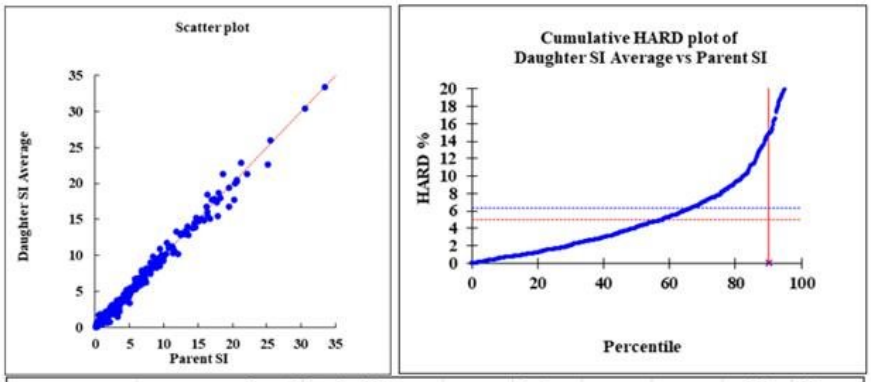


	Parent AL	Daughter Ave AL				
				Total mean	26.89	AL %
Pairs	678	678		Average bias (-ve if original is lower)	-0.31	AL %
Mean	26.73	27.05	AL %	Regression slope Y on X (not plotted)	0.99	
Minimum	0.10	0.10	AL %	Average HARD (= AMPD/2)	4.04	%
Maximum	52.10	51.92	AL %	Average HRD (Half Relative Diff.)	-0.63	%
Variance	116.25	117.58	AL % sq.	Precision based on CV (CI 68%)	14.6	%
CV	0.40	0.40		Absolute error based on Precision ±	3.92	AL %
Trimmed	0 below 0 AL % or above 100 AL %			(HARD limits 0% to 100%)	7.23	90th percen

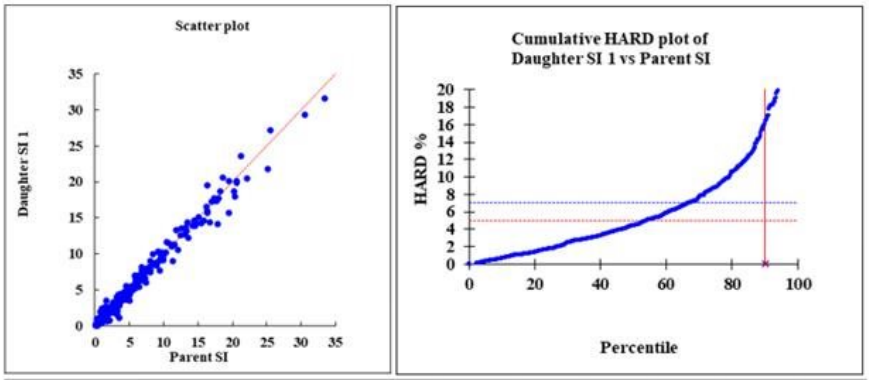


	Parent AL	Daughter AL 1				
				Total mean	26.91	AL %
Pairs	678	678		Average bias (-ve if original is lower)	-0.35	AL %
Mean	26.73	27.09	AL %	Regression slope Y on X (not plotted)	0.99	
Minimum	0.10	0.10	AL %	Average HARD (= AMPD/2)	4.77	%
Maximum	52.10	52.69	AL %	Average HRD (Half Relative Diff.)	-0.37	%
Variance	116.25	118.55	AL % sq.	Precision based on CV (CI 68%)	17.2	%
CV	0.40	0.40		Absolute error based on Precision ±	4.63	AL %
Trimmed	0 below 0 AL % or above 100 AL %			(HARD limits 0% to 100%)	7.91	90th percen

Figure 8-11: Precision of STE Parent AL to Average of Daughters (top) and to Daughter 1 (bottom) (SLR, 2021)



	Parent SI	Daughter SI Average				
Pairs	678	678		Total mean	3.03	SI %
Mean	3.04	3.01	SI %	Average bias (-ve if original is lower)	0.04	SI %
Minimum	0.10	0.10	SI %	Regression slope Y on X (not plotted)	0.99	
Maximum	33.43	33.41	SI %	Average HARD (= AMPD/2)	6.28	%
Variance	20.26	20.06	SI % sq.	Average HRD (Half Relative Diff.)	0.93	%
CV	1.48	1.49		Precision based on CV (CI 68%)	13.7	%
Trimmed	0 below 0 SI % or above 100 SI %		(HARD limits 0% to 100%)	Absolute error based on Precision ±	0.42	SI %
					14.7	90th percen



	Parent SI	Daughter SI 1				
Pairs	678	678		Total mean	3.02	SI %
Mean	3.04	2.99	SI %	Average bias (-ve if original is lower)	0.05	SI %
Minimum	0.10	0.10	SI %	Regression slope Y on X (not plotted)	0.98	
Maximum	33.43	31.62	SI %	Average HARD (= AMPD/2)	6.97	%
Variance	20.26	19.64	SI % sq.	Average HRD (Half Relative Diff.)	1.28	%
CV	1.48	1.48		Precision based on CV (CI 68%)	15.1	%
Trimmed	0 below 0 SI % or above 100 SI %		(HARD limits 0% to 100%)	Absolute error based on Precision ±	0.46	SI %
					16.0	90th percen

Figure 8-12: Precision of STE Parent SI to Average of Daughters (top) and to Daughter 1 (bottom) (SLR, 2021)

Table 8-5: Summary of precisions and means for 678 STE tests (November 2020)

Analyte	Original	Duplicate	Precision (± %)	90th Percentile (HARD %)	Mean (% grade)	Bias (% grade)
AL	Parent	Daughter Ave	14.6	7.2	26.9	-0.31
	Parent	Daughter 1	17.2	7.9	26.9	-0.35
	Daughter 1	Daughter 2	16.8	7.2	27.0	0.14
SI	Parent	Daughter Average	13.7	14.7	3.0	0.04
	Parent	Daughter 1	15.1	16.0	3.0	0.05
	Daughter 1	Daughter 2	14.6	13.5	3.0	-0.02
FE	Parent	Daughter Average	17.6	13.2	20.7	0.06
	Parent	Daughter 1	20.1	15.8	20.7	0.06
	Daughter 1	Daughter 2	19.1	16.5	20.7	-0.03
ST	Parent	Daughter Average	14.4	12.6	23.7	0.23
	Parent	Daughter 1	17.5	15.9	23.6	0.33
	Daughter 2	Daughter 1	18.3	16.9	23.6	-0.22

Notes:

1. Precision is based on the CV of the HARD statistic at a confidence interval of 68%
2. 90th percentile is based on the ranked HARD statistic
3. Mean is the mean of all pairs
4. Bias is difference in the Means of Original and Duplicate sets, negative if Original is lower.

There is a lot of information that can be drawn from the analysis presented in Table 8-5:

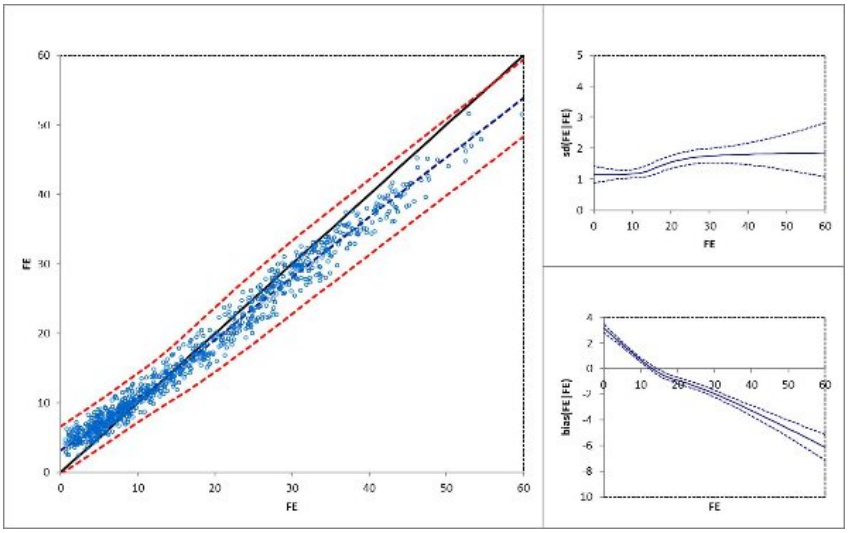
- The Precision between Daughter 1 and Daughter 2 defines the repeatability that can be expected after pulverizing the whole of the retained residue from the drill rig and splitting it under controlled laboratory conditions. For all 4 analytes the results are consistent, and the repeatability is only moderate (Precisions between 15 and 25%). This indicates that the particle size generated during drill sampling (refer to Figure 7-4), and the mass of sample collected, are not limiting factors on the sampling quality.
- The Precision between the Average Of Daughters and the Parent is only marginally better in all cases than that between the Parent and Daughter 1.
- The split taken at the drill rig (Parent, taken by splitting down to 150 g) is as good a representation of the drill interval grade as collecting the whole of the residue and carrying out pulverizing, homogenization and splitting.
- Improvement on the Field Duplicate practice has resulted from improved splitting at the drill rig and collection of the Duplicate (in this case the STE residue) under observed conditions by the geologist.

While the STE procedure could be retained for specific studies, in the SLR QP's opinion, the reintroduction of Field Duplicates using appropriate riffle splitters under supervision should be considered.

9.5.3.6 Pulp Repeats

The frequency of Pulp Repeats generated by the Bella LIMS system for FTIR is 1%. These pulp repeats are actually the REF samples used for monitoring the quality of the FTIR assays. As the FTIR assays are adjusted to match the REF assays (using a 'broken stick' curve adjustment to remove bias and maintain precision, see Figure 8-13) it is expected that there should be minimal bias between REF and FTIR corrected results (FTIR_corr). However, the repeatability between the two methods is an important attribute of the quality of the assay results used for Mineral Resource estimation, Mineral Reserves for mine planning, and mining grade control.

The REF samples are considered to serve the same purpose as pulp repeats in defining the repeatability of the assays.


FE
sd(FE|FE)
bias(FE|FE)

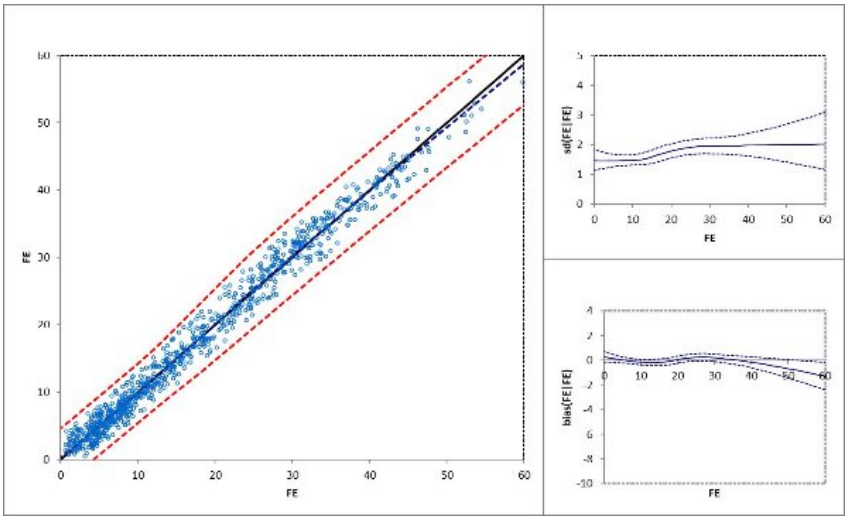
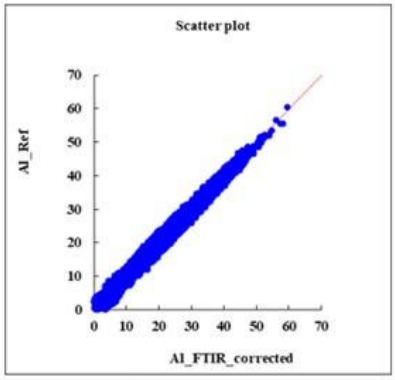
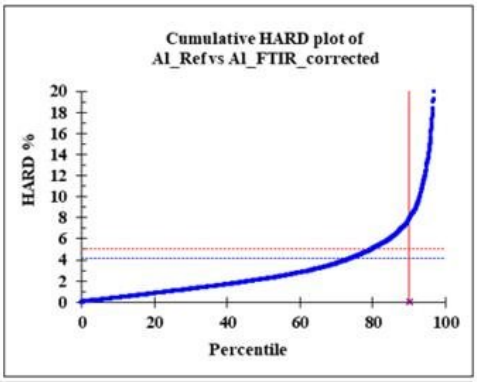
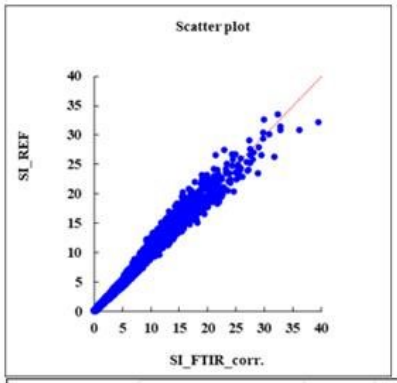

FE
sd(FE|FE)
bias(FE|FE)

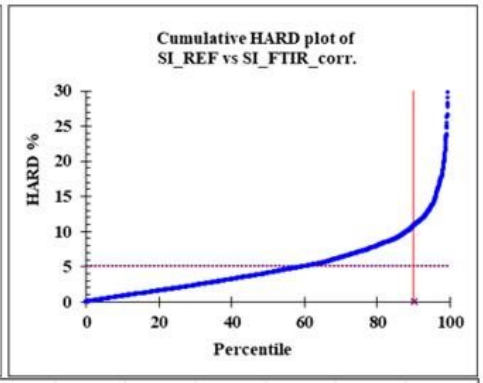
Figure 8-13: Example of the methodology used for broken stick correction of the FTIR results (from Franklin, 2019)





	AL_FTIR_corr.	AL_REF				
Pairs	4376	4376		Average bias (-ve if original is lower)	0.06	AL %
Mean	25.19	25.13	AL %	Regression slope Y on X (not plotted)	0.99	
Minimum	0.02	0.02	AL %	Average HARD (= AMPD/2)	4.17	%
Maximum	61.15	60.38	AL %	Average HRD (Half Relative Diff.)	0.22	%
Variance	125.02	124.09	AL % sq.	Precision based on CV (CI 68%)	12.5	%
CV	0.44	0.44		Absolute error based on Precision =	3.15	AL %
Trimmed	0 below 0 AL % or above 100 AL %			(HARD limits 0% to 100%)	7.8	90th percen
				Total mean	25.16	AL %





	SI_FTIR_corr.	SI_REF				
Pairs	4616	4616		Average bias (-ve if original is lower)	-0.08	SI %
Mean	4.64	4.71	SI %	Regression slope Y on X (not plotted)	1.02	
Minimum	0.02	0.10	SI %	Average HARD (= AMPD/2)	5.21	%
Maximum	39.52	40.96	SI %	Average HRD (Half Relative Diff.)	-0.46	%
Variance	33.68	35.43	SI % sq.	Precision based on CV (CI 68%)	10.2	%
CV	1.25	1.26		Absolute error based on Precision =	0.48	SI %
Trimmed	0 below 0 SI % or above 100 SI %			(HARD limits 0% to 100%)	10.7	90th percen
				Total mean	4.67	SI %

Figure 8-14: Precision of REF vs Corrected FTIR for AL and SI (SLR, 2021)

Table 8-6: Summary of precisions and means for REF vs FTIR (final corrected result)

Analyte	Pairs	Precision (± %)	90th Percentile (HARD %)	Mean	Bias	Min	Max
AL (REF vs FTIR corr.)	4376	12.5	7.8	25.2	0.06	0.0	61.2
	3473	4.0	4.8	29.4	0.04	15.0	61.2
SI (REF vs FTIR corr.)	4616	10.2	10.7	4.7	-0.08	0.0	41.0
	2520	7.8	9.0	1.8	0.05	0.1	5.0
FE (REF vs FTIR corr.)	4574	15.8	16.2	17.9	0.03	0.0	67.0
	2555	8.7	10.2	14.5	-0.03	5.0	30.0
ST (REF vs FTIR corr.)	4453	12.6	11.0	30.0	-0.12	0.0	92.4
	2865	13.4	13.5	17.2	0.00	0.5	40.0
AT (REF vs FTIR corr.)	4755	4.9	5.0	32.3	0.01	0.0	62.5
	2675	2.8	3.2	37.7	0.13	30.0	50.0
OX (REF vs FTIR corr.)	4441	21.9	22.1	1.1	0.00	0.0	9.0
	2324	10.5	12.5	1.5	0.00	0.5	5.0
BO (REF vs FTIR corr.)	411	50.3	86.4	0.6	0.20	0.01	6.0
	344	45.0	78.9	0.39	0.23	0.02	2.0

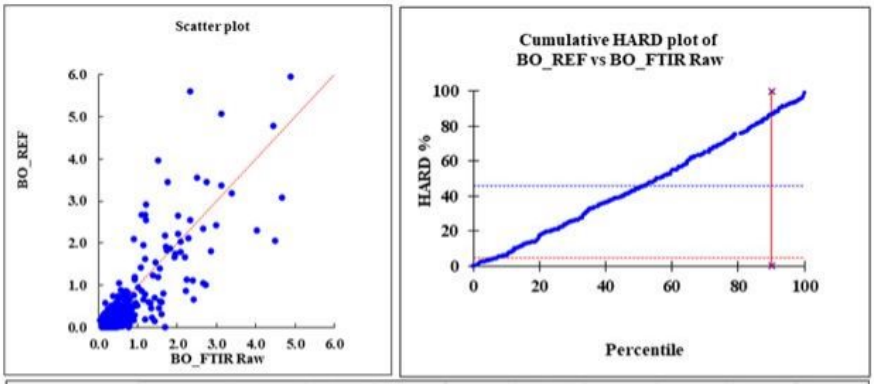
Notes:

1. Datasets trimmed to within Min and Max values are in blue font
2. Precision is based on the CV of the HARD statistic at a confidence interval of 68%
3. 90th percentile is based on the ranked HARD statistic
4. Mean is the mean of all pairs (as % grade)
5. Bias is difference in the Means of Original and Duplicate sets, negative if Original is lower (as % grade)
6. Min and Max (as % grade) indicate the range of the data used and is relevant to the trimmed statistics in blue font.

The repeatability (precision) and accuracy (bias) bivariate statistics summarized in Table 8-6 for this data set show:

- There is no evidence of bias, except possibly for BO (boehmite) which is masked by very poor repeatability (see scatter plot) in Figure 8-15. Note that the BO FTIR assays are Raw rather than corrected by the Method Set algorithm, evidently because the FTIR data provides only an indication of the boehmite mineralogy when calibrated to the XRD results. This is expected.
- Precision is excellent (less than 5%) for AT (Total Al_2O_3)
- Precision is good (between 5 and 15%) for AL, SI and moderate (15 to 25%) for FE and OX
- Precision improves significantly in the range of grades around the bauxite ore grade (bounded by the trimming limits in blue font in Table 8-6) except for SI.

Based on the datasets selected for examination randomly (i.e. without prior knowledge of the sampled areas, Method Sets, Priority Codes, or other differences), it is apparent that correcting the FTIR results using the REF assays obtained by microwave digestion (with XRF or ICP finish) produces results that are sufficiently unbiased and repeatable for the purpose of Mineral Resource estimation, except for BO (which is not reported in the Mineral Resource).



	BO_FTIR Raw	BO_REF				
Pairs	411	411		Total mean	0.56	BO %
Mean	0.67	0.46	BO %	Average bias (-ve if original is lower)	0.20	BO %
Minimum	0.05	0.01	BO %	Regression slope Y on X (not plotted)	0.94	
Maximum	4.88	5.95	BO %	Average HARD (= AMPD/2)	45.65	%
Variance	0.52	0.68	BO % sq.	Average HRD (Half Relative Diff.)	40.32	%
CV	1.09	1.79		Precision based on CV (CI 68%)	50.3	%
Trimmed	0 below 0 BO % or above 100 BO %			Absolute error based on Precision ±	0.28	BO %
				(HARD limits 0% to 100%)	86.4	90th percen

Figure 8-15: Poor precision of REF vs RAW FTIR for BO (SLR, 2021)

9.5.3.7 Pulp Re-Assay Programs

In 2018, Alcoa commenced using FTIR to re-assay batches of approximately 70,000 results that had been previously assayed using the MD – ICP REF method for AL, SI and FE. A number of packages and their interpretations were provided and SLR evaluated the data for P159 (Myara North, March 2019) as shown in Table 8-7 and Figure 8-16, and for P163 (Larego, June 2019) as shown in Table 8-8, with results for trimmed data in Table 8-9 and Figure 8-17.

Table 8-7: Summary of pulp repeats for Myara North (P159): MD-ICP (Original) vs New FTIR

Analyte	Pairs	Precision (± %)	90th Percentile (HARD %)	Mean	Bias	Min	Max
AL	68,295	19.0	13.66	26.7	1.02	0.10	65.0
SI	68,295	24.0	29.3	2.6	-0.04	0.10	35.5

FE	68,295	37.3	44.7	15.3	0.33	0.25	67.5

Table 8-8: Summary of pulp repeats for Larego (P163): MD-ICP (Original) vs New FTIR

Analyte	Pairs	Precision (± %)	90th Percentile (HARD %)	Mean	Bias	Min	Max
AL	40,238	26.9	23.2	26.7	-0.75	0.10	65.8
SI	26,493	21.7	23.6	3.3	-0.36	0.3	33.2
FE	40,233	30.1	32.38	17.2	1.32	0.25	98.1

Table 8-9: Summary of pulp repeats for Larego (P163) – trimmed: MD-ICP (Original) vs New FTIR

Analyte	Pairs	Precision (± %)	90th Percentile (HARD %)	Mean	Bias	Min	Max
AL	13,071	7.1	8.2	32.4	-0.12	26.0	39.0
SI	20,783	20.9	24.2	1.35	-0.04	0.3	5.0
FE	29,309	18.3	20.0	19.6	1.10	5.0	50.0

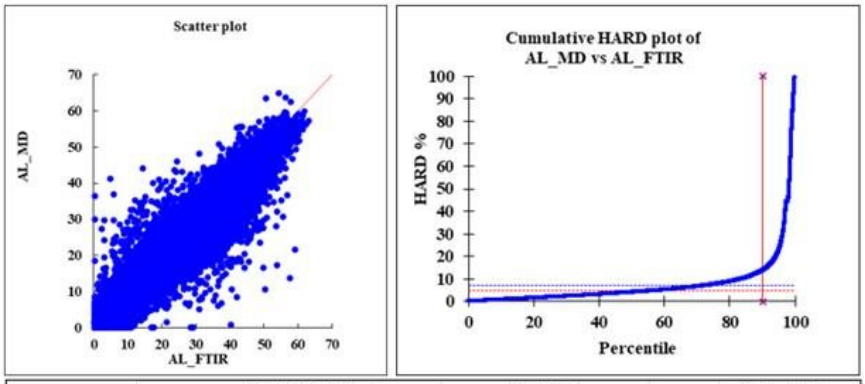
Notes for Table 8-7, Table 8-8 and Table 8-9:

1. Precision is based on the CV of the HARD statistic at a confidence interval of 68%
2. 90th percentile is based on the ranked HARD statistic
3. Mean is the mean of all pairs (as % grade)
4. Bias is difference in the Means of the paired data, negative if the FTIR assay is lower (as % grade)
5. Min and Max (as % grade) indicate the range of the data used, with trimmed limits in blue font.

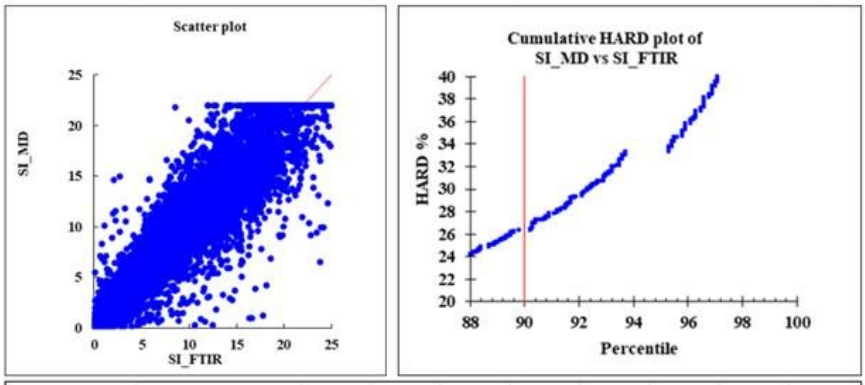
Results are consistent with previous evaluations by SRK (2021a) and indicate that overall repeatability of the re-assaying is only moderate for AL and SI and poor for FE, for both very large data sets. However, it is apparent that there are artefacts and errors in the original MD-ICP data.

The large data sets obscure the scatter and outliers. Some systematic errors are also apparent on the plots. For SI assays, at the limit of detection of 0.1 for FTIR and 0.2 for MD this results in many pairs with a HARD statistic of 33.33% (see SI percentile graph for P159 Myara North, Figure 8-16). Similarly, for SI the MD data has an upper limit of 22% and the FE data has an upper limit of 95% whereas the FTIR assays can be much higher. Such data errors seem to have slipped through Alcoa's data cleansing procedures for these repeat batches and can impact on the mean and bias estimates.

Trimming the P163 data set to limits approximating ore feed grades (with the trimmed limits shown in blue font in Table 8-9) significantly improves the precision and reduces the bias for AL. There is less improvement for SI and FE.

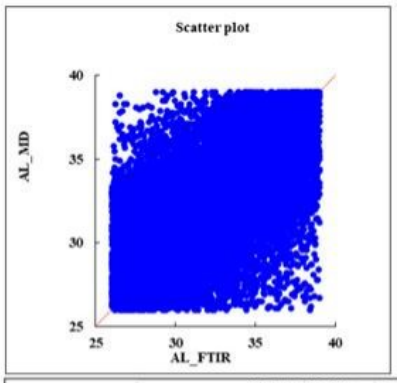


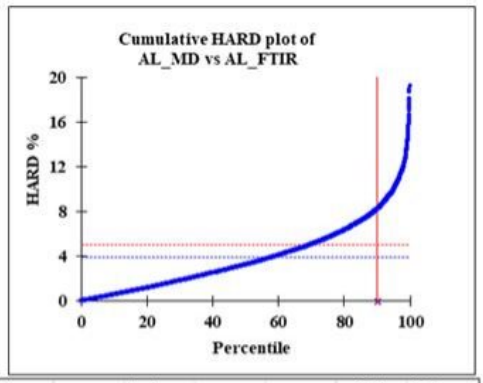
	AL_FTIR	AL_MD				
				Total mean	26.72	AL %
Pairs	68295	68295		Average bias (-ve if original is lower)	1.02	AL %
Mean	27.23	26.21	AL %	Regression slope Y on X (not plotted)	0.90	
Minimum	0.10	0.10	AL %	Average HARD (= AMPD/2)	7.11	%
Maximum	63.11	65.00	AL %	Average HRD (Half Relative Diff.)	1.95	%
Variance	111.05	100.09	AL % sq.	Precision based on CV (CI 68%)	19.0	%
CV	0.39	0.38		Absolute error based on Precision ±	5.08	AL %
Trimmed	0 below 0 AL % or above 100 AL %			(HARD limits 0% to 100%)	13.66	90th percen



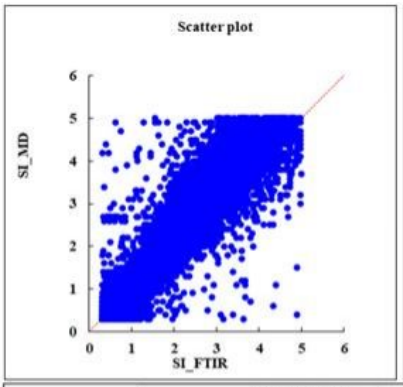
	SI_FTIR	SI_MD				
				Total mean	2.64	SI %
Pairs	68295	68295		Average bias (-ve if original is lower)	-0.04	SI %
Mean	2.62	2.66	SI %	Regression slope Y on X (not plotted)	0.96	
Minimum	0.10	0.20	SI %	Average HARD (= AMPD/2)	11.79	%
Maximum	35.51	22.00	SI %	Average HRD (Half Relative Diff.)	1.10	%
Variance	14.20	14.10	SI % sq.	Precision based on CV (CI 68%)	22.7	%
CV	1.44	1.41		Absolute error based on Precision ±	0.60	SI %
Trimmed	0 below 0 SI % or above 100 SI %			(HARD limits 0% to 100%)	26.34	90th percen

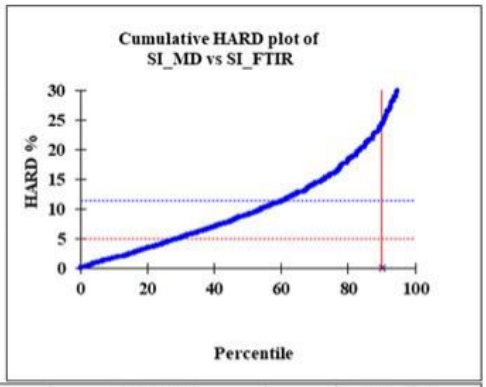
Figure 8-16: P159 Myara North pulp re-assaying of old MD vs new FTIR for AL and SI. ***Note artefacts in SI plots, which can be removed by trimming (SLR, 2021)***





	AL_FTIR	AL_MD				
Pairs	13071	13071		Average bias (-ve if original is lower)	-0.12	AL %
Mean	32.35	32.47	AL %	Regression slope Y on X (not plotted)	0.52	
Minimum	26.02	26.00	AL %	Average HARD (= AMPD/2)	3.93	%
Maximum	38.98	39.00	AL %	Average HRD (Half Relative Diff.)	-0.22	%
Variance	12.45	10.71	AL % sq.	Precision based on CV (CI 68%)	7.1	%
CV	0.11	0.10		Absolute error based on Precision ±	2.29	AL %
Trimmed	27167 below 26 AL % or above 39 AL %			(HARD limits 0% to 100%)	8.19	90th percen
				Total mean	32.41	AL %





	SI_FTIR	SI_MD				
Pairs	20783	20783		Average bias (-ve if original is lower)	-0.04	SI %
Mean	1.33	1.36	SI %	Regression slope Y on X (not plotted)	1.13	
Minimum	0.31	0.30	SI %	Average HARD (= AMPD/2)	11.46	%
Maximum	4.99	5.00	SI %	Average HRD (Half Relative Diff.)	3.23	%
Variance	0.93	1.34	SI % sq.	Precision based on CV (CI 68%)	20.9	%
CV	0.73	0.85		Absolute error based on Precision ±	0.28	SI %
Trimmed	19455 below 0.3 SI % or above 5 SI %			(HARD limits 0% to 100%)	24.24	90th percen
				Total mean	1.35	SI %

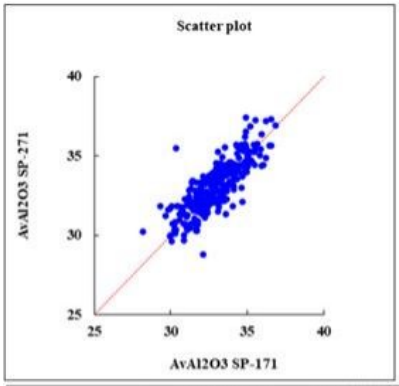
Figure 8-17: P163 Larego pulp re-assaying of old MD vs new FTIR for AL and SI (trimmed) (SLR, 2021)

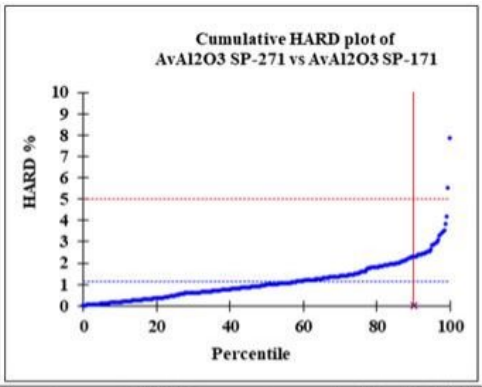
9.5.3.8 Stockpile Feed and Sampling

Refinery feed grade is monitored at Huntly and Willowdale using material collected at the Pinjarra and Wagerup sample plants. At each operation, the sample plants are located at the refinery end of the overland conveyors, just prior to the stockpile stackers.

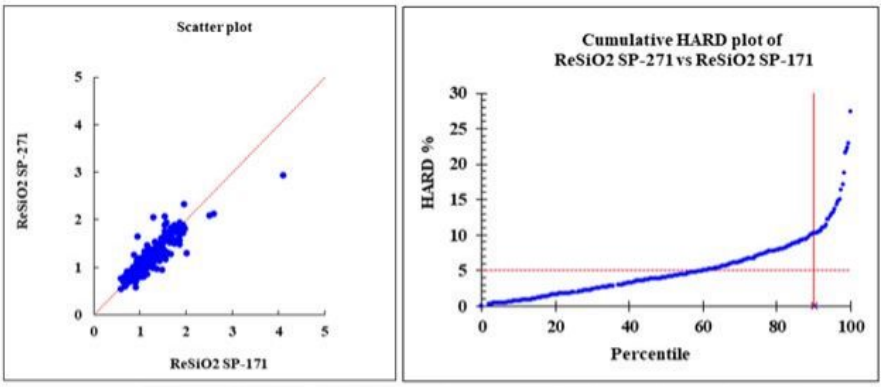
The stockpile area at the Pinjarra refinery is fed by two conveyor belts (SP-171 and SP-271) that derive their ore from the same crusher (currently at Myara). Prior to the ore being combined from the belts and fed to the stockpile area, it passes through a sampling tower that alternatively takes a primary cut from each belt, dries, crushes, subsamples and combines them into two parallel samples for 12 hour shifts.

The repeatability of the ore grades can be determined by comparing these paired samples (Figure 8-18 for AL and SI, Table 8-10 summarising results for all analytes).





	AvAl2O3 SP-171	AvAl2O3 SP-271				
Pairs	292	292		Total mean	32.95	Av.Al203 %
Mean	32.89	33.02	Av.Al203 %	Average bias (-ve if original is lower)	-0.13	Av.Al203 %
Minimum	28.16	28.77	Av.Al203 %	Regression slope Y on X (not plotted)	0.83	
Maximum	36.81	37.42	Av.Al203 %	Average HARD (= AMPD/2)	1.12	%
Variance	2.40	2.49	Av.Al203 % sq.	Average HRD (Half Relative Diff.)	-0.20	%
CV	0.05	0.05		Precision based on CV (CI 68%)	2.0	%
Trimmed	0 below 0 AvAl203 % or above 100 Av.Al203 %			Absolute error based on Precision ±	0.67	Av.Al203 %
				(HARD limits 0% to 100%)	2.3	90th percen



	ReSiO2 SP-171	ReSiO2 SP-271				
Pairs	292	292		Average bias (-ve if original is lower)	0.03	ReSiO2 %
Mean	1.20	1.18	ReSiO2 %	Regression slope Y on X (not plotted)	0.81	
Minimum	0.59	0.54	ReSiO2 %	Average HARD (= AMPD/2)	5.05	%
Maximum	4.09	2.94	ReSiO2 %	Average HRD (Half Relative Diff.)	1.05	%
Variance	0.14	0.12	ReSiO2 % sq	Precision based on CV (CI 68%)	9.3	%
CV	0.32	0.30		Absolute error based on Precision ±	0.11	ReSiO2 %
Trimmed	0 below 0 ReSiO2 % or above 100 ReSiO2 %			(HARD limits 0% to 100%)	10.2	90th percen

Figure 8-18: Precision of paired Stockpile Belt samples for AL and SI (SLR, 2021)

Table 8-10: Summary of Stockpile Belt paired samples for Myara North in 2018: 292 pairs for SP-271 vs SP-171

Analyte	Precision	90th Percentile	Mean	Bias	Min	Max
AL	2.0	2.3	32.95	-0.13	28.16	37.42
SI	9.3	10.2	1.19	0.03	0.54	4.09
FE	6.3	7.0	17.15	-0.06	9.90	27.69
AT	1.6	1.8	38.72	-0.08	34.28	43.48
ST	5.6	6.5	21.10	0.24	13.25	34.60
SO	4.3	4.9	2.88	-0.03	1.83	4.14
OX	7.2	7.9	1.96	0.00	1.09	3.37
BO	37.2	43.5	0.22	0.00	0.01	1.47

Notes:

1. Precision is based on the CV of the HARD statistic at a confidence interval of 68%
2. 90th percentile is based on the ranked HARD statistic

3. Mean is the mean of all pairs (as % grade)
4. Bias is difference in the Means of Original and Duplicate sets, negative if Original (SP-171) is lower (as % grade)
5. Min and Max (as % grade) indicate the range of the data, in this case the range of ore grades going to the stockpiles.

Precision demonstrated in Table 8-10 is excellent for AL, AT, ST and SO. Precision is good for SI, FE and OX but poor for BO. The high quality of the repeatability results is surprising and attests to:

- The quality of the REF assays performed
- The sample preparation in the Pinjarra Laboratory of the 12 hourly shift samples
- The homogenization and blending performance of the mining operation, despite the large particle size of material on the twin belts.

The lack of any significant bias attests to the performance and reliability of the sampling tower in taking a primary cut and reducing it correctly, despite various design flaws noted for some of the sampling towers during independent reviews since the late 1980s (Gy, 1984; Rennick et al, 1992; Knight, 2016; Lyman, 2017; Holmes, 2018).

The good performance for all analytes except BO indicates that the low grades of BO may be near detection limits (defined as where the precision approaches 100%).

Table 8-10 also provides a good indication of the average grades of ore and the expected range (minimum to maximum) for the ore fed during the period covered by the data set. Arguably, all precision data previously presented could be trimmed to such ranges and would demonstrate improved precision (e.g. as shown by the results in blue font in Table 8-6).

9.5.4 QP Opinion

It is the SLR QPs opinion that the large data sets collected over a long timeframe, the satisfactory mine production shown by reconciliation results (see 11.12), and the QC data sets examined, all provide sufficient confidence in the available data for resource estimation.

Specifically:

- Appropriate internal reference material (standards), wet chemical certified reference materials, and blanks are monitored.
- The paired data from stockpile belts SP-171 and SP-271 indicates that the REF assaying method, and the sampling tower, have excellent repeatability and the ore grades delivered to the Pinjarra stockpiles from Myara North show good homogeneity after crushing and prior to stockpile blending.
- The programs of extensive re-assaying of pulps provide evidence that the procedures have been maintained and are sound over a long period.
- The REF- FTIR data provides confidence that the FTIR assaying technique, a rapid spectral method, is sound when calibrated and validated with the REF data.
- The comprehensive monitoring of REF data both internally and through umpire assays is appropriate and results are reasonable.

- The STE method is a reasonable alternative to Field Duplicates and indicates to SLR that the drill rig splitting is appropriate (unbiased, and producing moderate precisions of less than 20%).
- The available twinned hole data indicated poor repeatability (as expected, due to geological variability and perhaps sample splitting) which obscures any analysis of possible bias.

In the opinion of the SLR QP, the QA/QC of sample preparation and assaying is adequate and the assay results are suitable for use in Mineral Resource estimation.

It is the opinion of the SLR QP that the analytical procedures used for the Alcoa Mineral Resource comprises part of conventional industry practice. FTIR is not widely used yet in the bauxite industry but is becoming more widely accepted and applied to more operations. At Alcoa the method has been consistently applied successfully for a decade and is routinely validated by industry standard XRF and wet chemical procedures as discussed in Section 8.3 and 8.4.

It is the opinion of the SLR QP from the studies on FTIR repeatability discussed above that the overall precision and accuracy of the FTIR assaying is acceptable.

10.0 DATA VERIFICATION

10.1 Data structures

Wherever possible the transfer of geological, sampling and assaying data is now carried out digitally.

The use of rugged field tablets was introduced after an external review (Snowden, 2015). The data recorded at the drill rig is uploaded daily via WiFi for validation prior to importing into the acQuire database. This allows the data to be captured, checked, approved, and then loaded without any further manual keystroke entry.

The sample preparation and assaying data are all recorded at the Bella facility (see Figure 8-3) allowing all aspects of the sample preparation to be tracked and transferred to KWI through direct connection to their Laboratory Information Management System (LIMS). After calibration, validation and checking of the FTIR and REF assays they are transferred digitally to the acQuire database.

Within the database, scripts are run to prioritise the results and to define the BEST value for each analyte (e.g. AL_BEST, SI_BEST, etc). The downhole accumulations of all grades are calculated, and the base of mineralization is determined. Other values are also calculated such as the Density using a regression equation (see Section 11.8.5).

An events table is used to change the status of each hole at all stages as it progresses through the validation process from designed, to drilled, to despatched, to lab pending, to validated.

The various downhole geological features (LithCode, Seam, Geol Floor, etc) are all verified spatially, validated by geologists using the vertical position and assays (e.g. Figure 7-7), and where appropriate metadata (e.g. Status Flag) is added to record the basis of the interpretation.

The required modelling files are exported from the acQuire database by the geostatisticians using queries. The final Mineral Resource models are then imported into the over-arching ArcMap environment for mine planning, and integration with the environmental and other planning protocols.



Figure 9-1: Visual display of hole status (logged and assayed) for hole G39150224 in Serpentine (Alcoa, 2021)

10.2 Data verification measures

The SLR QP interrogated the data extracted from the acQuire database for two areas (Serpentine and Millars). For these two areas the count of records in each Table is summarized in Table 11-2.

Table 9-1: Count of records by database Table for two database extracts

Data type	Table	Serpentine	Millars
Collars	*tblass*	6,362	8,298
Surveys	*tblsur*	6,362	8,298
Assays	*tblass*	59,622	70,905
REF Assays	*tblassrefs*	611	711
Lithology	*tblgeoLithology*	69,564	82,762
Geology Floor	*tblgeoGeolFloor*	69,561	82,761
Seam	*tblgeoSeam*	69,564	82,762

Extensive checks were run to validate the integrity. These included searching for duplicate records, downhole gaps¸ interval overlaps, missing collar or survey records, etc.

The following observations were made:

- As expected the Validation Tables ensure that there are no anomalous codes.
- Checks for assay closure (adding all assays to 100%) are done by Alcoa when the assay data is prepared for resource estimation. The availability of total oxide assays (e.g. AT and ST) has progressively increased over time.
- In a few cases (156 for Serpentine, drilled from October 2019 to December 2019, and 114 for Millars) there were blank values for LithCode in the table *geoLithology* at the top of the hole, followed by a zero-length interval (e.g. From 1.2 m and To 1.2 m) with a valid LithCode. This is due to the practice of not sampling the overburden but instead discarding it, creating in some cases a short interval with no assay or LithCode. This type of database error is usually picked up by a validation check looking for zero length drill segments. In this deposit, because the geological logging is expected to follow a vertical sequence (which is used for some of the interpretation scripts), such zero length intervals are not uncommon to allow for pinching and swelling of some horizons.

Some calculation and range checks were run that highlighted gaps or anomalies in the scripts used to validate that data before resource estimation:

- There are 19 records with ST_BEST values greater than 100% in Serpentine and 2 in Millars. Such values should be investigated, trimmed and flagged.
- There are a number of records (107 for Serpentine and 165 for Millars) where AL (available alumina) is greater than AT (total alumina). There are also records (1,273 for Serpentine and 2,029 for Millars) where SI (reactive silica) is greater than ST (total silica). These should be further investigated, flagged in the database, and future instances flagged during data loading so that

when such results (infrequently) occur there is recognition during the data loading that this is due to FTIR assays outside the normal calibration range, rather than due to sample mix-up or contamination.

- Checks on the regression calculation for density were run on the Serpentine database. There were 1,187 records not flagged as Seam=CAP, that had density values ranging from 2.04 to 2.28. These were either 20% or 40% CAP and had a density value reflecting the length weighted average of the two domains assigned. Of the total 6,399 records with valid seam and iron data, SLR found that 5,566 (87%) were within ±0.1 of the database density value. The remaining 833 records with Seam=CAP and an FE_BEST assay, were either 60% or 80% CAP and had a density value reflecting the length weighted average of the two domains assigned.

10.3 QP Opinion

The database extracts that were provided proved very robust to scrutiny, save for a small number of anomalies noted, none of which are considered material in view of the vast number of drill holes, assays and other records.

The SLR QP is of the opinion that the database is adequate and the data is appropriate for the purpose of Mineral Resource estimation.

11.0 MINERAL PROCESSING AND METALLURGICAL TESTING

Mineral processing and metallurgical test work samples representing the Darling Range operations are not available; however, this is an operating mine and consistent operating data demonstrates that the ore is directly transported to the refineries following size reduction. SLR understands that these operating data represent all material mined for ten years and sourced from four mining regions and as such represent the various types and styles of mineralization within the Darling Range operations.

It is important to note that there is no upgrading involved in the processing and therefore the processing recovery can be considered above 99% allowing for any losses in production.

The operating data between 2010 to 2020 indicates that the product from the Darling Range operations consisted of an average Al_2O_3 grade of 33% and average SiO_2 grade of 20%. It is important to note that higher grades of reactive SiO_2 is potentially deleterious but that remained below 1.2% throughout the 10 years of operation. SLR understands that according to the mine plan the Total SiO_2 content on an annual average basis remains below 20%, and that reactive SiO_2, on the same basis, remains at or below 1.25% for the next 10 years. This means there is no evidence of any deleterious elements present in the Darling Range ore within the next 10 years of production.

A summary of the product grades from the Darling Range operations are shown in Table 10-1, Table 10-2 and Table 10-3.

Table 10-1: Product grades of Darling Range Operation (Willowdale – Wagerup refinery feed)

Year	Moisture (%)	LOI (%)	Total Al_2O_3 (%)	Total SiO_2 (%)	Fe_2O_3 (%)	TiO_2 (%)	A.Al_2O_3 (%)	R.SiO_2 (%)
2010	7.959	22.34	38.10	21.76	17.49	1.431	32.81	1.134
2011	7.930	20.89	40.57	22.28	17.64	1.466	32.75	1.141
2012	7.990	21.02	38.13	21.12	18.06	1.577	32.96	1.164
2013	7.745	21.15	36.80	18.57	19.48	1.607	32.72	1.209
2014	7.853	21.24	37.21	18.09	19.34	1.624	33.10	1.170
2015	7.484	21.48	37.01	18.01	19.03	1.719	33.16	1.112
2016	7.816	21.63	37.56	16.73	20.63	1.746	33.06	1.139
2017	7.817	21.75	37.93	16.01	21.37	1.825	33.03	1.103
2018	7.952	21.64	38.29	15.89	21.34	1.880	33.02	1.131
2019	7.611	21.28	37.33	16.76	21.34	1.851	32.29	1.153
2020	7.835	21.50	37.40	14.12	23.25	2.098	32.45	1.074

Table 10-2: Product grades of Darling Range operations (Huntly–Pinjarra refinery feed)

Year	Moisture (%)	LOI (%)	Total Al_2O_3 (%)	Total SiO_2 (%)	Fe_2O_3 (%)	TiO_2 (%)	A.Al_2O_3 (%)	R.SiO_2 (%)
2010	7.4	20.8	38.6	20.8	17.4	1.34	33.1	1.05
2011	7.8	21.0	38.8	20.0	18.0	1.41	33.0	1.04
2012	8.2	21.4	39.4	20.2	17.1	1.37	33.6	1.13
2013	8.1	21.5	39.8	19.5	17.1	1.35	33.9	1.12
2014	8.2	21.5	39.6	18.6	17.7	1.45	33.8	1.16
2015	8.0	21.6	39.3	19.5	17.3	1.41	33.8	1.08
2016	8.2	21.4	39.2	20.3	17.0	1.38	33.8	1.13
2017	8.3	21.3	39.3	19.6	17.5	1.42	33.9	1.11
2018	8.3	21.4	39.1	19.5	17.6	1.42	33.7	1.07
2019	8.1	21.3	38.9	20.1	17.2	1.38	33.5	1.12
2020	8.4	21.4	39.1	18.4	18.6	1.52	33.5	1.20

Table 10-3: Product grades of Darling Range operations (Huntly– Kwinana refinery feed)

Year	Moisture (%)	LOI (%)	Total Al_2O_3 (%)	Total SiO_2 (%)	Fe_2O_3 (%)	TiO_2 (%)	A.Al_2O_3 (%)	R.SiO_2 (%)
2006	7.8	21.7	39.3	18.7	18.0	1.37	33.9	1.10
2007	8.0	21.6	39.2	19.5	17.6	1.33	33.7	1.11
2008	7.9	21.3	39.1	20.1	17.3	1.34	33.8	1.09
2009	7.8	21.3	39.0	20.7	17.3	1.29	33.5	1.02
2010	7.5	21.4	38.6	20.8	17.4	1.26	33.1	1.04
2011	7.6	21.3	38.7	20.1	18.2	1.30	32.8	1.03
2012	8.2	21.5	39.4	20.3	17.0	1.25	33.5	1.13
2013	8.1	21.8	39.8	19.5	17.1	1.26	33.9	1.11
2014	8.2	22.0	39.6	18.8	17.7	1.37	33.7	1.17
2015	8.0	22.0	39.4	19.7	17.2	1.31	33.8	1.08
2016	8.2	21.7	39.1	21.3	16.1	1.32	33.8	1.03
2017	8.3	22.2	38.9	20.6	16.5	1.34	33.8	1.03
2018	8.3	22.1	38.6	20.8	16.7	1.33	33.9	1.05

Year	Moisture (%)	LOI (%)	Total Al_2O_3 (%)	Total SiO_2 (%)	Fe_2O_3 (%)	TiO_2 (%)	A.Al_2O_3 (%)	R.SiO_2 (%)
2019	8.0	21.8	38.9	21.2	16.4	1.32	33.5	1.12
2020	8.4	21.7	39.1	19.8	17.6	1.44	33.5	1.16

11.1 QP opinion

SLR is of the opinion that the Darling Range operation demonstrated that ore can be effectively crushed and supplied to a refinery for further upgrading to produce Alumina. The historical operational data confirmed that the ore consistently met refinery specifications without any deleterious elements. Based on this, and the additional information about the mine plan provided by Alcoa, it is reasonable to assume that the ore from Darling Range can be economically processed for the next 10 years.

12.0 MINERAL RESOURCE ESTIMATES

12.1 Summary

The Darling Range resource inventory comprises over 13,000 resource blocks with a combined area of approximately 10,870 ha averaging 50 kt. The lateritic bauxites occur as surficial coverings of limited thickness, typically between 4 m to 8 m, but with significant lateral extent. Historically, resource estimation was by 2D plan-polygonal methods (Polygonal) referred to by Alcoa informally as the ResTag procedure. More recently, resource estimation by Alcoa has evolved to include gridded seam (GSM) and 3D block (3DBM) models using geostatistical techniques. Mineral Resource estimates based on GSM and 3DBM models (and some Polygonal models) consider practical mining constraints.

The delineation of Mineral Resources using 3D methods has focused on well drilled areas that fall within the 10-year mine plan and comprise approximately 30% of the Mineral Resources in 37 3DBM models. GSM models were typically constructed in areas with 15 m spaced drilling. Approximately half of the Mineral Resources are based on Polygonal (ResTag) estimates which are mostly located in areas of wider-spaced (30 m and 60 m) drilling and are of lower confidence. All new resource updates employ the 3DBM methods irrespective of drill hole spacing.

Mineral Resource estimation was carried out by Alcoa and resources are defined for 92 sheets in 70 mining regions. There are 13,467 discrete zones of mineralization that comprise the resource, each split vertically into 4 domains for which 11 elements were estimated. SLR carried out audits on representative models selected in conjunction with Alcoa and comprising:

- Models to be mined in the short to medium term (less than 5 years)
- Models with significant amounts of resource material
- Models representing the three estimation methods used by Alcoa.

The models audited were:

- ResTag estimation method: Teesdale
- GSM estimation method: Larego (F54 and F55)
- 3DBM estimation method: Serpentine (R25) and Millars (R22).

The audit process by SLR comprised examination of the procedures used by Alcoa, independent review and discussion with staff, normal validation checks (e.g. statistics, swath plots, visual examination, change of support analysis and generation of grade-tonnage curves). The two 3DBM models were examined in detail. The other models were examined and interrogated to ensure that the documented procedures were followed and that results were consistent with SLR expectations based on the data inputs.

The process used by Alcoa involves an integrated approach to data collection, bauxite delineation, and production planning aimed at the provision of feedstock that meets the requirements of the local alumina refineries.

For all 3 estimation methods drill holes were flagged with geological units using multi-pass geochemical scripts that included thickness constraints. The GSM flagging process incorporated some additional mining constraints. Geological interpretations in both 2D and 3D were constructed with the flagged drill hole composite data, which constrain the spatial estimation of bauxite mineralization. Subsequent to block

grade estimation, mining constraints are applied to the 3DBM models to restrict Mineral Resources to areas of potentially economic bauxite mineralization.

AL, SI, FE, ST, PT, OX, EO, CO, and SU are estimated for all models, but only AL and SI are reported for the Mineral Resource. GSM uses inverse distance weighting methods to assign grades to the bauxite profile, and 3DBMs rely on ordinary kriging block grade estimates. Validation methods differ slightly for the different model types, but all models are reported by Alcoa to validate well against the input drill hole data.

Mineral Resources have been classified in accordance with the definitions for Mineral Resources in S-K 1300, which are consistent with Australasian JORC Code (2012) and Canadian NI 43-101 (2014) definitions, and are determined primarily on drill hole spacing. Models constructed primarily with pre-2010 drill holes are downgraded as this information is considered to be of lower confidence.

Mineral Resource estimates exclusive of Mineral Reserves are shown in Table 11-1, and include a 5% reduction factor in tonnage, based on the results of annual reconciliations (see discussion on density in Section 11.13).

Table 11-1: Summary of Mineral Resources exclusive of Mineral Reserves – 31st December 2021

Category	Tonnage (M dmt)	A.Al_2O_3 (%)	R.SiO_2 (%)
Measured	48.0	32.9	1.11
Indicated	34.8	31.9	1.12
Total Measured + Indicated	**82.8**	**32.5**	**1.11**
Inferred	320	33	1.2

Notes:

1. The definitions for Mineral Resources in S-K 1300 were followed, which are consistent with JORC (2012) definitions
2. Mineral Resources are 100% attributable to AWAC
3. Mineral Resources are estimated at a geological cut-off grade, which generally approximates to nominal cut-off grades of 27.5% A.Al_2O_3 with less than 3.5% R.SiO_2. Locally the cut-off grade may vary, dependent on operating costs and ore quality for blending. The target grade for mine planning is 32.7% available aluminum oxide (A.Al_2O_3) and 1.0% reactive silica (R.SiO_2)
4. Mineral Resources have been estimated using a three-year trailing average of arms-length sales of bauxite from Darling Range. The price that constrains the estimate for optimisation was discounted to exclude export logistics costs, i.e. the base price was USD24/t, and the discounted price was USD16/t.
5. A minimum total mining thickness of 1.5 m was used
6. *In situ* dry bulk density is variable and is defined for each block in the Mineral Resource model
7. A global downwards adjustment of tonnes by 5% is made to account for density differences based on historic mining performance
8. Mineral Resources are reported exclusive of Mineral Reserves
9. The reference point for the Mineral Resource is the *in situ* predicted dry tonnage and grade of material to be delivered to the refinery stockpile following the application of mining design parameters
10. Metallurgical recovery has not been directly considered in the estimation of Mineral Resources as the Darling Range operations do not include a conventional processing plant, only crushing as described in Section 14.0. The metallurgical recovery of the three refineries (Kwinana, Pinjarra and Wagerup) are beyond the boundaries of the mining operations being the subject of the TRS.
11. Numbers may not add due to rounding.

12.2 Resource Database

12.2.1 Drill Hole Data

Drill hole collar, survey, and assay data are exported from the acQuire database for resource estimation.

Data exports from acQuire currently utilize Python scripts and the Spyder open-source plugin for validation and initial processing, including:

- Assigning 999 as the Domain code where drill hole intervals lack AL, SI and Fe assays
- Removing holes from the database if located greater than 7 m horizontally from the planned location
- Identifying and removing duplicate or repeat holes based on a set of criteria
- Resetting AL to AT where AL exceeds AT
- Resetting SI to ST where SI exceeds ST
- Calculating Assay Total = AT (AL if AT absent) + ST + BO + FE + SU + CO
- Deleting assays for samples where the Assay Total is below 70% or greater than 100%.

The output is a set of CSV files for collar, survey, assay, and geology.

The validation checks have been implemented progressively over time as drill hole data for some project areas includes some samples where AL exceeds AT and SI exceeds ST.

Other than collar elevation adjustments, no further data transformations are applied prior to resource estimation.

12.2.2 Topographic data

Digital elevations models (DEMs) were generated from (in order of priority) drill collar survey data, LiDAR survey data, and Landgate satellite data. A 7.5 m by 7.5 m mesh is used for the DEMs. Drill hole collar elevations were registered to the DEM for resource estimation.

12.3 Geological Interpretation

12.3.1 Polygonal Models

For Polygonal resource estimates, grade-based ‘geological’ codes are assigned to drill hole intervals. These codes are used to define the top and bottom of the ‘bauxite’ horizon in each hole, which is then used to estimate the bauxite volumes and average grades within polygons.

The top of the bauxite usually coincides with the base of the overburden, as defined in the drillers’ logs. The base of the Bauxite Zone (termed the geological floor) is defined within the acQuire database using a multi-pass script that applies the following hierarchical set of rules to the sample grades:

Pass 1

- Uphole search for two consecutive samples with individual AL values ≥27.0%
- Record depth of the lower of the two samples

- Check that the cumulative AL at that depth is ≥27.5%
- Check that the individual SI at that depth is ≤3.5%
- Check that the cumulative SI at that depth is ≤3.0%
- Check that the cumulative OX at that depth is ≤4 kg/t
- Check that the sampled depth is ≥2.0 m, but less than hole depth (if equal, see pass 3)
- If all criteria are met, set flag to “pass”, set geological floor depth to lower sample depth
- Proceed to pass 2.

Pass 2

- Uphole search for two consecutive samples with individual AL values ≥25.5%
- Record depth of the lower of the two samples
- Check that the cumulative AL at that depth is ≥27.5%
- Check that the individual SI at that depth is ≤3.5%
- Check that the cumulative SI at that depth is ≤3.0%
- Check that the cumulative OX at that depth is ≤4 kg/t
- Check that the sampled depth is ≥2.0 m, but less than hole depth (if equal, see Pass 3)
- If all criteria are met, set flag to “pass”, set geological floor depth to lower sample depth
- If any criteria fail, geological floor defined in Pass 1 is retained.

Pass 3

- Uphole search for two consecutive samples with individual AL values ≥27.0%
- Record depth of the lower of the two samples
- Check that the cumulative AL at that depth is ≥27.5%
- Check that the individual SI at that depth is ≤3.5%
- Check that the cumulative SI at that depth is ≤3.0%
- Check that the cumulative OX at that depth is ≤4 kg/t
- Check that sampled depth = hole depth
- If all criteria are met, set flag to “pass – open”, set geological floor depth to lower sample depth.

Pass 4

- Uphole search for two consecutive samples with individual AL values ≥24.5%
- Record depth of the lower of the two samples
- Check that the cumulative AL at that depth is ≥25.0%
- Check that the individual SI at that depth is ≤3.5%

- Check that the cumulative SI at that depth is ≤3.0%
- Check that the cumulative OX at that depth is ≤4 kg/t
- Check that the sampled depth is ≥2.0 m, but less than hole depth (if equal, see pass 3)
- If all criteria are met, set flag to “marginal”, set geological floor depth to lower sample depth.

The application of these rules assigns a geological floor depth to each hole, along with a Pass, Pass-Open, Marginal, or Fail flag. Holes flagged as Marginal or Fail are inspected by Alcoa staff members, with manual adjustments applied if warranted. For areas infilled to 15 m spaced holes, the geological floor model is replaced by a mining floor model, which is discussed in the following section.

Results of geological floor flagging are used to subjectively define the lateral extents of the Mineral Resource. Outlines are manually interpreted by Alcoa geologists in ArcGIS or MineSight, and are guided by consistency in thickness, depth, and grade, minimum limits on the number of enclosed samples and the enclosed area, and local geomorphology. The polygons delineate separate areas that typically range in size from 10 ha to 100 ha, with most being around 30 ha. An example plan view is shown in Figure 11-1.

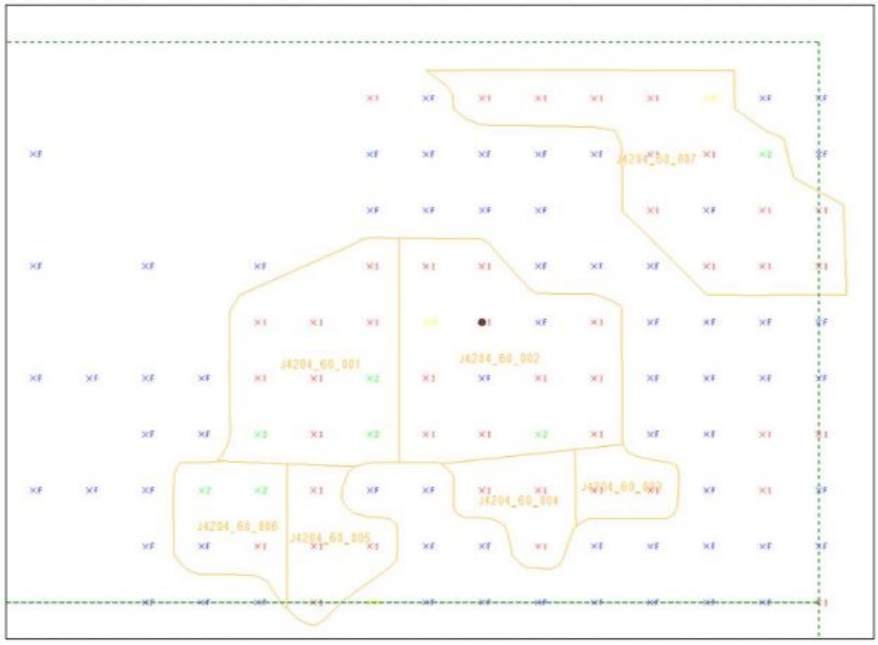


Figure 11-1: Plan View of Polygonal Approach (Pass = red, pass open = green, marginal = yellow, fail = blue) (Alcoa, 2022)

12.3.2 Gridded Seam Models

GSM models are located in areas of 15 m spaced infill drilling and include practical mining constraints as part of the 'geological' interpretation used for resource models.

The base of overburden and the base of caprock is identified in each drill hole as 3D points and wireframed as surfaces. The geological bauxite zone floor, which is defined for the wider drill spacings used for Polygonal estimates, is replaced by a mining floor for GSMs. The mining floor is interpreted directly from the drill hole data presented on the 15 m spaced east-west cross sections, digitized in MineSight as strings, then linked to form wireframe surfaces.

The interpretation of the mining floor is a manual process performed by the site geologist, with the objective of achieving acceptable grades and practical mining outlines. The mining floors are defined using a set of guidelines instead of prescribed rules, including:

- Nominal cut-off grades of ≥27.5% AL and ≤3.5% SI are used for mining floor definition;
- If the SI grade in the sample immediately below the floor exceeds 5.0%, the floor is raized 0.5 m;
- A minimum face height (distance from mining floor to the base of overburden) is targeted;
- Face heights exceeding 4 m will require multiple cuts or bench mining;
- The overburden to face height ratio should not exceed 1;
- A maximum floor gradient of 1 in 7 is required between 15 m spaced holes (the gradient can be increased to 1 in 5 for second and third cuts);
- Benching should be invoked where the gradient constraints cannot be maintained; and
- The floor interpretations should be extended laterally into at least one of the surrounding waste holes.

The base of overburden and mining floor surfaces are used to flag the drill hole samples. For each drill hole, the samples located below the base of the overburden and above the mining floor are composited into a single interval, with composite grades length- and density-weighted. Additional drill hole composites are generated for second and third pass mining floors.

The composite data are examined in plan view, and polygons are digitized around the interpreted lateral extents of the mining zones using the following guidelines:

- Nominal cut-off grades of ≥27.5% AL and ≤3.5% SI for lateral boundary definition
- The boundary is positioned at least 15 m away from holes with SI grades exceeding 5%
- Buffer zones are placed around environmental constraints, and around bedrock outcrop
- Internal waste zones should contain at least three drill holes
- Individual polygons should have an area of at least 1 ha
- A width of at least 45 m should be retained for mining equipment movement.

The resulting polygons are divided into 'mining' blocks that each contain approximately 20 kt to 40 kt.

12.3.3 3D Block Models

Similar to the Polygon and GSM interpretation approaches, a set of rules are used to assign initial domain codes to individual samples. These Domain codes are then modified in several subsequent passes that take into account the grades and coding of other intervals in the hole.

The initial script is used to assign a Domain code to each interval based on various combinations of major analyte threshold grades. A total of 6 main material type Domains (DOMAF) are defined, namely overburden (DOMAF=99), caprock waste (10), caprock bauxite (20), bauxite (30), low-grade bauxite (40), and clay (50). Each of these material types (apart from overburden) is divided into up to five grade-based sub-domains. Three subsequent coding passes are conducted that iteratively adjust the codes to combine the sub-domain into the 6 main Domains whilst ensuring that strict stratigraphic ordering is maintained. A further two passes are coded to assign Domain codes that denote whether the material is derived from granite or dolerite.

The base of each Domain is generated on a 7.5 m by 7.5 m grid using an automated modelling process. Where drill holes do not penetrate the full bauxite profile or where the Domain contact is not defined exactly due to missing assays a conditional simulation algorithm is used to estimate the Domain thickness from adjacent drill holes. The simulation algorithm employs a Matern variogram and selects the average of 10 simulations for the missing data point. The grid mesh is then wireframed in MineSight to provide 3D surfaces. The base of Domain 50 (Clay) is set at 10 m below the top of that Domain.

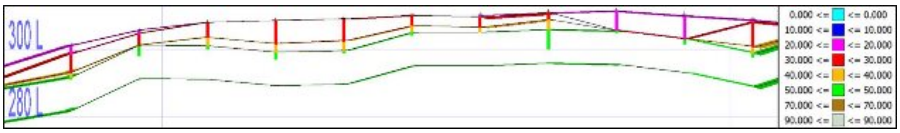


Figure 11-2: Example Section showing Domain (DOMAF) and Wireframed Surfaces (SLR, 2022)

3:1 vertical to horizontal exaggeration

Potential dolerite dyke intervals are flagged for samples where FE exceeds 25% and ST is below 10%, and the entire hole is flagged as potential dolerite dyke if 3 or more samples are flagged in this manner. The interpretation of dolerite dykes is carried out manually using local orientation trends and may be based on one or more holes (see Figure 11-3). Dolerite dykes are assumed to be vertical and are extended laterally half-way between drill holes. Dolerite dykes can represent up to 15% of material in some areas but unweathered material can generally be screened out in the pit or prior to crushing as oversize boulders. Dolerite dykes tend to be well defined only when drill hole spacings are reduced to 15 m by 15 m.

A lateral boundary is interpreted to constrain the resource model (see Figure 11-3) and the 3D surfaces are extended where required. The lateral boundary, domain surfaces, and dolerite dyke interpretations are converted to wireframe solids.



Figure 11-3: Plan View of Bauxite Zone and Interpreted Dykes at Serpentine (SLR, 2022)

12.4 Statistical Checks

Statistical checks by Alcoa and independent reviewers are typically carried out by univariate statistical comparisons and histogram, grade trend, scatter, and cumulative log probability plots.

Univariate statistics by Domain are calculated pre- and post-compositing for validation, and for checks against the resulting resource models. For areas with multiple drilling campaigns carried out at significant time lags, SRK (2021a) previously noted that there were no material or unexpected differences between subsets of the dataset grouped by drilling period or drilling grid.

Histograms show that most analytes have distributions that are close to normal, as shown in Figure 11-4 for AL. The exception being SI, which is moderately to strongly positively skewed, as shown in Figure 11-5.

Marked grade trends with depth exist for most analytes but are consistent with the mineralization style and have been adequately accounted for by the geological interpretation and the use of unfolding methods during block grade estimation.

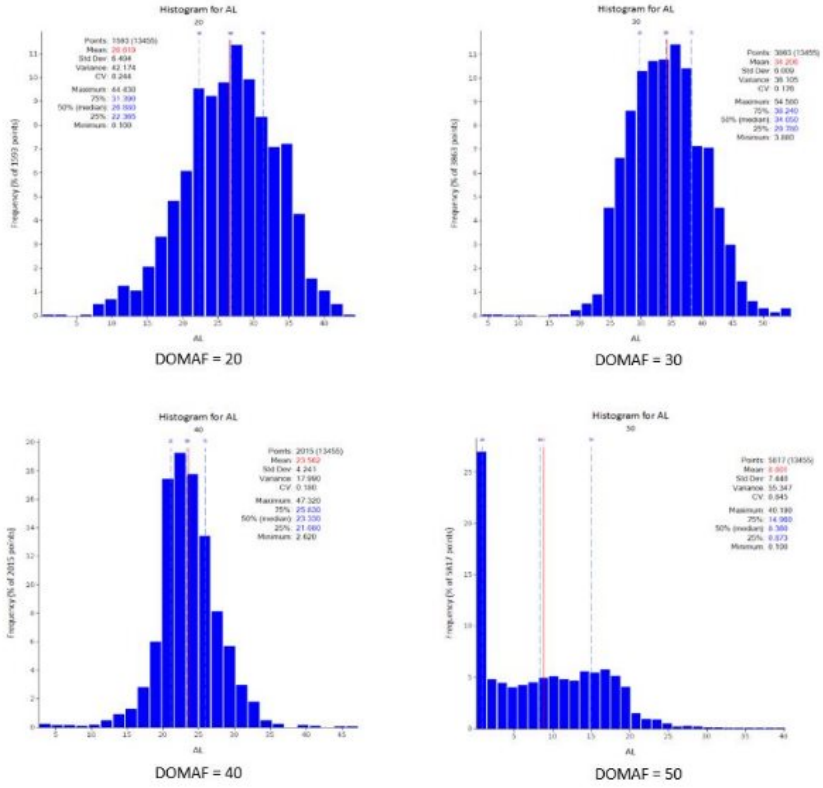


Figure 11-4: Histograms of AL by DOMAF at Serpentine (SRK, 2021)

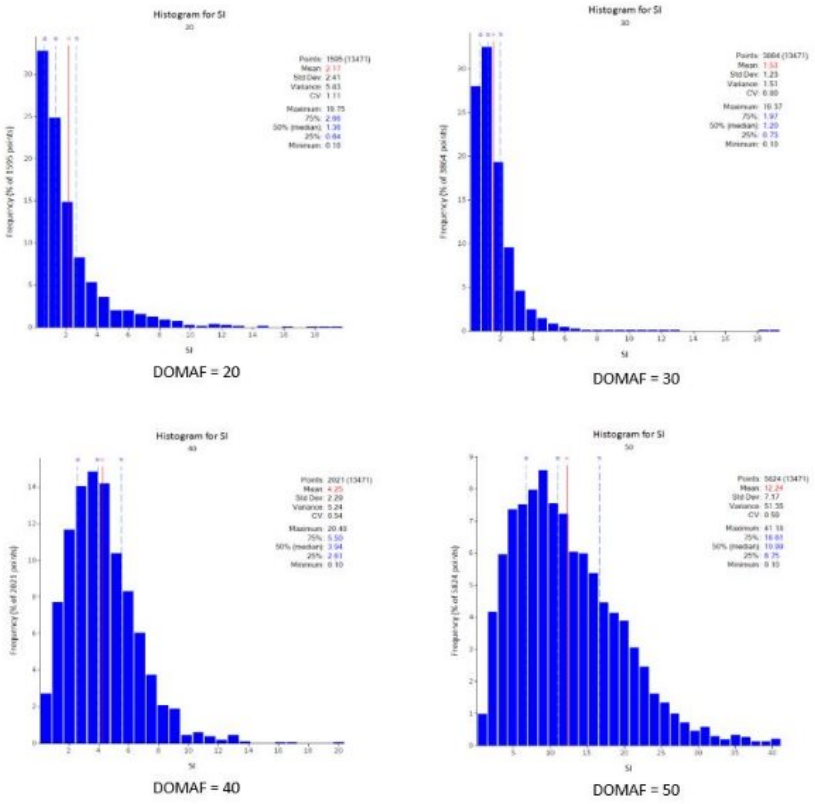


Figure 11-5: Histograms of SI by DOMAF at Serpentine (SRK, 2021)

Figure 11-6 plots SI versus ST for the clay zone at Serpentine. Note that reactive silica (SI) was greater than total silica (ST) for some composites (left-hand plot), and these relationships were carried through to the block model (right-hand plot). In the datasets reviewed, this issue was most common for SI in the clay zone, but there were also small numbers of bauxite zone samples with available alumina (AL) greater than total alumina (AT). This issue is not considered to be material for the Mineral Resource estimate, and adequate checks are now in place for future resource models.

Figure 11-7 shows the relationship between AL and SI for the bauxite and clay zones at Serpentine. Note the progressive increase in SI as the bauxite profile changes with depth from Hardcap (20), through friable bauxite, and to Clay (50), which was supported by grade trend plots.

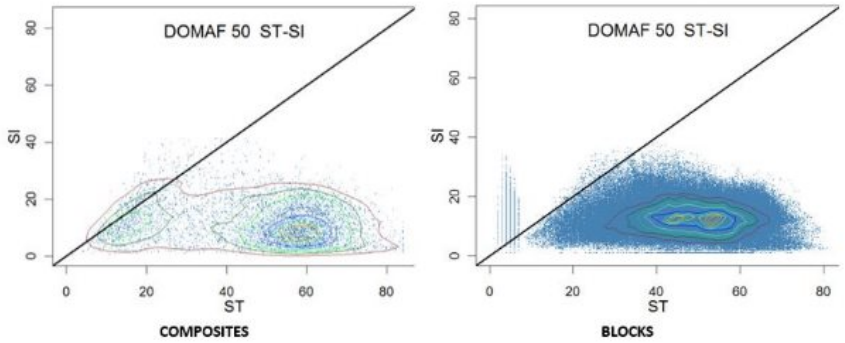


Figure 11-6: Scatterplots of SI versus ST for DOMAF 50 at Serpentine (SRK, 2021)

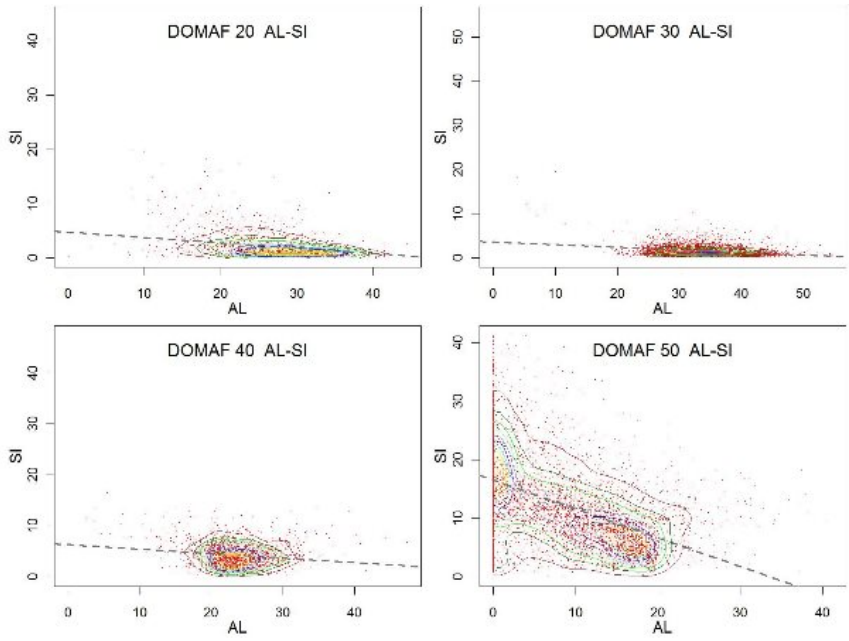


Figure 11-7: Scatterplots of AL versus SI by Domain at Serpentine (SRK, 2021)

12.5 Treatment of High-Grade Assays

High-grade caps for all analytes were applied to individual composites by Alcoa on a domain-by-domain basis following inspection of the data distribution. The SLR QP confirmed that high-grade caps were typically greater than the 99th cumulative sample percentile, as shown by horizontal lines in the plots in Figure 11-8.

No high-grade spatial restrictions were used by Alcoa in the resource estimation process.

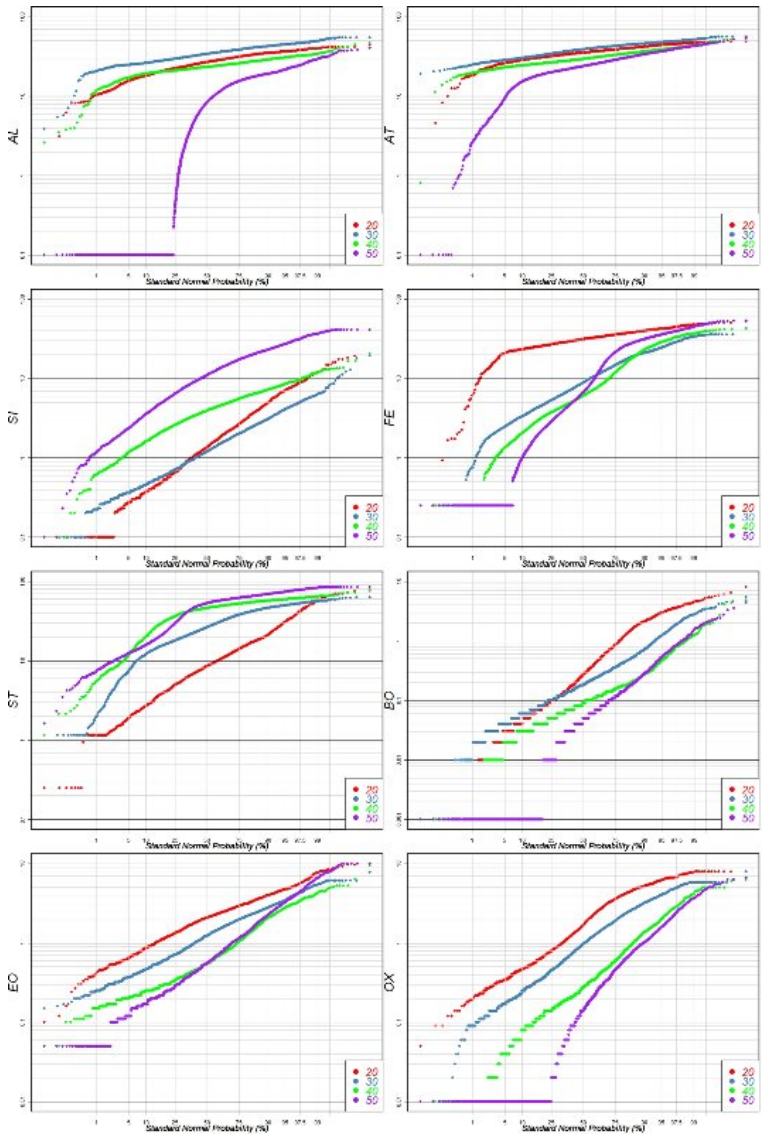


Figure 11-8: Cumulative Log Probability Plots for Serpentine Composites

12.6 Compositing

Drill holes were sampled at 0.5 m intervals in the bauxite zone below the base of the overburden, with a residual sometimes present at Domain contacts. The Polygon and GSM estimation approaches used the original drill hole data intervals. Prior to the interpretation of geological surfaces, holes used in the 3DBM resource estimates were composted to 0.5 m with residuals calculated to ensure their length was 0.25 m to 0.75 m.

Following the interpretation of geological surfaces, drill holes used for Polygonal and GSM resource models were composited to:

- Polygonal – a single interval for samples located below the base of the overburden and above the geological floor.
- GSM - a single interval for samples located below the base of the overburden and above the mining floor. Additional composites were generated in areas where second and third pass mining floors were identified.

All grade compositing for drill holes employs length-weighted linear averages.

12.7 Trend Analysis - Variography

Only some variogram analysis was carried out for Polygonal and GSM models as variogram parameters were not required to generate the resource models. Variogram analysis is routine for 3DBMs. Experimental variograms are calculated in unfolded space, with bauxite Domains 20, 30 and 40 unfolded to the 10/20 Domain contact and the clay Domain (50) unfolded to the 40/50 Domain contact.

Experimental variograms are calculated for AL, SI, ST, and FE for the bauxite zone, standardized to a sill of one, and modelled with 3-structure spherical models, as shown in Figure 11-9. A single variogram model is selected that provides a best fit to these four variables. Variogram models tend to display nugget values of less than 20% and total ranges of several hundred meters, but 80% of the sill is generally reached within 100 m laterally. As expected, horizontal to vertical anisotropy ratios are high (typically exceeding 50:1), but there is little lateral anisotropy. Only minor differences in Huntly and Willowdale variogram models were noted by SRK (2021a). This good definition of continuity compared to the 15 m drill spacing is considered by SLR to be a benefit of the unfolding approach.

Independent variogram models for each bauxite domain and analyte are not used for grade estimation to enable correlations between analytes to be maintained during the change in support from drill hole samples to blocks, which is important for mine planning considerations.

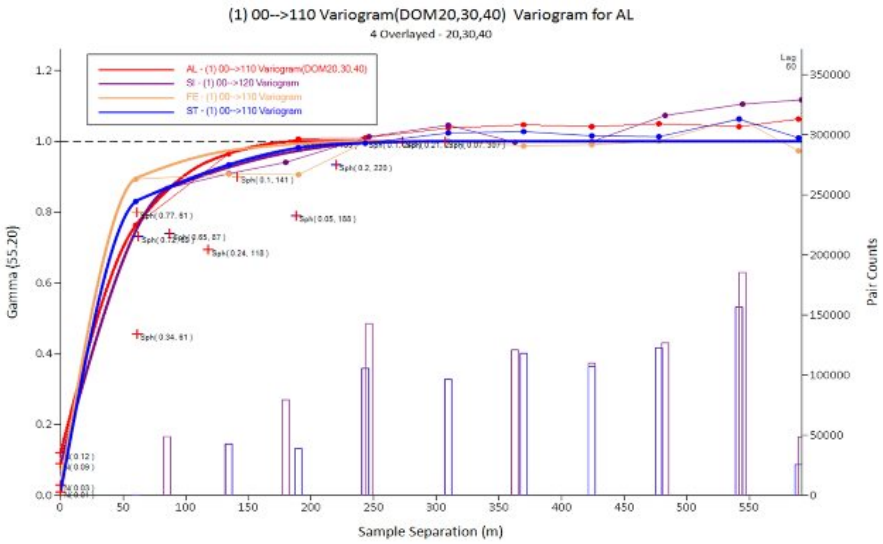


Figure 11-9: AL, SI, FE, and ST Directional Variogram Models at Serpentine

12.8 Bulk Density

For Mineral Resource estimation purposes, density can be regarded as another analyte, and tests can be evaluated for repeatability (precision) and accuracy (bias). The determination of the metal content of a specified volume of ore is as sensitive to density as it is to grade, and this is certainly the case for gold mining with high value, low concentration assays. For bulk commodities there is usually much more emphasis on grade since product tonnages are measured by weightometer.

Alcoa does not routinely collect density data but relies on production records to define averages. This is due to the broad geological consistency of the ore zones and the local chemical and physical nature of the lateritized ore. Porosity and permeability in particular show high lateral and vertical variability, rendering repeatability of density test work meaningless. Even were large numbers of data points available (for example by developing a density algorithm from the FTIR assaying of every drill sample, and then modelling it) the resulting model would still need to be factored by the actual mining results for local porosity.

For 3DBM resource estimation, each drill hole bauxite composite is assigned a dry *in situ* bulk density (DIBD) value based on the logged material type and the FTIR iron grade using the regression equation defined below in Section 11.8.5.

The available density test work data is summarized as follows.

12.8.1 1980 to 1992

Senini (1993) collated and reviewed all previous bauxite density data, including that by Sadleir done in 1986, and modified Sadleir's algorithm used for computation of density from individual 0.5 m sample assays of Fe_2O_3. Results are summarized in Table 11-2.

Table 11-2: Summary of density test data (t/m^3) from 1980 to 1992 (Senini, 1993)

Year	Source	Material	Count	Mean	Min	Max	Fe Mean	Regression On Fe_2O_3	
								Slope	Intercept
1980	DOSCO	Hardcap	18	2.200	1.98	2.52	19.35	0.0089	2.032
1986	Sadleir (in Senini)	Hardcap	14	2.364	2.08	2.75	20.88	0.0092	2.172
1992	Senini	Hardcap	67	2.409	1.81	3.10	21.00	0.0103	2.192
1986	Sadleir (in Senini)	Friable	11	1.846	1.64	2.12	8.80	0.0015	1.830
1992	Senini	Friable	27	2.225	1.88	2.79	14.30	0.0045	2.289
1980 - 1992	reported above	Granitic	67	2.327	1.81	3.10	16.71		
1980 - 1992	reported above	Doleritic	32	2.444	2.07	2.96	28.96		

While the approach used has merit, there are some obvious challenges:

- There are very few data points, unevenly distributed by material type and mining area
- Methodologies for collecting and testing the samples varied (sand replacement method for Hardcap, driven cylinder for Friable, water displacement are all noted)
- There is some lack of clarity on moisture, but it is assumed that the values are all *in situ* dry bulk density reported as t/m^3.

The differences between Hardcap (caprock) and Friable (other material) and between granitic or doleritic derivation are however clear.

Senini (1993) concluded that the dry *in situ* bulk density (DIBD) should be estimated using a regression equation which is still used.

12.8.2 2013 to 2018 drill samples

Various further test programs have been attempted including collection of all material from drill samples (assuming the drill hole volume is constant) and then taking wet and dry weights and assaying for iron. There were 51 samples from 8 holes at Huntly and 93 samples from 24 holes at Willowdale. Scatter plots produced by SRK 2021a showed significant scatter of all available data for both Hardcap and Friable (other) material.

12.8.3 2016 to 2017 pit samples

Alcoa collected 2 kg to 5 kg grab samples from 16 Huntly pits (76 samples) and 10 Willowdale pits (41 samples). Water immersion density testing was done by Bureau Veritas. The average of 2.01 t/m^3 is significantly lower than that from the 2015 study of 2.23 t/m^3. The drill samples did not account for porosity and voids, and were not adequately sealed.

FTIR assays for Fe2O3 were compared to sealed and unsealed density estimates and it was found that Senini's regression equation better predicted the unsealed densities. Thus it appears that the current regression equation based on Fe_2O_3 assays overestimates the in situ dry tonnage.

12.8.4 2018 downhole density estimates

In December 2018 Alcoa contracted downhole geophysical measurements in 54 aircore holes drilled in the Larego area. The data from this study is still being evaluated and is not used for Mineral Resource estimation.

12.8.5 Density estimation

Ore grades range from 28 to 38% A.Al_2O_3 for paired belt sample data (see Section 8.5.3.8) whereas test work densities range from 1.5 t/m^3 to 3.2 t/m^3 but the data is sparse and unreliable.

For resource estimation, each 0.5 m drill hole sample is assigned a dry in situ bulk density (DIBD) value based on the logged material type and the FTIR iron grade, using Senini's 1993 regression equation:

Hardcap (caprock) *= 2.19 + 0.0103*Fe*

Friable (other) *= 2.00 (used for all non-Hardcap material)*

If the sample is logged as comprising a mix of Hardcap and Friable, the assigned value for that 0.5 m interval represents a volume-weighted average. There is no differentiation between granitic and dolerite derived bauxite, due to the relatively small proportion of the latter (less than 15%).

In resource estimates prior to 2017 a moisture content of 9% was assumed and used to estimate wet tonnes. Since the implementation of 3D block modelling in 2018, densities are assigned after grade estimation, based on the regression equation and Fe grade of Hardcap, and using 2.0 t/m^3 for all other material, weighted by the proportion of Hardcap or other material.

12.8.6 Reconciliation of density

Alcoa uses comparisons between the As Mined tonnages and the sampling tower weightometers to apply adjustment factors to mine design estimates, scheduling and stockpile planning. Such adjustments are not applied directly to the Mineral Resource estimate as they vary locally.

Reconciliation of Huntly and Willowdale mined production (see discussion on density in Section 11.13) indicates that the density estimates are biased, with the long-term average As Mined tonnages being approximately 5% higher than the actual production measured on calibrated weightometers.

12.8.7 Density conclusions

The density data is limited in coverage and there is significant uncertainty regarding the methodology used for some sampling programs. A simple regression algorithm is used to estimate the DIBD for Hardcap

from the FTIR assays of Fe_2O_3. This does not account for voids or porosity, nor does it differentiate between Hardcap derived from granitic or doleritic material. All other material is assigned a density of 2.0. A constant moisture content of 9% is assumed for wet tonnages.

12.8.8 QP Opinion

In SLR's opinion the dry bulk density data is less well controlled than other analytes, but the long history of mining production and stockpile reconciliation means that the assumed values are adequate for resource estimation.

12.9 Resource Models

12.9.1 Polygonal

For each drill hole contained within a polygon, the samples located below the base of the overburden and above the geological floor are composited into a single interval. The following quantities are assigned to each polygon:

- Thickness = average length of contained composites
- Grade = length-weighted average grade of contained composites (density weighting is not applied)
- Density = average density of contained composites
- Volume = Polygon area by Thickness
- Tonnage = Volume by Density.

12.9.2 Gridded Seam Modelling

GSM employs 15 m by 15 m cells centered on the nominal drill hole locations. Separate seams are created for overburden, and for the interpreted Bauxite Zone (BXZ) between the overburden and the mining floor. BXZ is subdivided into separate seams where second and third mining cuts have been interpreted. Interpreted wireframe surfaces are used to assign a seam thickness to each cell (effectively the seam thickness of drill hole at the cell centroid).

Cell grade estimation used inverse distance weighting (IDW) techniques as follows:

- Hard boundaries, with each seam cell only estimated using nearby composite drill hole data within the corresponding seam
- IDW weighting factor of 1.2 for SI and 2 for all other variables
- 1 by 1 by 1 cell discretization
- Isotropic search distance of 180 m
- Minimum of 2 and maximum of 8 composites with a maximum of 2 per quadrant

Where drill holes are located at the centroid of cells the resulting cell grade estimates are essentially nearest neighbor estimates. In other words, the GSM outcomes are equivalent to 2D polygon estimates, with the usual constraint of that method, i.e. that the block variances are not smaller than the composite variances.

The GSM is constrained to the interpreted lateral extents of the mining zones. For each mining zone the following attributes are determined:

- Seam Thickness = average seam thickness of the contained GSM cells
- Grade – weighted average grade of contained cells (density weighting is not applied)
- Density = average density of contained cells
- Volume = mining zone area by Seam Thickness
- Tonnage = Volume by Density

12.9.3 3D Block Modelling

In 2019, Alcoa commenced preparing Mineral Resource estimates using 3DBM techniques, with the aim to progressively replace all Polygonal and GSM models. To date, Alcoa has prepared a total of thirty-seven 3DBM representing around 30% of the Mineral Resource.

This section describes the current 3DBM procedures, which have evolved over time, with some parts now automated or semi-automated. Changes in the 3DBM procedures have generally been minor and are not considered material to the resulting resource models.

Block models are initially generated:

- using the ML1SA lease area grid
- with an origin that ensures that the majority of the drill holes are located nearer to the block corners rather than the centroids
- with a parent block size of 15 m by 15 m by 0.5 m and a sub-block size of 3 m by 3 m by 0.25 m (XYZ)
- flagged with a Domain (DOMAF) code based on the domain surface interpretations.

Block grade estimation:

- includes estimation of AL, SI, ST, FE, EO, PT, CO, SU, OX, BO, and AT
- is done by ordinary kriging (OK) for parent blocks, with parent grade estimates assigned to all sub-blocks within the parent block
- uses the same unfolding surfaces as used for variogram analysis
- sets soft boundaries for bauxite Domains (DOMAF 20, 30, 40)
- uses a 3-pass search strategy for bauxite Domains and only one pass for the clay zone (parameters listed in Table 11-3), with:
    - the major and semi-major orientations in the unfolded horizontal plane
    - a minimum of 4 or 12 samples and a maximum of 27, with a maximum of 3 from any one drill hole. Thus, a minimum of 4 holes is required for Pass 3 and 2 holes for Passes 2 and 1
- uses the same variogram for all analytes

- DIBD (density) is not estimated into individual parent and sub blocks, but is a post-estimation calculation based on the block domain compositions (see 11.8.5).

The OK estimation approach is designed to maintain correlations between analytes and assist in ensuring that estimation totals are consistent with the input drill hole data.

Table 11-3: Ordinary Kriging search parameters

Domain	Pass	Search Distance (m)			Number of Samples		
		Major	Semi-major	Minor	Min	Max	Max Per Hole
20, 30, 40	3	300	300	50	4	27	3
	2	100	100	20	4	27	3
	1	55	55	20	12	27	3
50	1	300	300	50	4	27	3

A set of wireframe solids representing the mining outlines are generated using a similar grade accumulation and threshold approach to those used for the GSM model, as shown in Figure 11-10. The sub-block model is then regularized to 15 m by 15 m by 0.5 m (XYZ), with blocks located within the mining solids flagged for reporting Mineral Resources. Block tonnages are factored to reflect the proportion of the block contained below the topographic surface and within the mining solid.

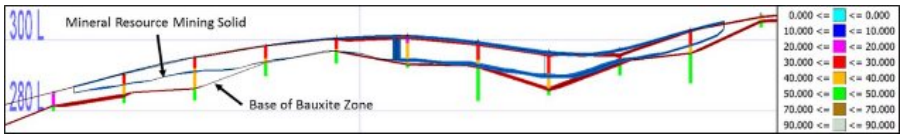


Figure 11-10: Example section showing Bauxite Zone and mining solid (SLR, 2021)

Notes:

1. Vertical to horizontal exaggeration is 3:1
2. Drill holes colored by DOMAF variable

12.10 Block Model Validation

12.10.1 Polygonal and Gridded Seam Modelling

Alcoa uses a similar general approach to validate both the Polygonal and GSM resource models which includes:

1. Visual validation of cell estimated grades versus seam composited data
2. Comparison between composite and block model global statistics
3. Swath plots comparing cell grades against seam composite grades
4. Comparison between models when upgraded with new information.

Estimated cell grades were compared visually to the drill hole composite grades to ensure that the cell grade estimates appeared consistent with the drill hole seam composite data.

As GSMs were effectively nearest neighbor estimates, checks by SRK (2021a) on several GSM models indicated excellent global and local correlation between the estimated cell grades and the input seam composite grades.

SLR undertook some independent checks on datasets and GSMs for the F54 and F55 blocks to confirm that the modelling procedures had performed as intended. Results were consistent with those observed by SRK (2021a) and no material issues were noted.

Polygonal resource models were updated by Alcoa when drill hole data is infilled from 60 m and 30 m spacings, and then GSM models were previously produced by Alcoa after 15 m infill drilling (3DBM models are now produced routinely at this stage). Changes in tonnages and average grades (AL, SI, OX) are presented as scatterplots in Figure 11-11 for map sheets at Huntly where such infill drilling has occurred. It is noted that:

- material differences in tonnages are evident for individual map sheets, represented by the scatter around the 45° line in the top left-hand plot in Figure 11-11
- globally, there is only a 3% change in resource tonnage when infilling from 60 m to 30 m, but a 22% drop in tonnage when the deposit is further infilled to 15 m drill centers. The latter is mainly due to a change in the geological interpretation from a geological to a mining floor
- decreasing the drill spacings from 60 m to 15m results in an average reduction in SI of 10%, an increase in OX of 5%, but little change to AL. These grade changes are likely due to the preferential loss of deeper DOMAF 40 material that is high-in SI and low in OX when mining constraints are considered (see Figure 11-10)
- similar grade-tonnage relationships related to infill drilling were noted at Willowdale by SLR.

Applying a global correction factor to Polygonal resource model tonnages generated from 30 m and 60 m spaced drill hole datasets is not considered appropriate as local differences are highly variable and not considered to be predictable, as shown by the red dots in the top left-hand plot in Figure 11-11.

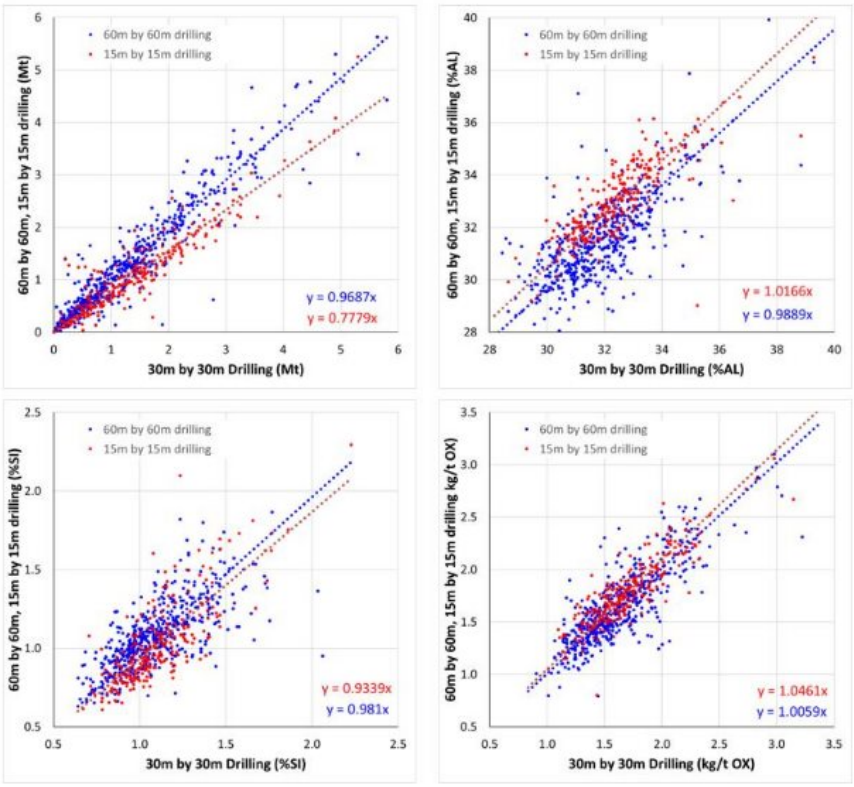


Figure 11-11: Resource comparison scatterplots for Huntly (Tonnage, AL, SI, OX) (SLR, 2021)

12.10.2 3D block modelling

Model validation checks by Alcoa include:

1. Volume checks between the geological interpretation solids and sub-block model
2. Visual validation of block model coding and estimated grades versus composite data
3. Comparison between composite and block model global statistics
4. Swath plots comparing block grades against composite grades.

SLR undertook some independent checks on datasets and block models for Serpentine and Millars and obtained results that were consistent with those provided by Alcoa. Example screen captures of coded block models and AL and SI block estimates are shown in Figure 11-12.

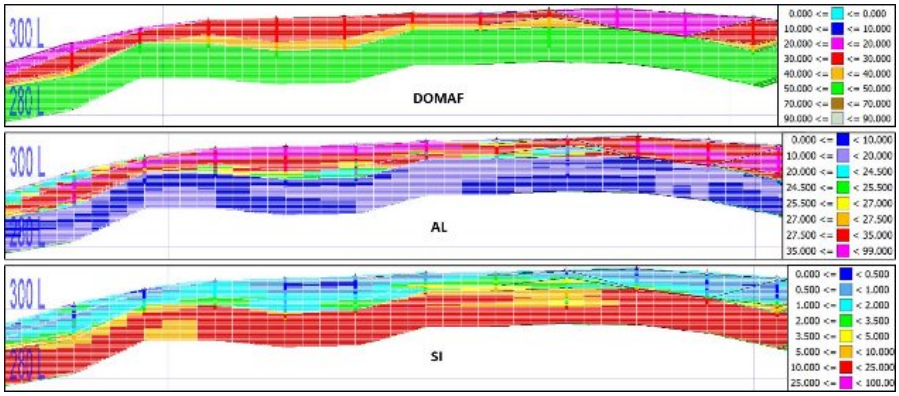


Figure 11-12: Example sections showing DOMAF, AL, and SI block estimates (SLR, 2021)

3:1 vertical to horizontal exaggeration

Most global checks indicate generally good correlation between the estimated model grades and the input composite grades. However, Domain swath plots suggest that the use of a single unfolding surface and soft boundaries for the Bauxite Zone (DOMAF 20, 30, and 40) has led to grade smoothing. For example, Figure 11-13 indicates overestimation of DOMAF 20 and 40 for AL, and underestimation for DOMAF 30. As Alcoa generally mines the majority of the bauxite profile this issue is not considered material and any estimated bauxite that is left behind would likely be DOMAF 40 (low-grade bauxite). Consequently, the impact of grade smoothing for AL would introduce some conservatism into the model. Bauxite Zone block estimates could be improved by unfolding each Domain independently and using semi-soft boundaries.

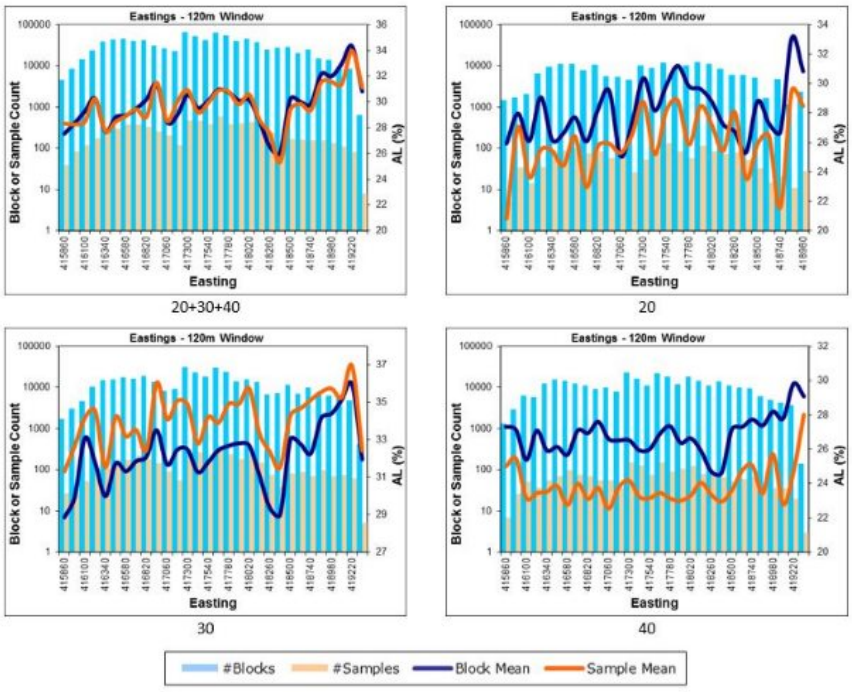


Figure 11-13: AL swath plots by DOMAF at Serpentine (SLR, 2021)

As discussed previously, the inequality constraint AL ≤ AT and SI ≤ ST was not met for all blocks due to:

- the inequality constraints not being honored in the input data
- incomplete assaying of AT and ST.

Scatterplots for some key analytes were spot checked by SLR to ensure that correlations identified for composite data were maintained during block grade estimation. In most instances there was good reproduction of the correlations during the change in support from 0.5 m composites to 15 m by 15 m by 0.5 m blocks (compare Figure 11-7 and Figure 11-14). However, there were commonly artefacts related to a small number of blocks that were generally located in the periphery of the deposit. These are shown as vertical lines in Figure 11-14.

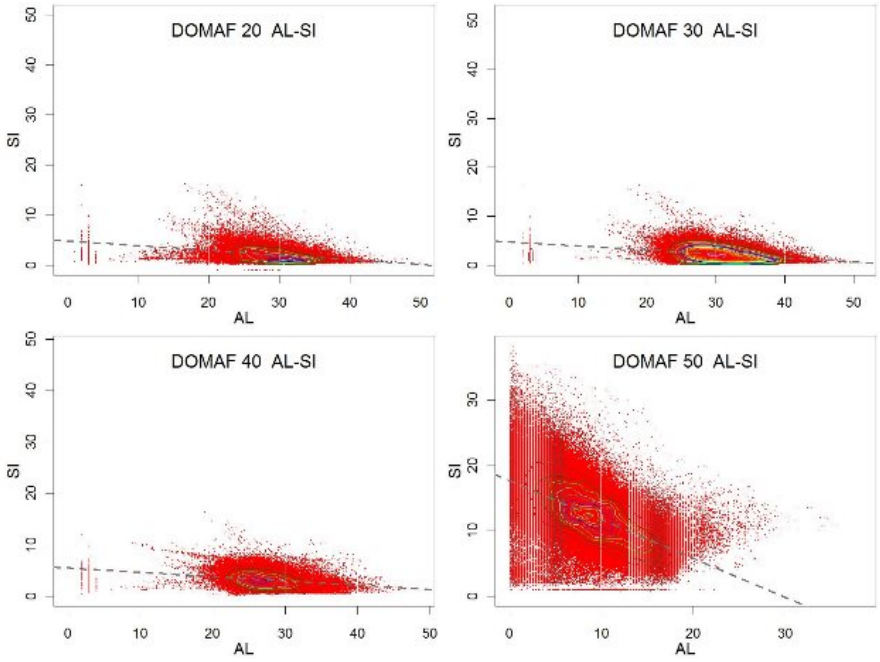


Figure 11-14: Scatterplots of AL versus SI by DOMAF at Serpentine (SLR, 2021)

A discrete Gaussian (DG) change-of-support check is appropriate to assess smoothing in resource estimation models. A range of variance reduction F factors from 0.20 through to 0.7 in 0.1 increments were also chosen to represent the results that may be achieved through various mining selectivities. Higher F values result in grade-tonnage distributions that could be achieved through more selective mining and high-quality grade control practices. Conversely, lower F values result in grade-tonnage distributions that would result from less selective mining and/or poorer-quality grade control practices.

The DG approach was used by SLR to determine the theoretical AL grade-tonnage curves for the Bauxite Zone at Serpentine by considering various F factors for the 0.5 m composite data (Figure 11-15). This Figure also shows the actual grade-tonnage curve for the Serpentine 3DBM resource model. The resource model tonnage curves are consistent with the F=0.4 DG curves for all cut-offs likely to be considered at Serpentine for open pit mining. This provides further support that any grade smoothing present in the Serpentine model is unlikely to be material to the Mineral Resource estimate.

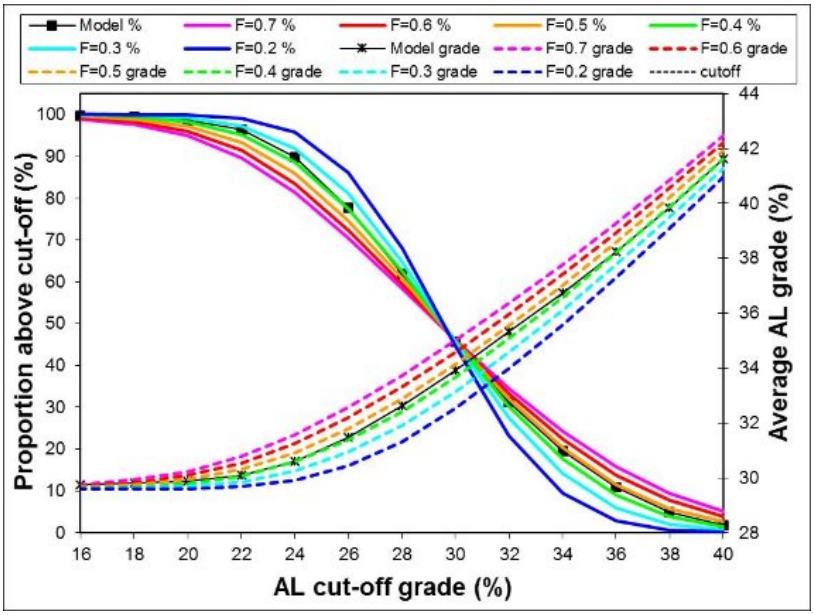


Figure 11-15: AL grade-tonnage DG curves versus Serpentine block model

12.11 Cut-off Grade and Mining Constraints

The generally accepted historical economic mining cut-off grade (Hickman et al, 1992) has not appreciably changed and is 27.5% A.Al_2O_3. Lowering this results in increases in R.SiO_2, offsetting gains made by increased alumina tonnages. The typical average mined grade of 30-35% A.Al_2O_3 is low by world standards. For Alcoa's three captive alumina refineries the R.SiO_2 grade must be less than 5%, and preferably less than 2%. The minimum size for an orebody to be effectively mined is 70,000 t, and most orebodies are approximately 300,000 t.

The cut-off grade used for Mineral Resources is implicit in the delineation of the Bauxite Zone for the various resource model methods (see Section 11.9). In general, the cut-offs are AL ≥27.5%, SI ≤3.5%, with OX ≤4 kg/t, and a minimum 2 m thickness. However, bauxite resources can include material outside these specifications that may also be considered as mineable material, equivalent to dilution. The AL, SI, and OX grade constraints applied in the definition of the Bauxite Zone have demonstrated over many years to provide economic material to Alcoa's alumina refineries.

Mining constraints applied to the GSM and 3DBM Mineral Resource include:

- a minimum area of 1 ha
- a minimum face height of 1.5 m (distance from mining floor to the base of overburden)

- face heights exceeding 4 m are treated as multiple benches
- an overburden to face height ratio ≤1
- a maximum floor gradient of 1 in 7 over a minimum of 15 m for the first cut, and 1 in 5 for second and third cuts
- a minimum access corridor of 45 m for mining equipment.

Profitable mining since the 1960s has been based on the resource modelling outcomes described in this report, which demonstrates reasonable prospects of economic extraction for the Alcoa Mineral Resource.

Mineral Resources are estimated using a long-term metal price of A$25 /t alumina, this being an Alcoa internal transfer price related to the export price received for alumina

12.12 Reconciliation

12.12.1 Sampling tower data

Refinery feed grade is monitored for the Huntly and Willowdale mining regions using material collected just prior to the stockpile stackers at the Pinjarra and Wagerup sampling towers respectively.

Alcoa mine planning personnel rely upon historical comparisons between the As Mined estimates and the sampling tower data to apply adjustment factors to mine design estimates, to assist with scheduling and stockpile planning activities. The adjustments are not applied to the reported global Mineral Resource estimates as they are considered to be local factors.

Sampling tower performance was discussed in Section 8.5.3.8.

12.12.2 Resource to sampling tower comparison

Alcoa reconciles the resource (mine design) estimates with the sampling tower estimates once mining is completed for each mining zone. It is important to note that the majority of the Mineral Resources are prepared using 30 m or 60 m spaced data, whereas As Mined to sampling tower reconciliation is based on mine planning models constructed from 15 m spaced data that include additional mining constraints.

Figure 11-16 and Figure 11-17 show the annual relative tonnage and grade differences for both Huntly and Willowdale respectively. These plots indicate:

- the presence of grade and tonnage biases, which for some grades show long-term trends. For example, both SI and ST display differences of up to 30% in the mid-2000s, followed by gradual reductions to approximately 5–10% in the last few years
- that As Mined tonnage estimates are, on average, biased high by approximately 5%
- that most As Mined grades are currently within 10% of the sample plant grades.

The sources of the reconciliation differences shown in Figure 11-16 and Figure 11-17 are not known, but the following factors could contribute:

- Resource models were prepared using FTIR assay data, whereas the sampling tower samples are assayed using the same techniques as the REF Method (see Table 8-1 in 8.3.2.1) but with BD rather than MD. Alcoa assumes that this is more accurate, but that is difficult to confirm for partial digestion methods such as AL, SI, and OX.

- Changes in the resource modelling procedures from Polygonal, to GSM, to 3DBM. The latter method has only recently been introduced and represents limited material processed in recent years.
- The As Mined grades and tonnages could include some additional dilution and ore loss relative to the planned mine design.
- Differences between the Pinjarra (inspected and validated by SLR, see Section 8.5.3.8) and Wagerup sampling towers.

Incremental reconciliation improvements appear to have commenced around 2010, which may reflect an improvement in data quality (drilling and assaying procedures) around this time. Consequently, Mineral Resources using data collected prior to approximately 2010 are considered to be of lower confidence and the classification of resource models constructed from this data has been downgraded accordingly.

Reconciliation data in recent years falls within acceptable limits on an annual basis to support the classifications used for reporting of Alcoa's Darling Range Mineral Resource.

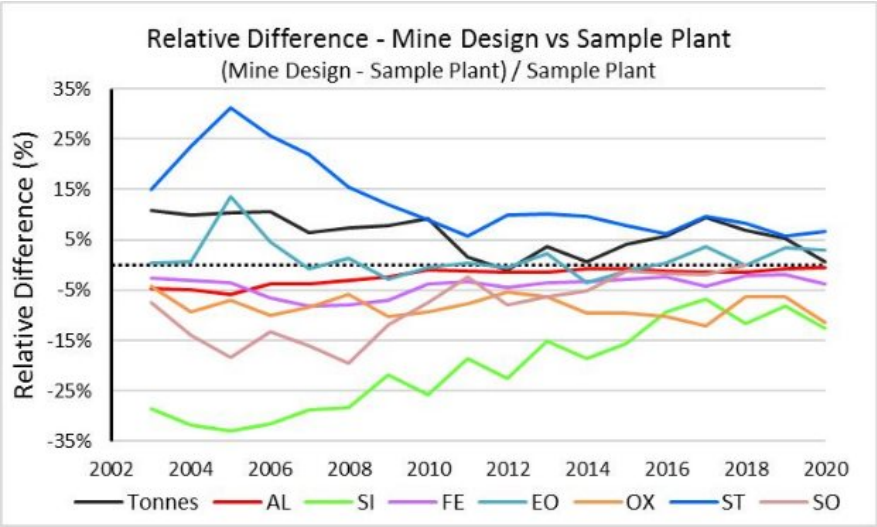


Figure 11-16: Resource versus Sample Plant Reconciliation – Huntly (Alcoa, 2021)

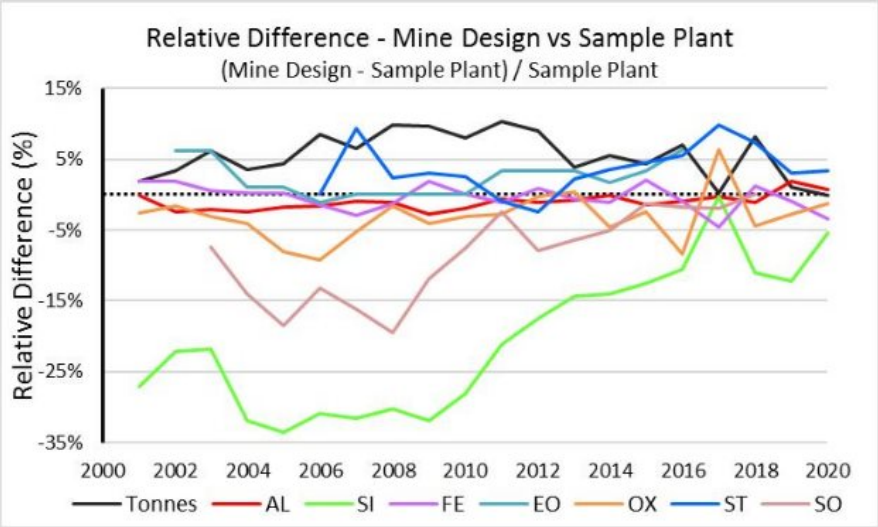


Figure 11-17: Resource versus Sample Plant Reconciliation – Willowdale (Alcoa, 2021)

12.13 Mineral Resource estimation risk

The estimation of Mineral Resources for any commodity, including bauxite, is subject to significant risks, including those described below and elsewhere in the discussion of risks associated with mining and processing of bauxite to produce alumina (see Section 12.8). An investor should carefully consider these risks. If any of the described risks occur, the Darling Range bauxite mining and processing business, financial position and operational results could be materially affected adversely.

The purpose of Public Reports issued under S-K 1300 and other similarly purposed International Codes (JORC, 2012; NI 43-101, 2014) is to ensure that known risks are disclosed by the QP subject to expectations of Transparency, Materiality and Competency. This report addresses the technical risks associated with the Geology, Sampling, Assaying, Data Management in Sections 6.0 to 9.0 and Mineral Resource Estimation in Section 11.0. The Qualified Person considers that no material technical risks are identified in those Sections.

The risks described below are not comprehensive and there may be additional risks and uncertainties not presently known, for example due to market or technology changes, that are currently deemed immaterial but may also affect the business. SLR considers that the following risks specifically pertain to the Mineral Resources declared for Alcoa's Darling Rang operations.

12.13.1.1 Specific identified risks

- Continuous improvement of all aspects of Alcoa's resource delineation programs means that, changes have been incremental as refinement to previous procedures. Thus estimates for the majority of the Mineral Resource inventory are essentially variants of those devised in the late 1980s and early 1990s and are not consistent with current conventional practices. This is reflected in the large tonnage of Inferred Resources declared. The demonstrated successful operation of the Alcoa operations over an extended period indicates that it is unlikely that any aspects of the data collection and resource delineation process are significantly flawed, although there are recognized shortcomings.

- Drill sampling is essentially the extraction of small volumes of material taken to be representative of the large tonnages being estimated. There are always local errors of precision and may be bias that is not recognized. Robust sample preparation and geostatistical estimation are used to identify and overcome these errors, backed up by closed-loop reconciliation with the stockpile tower samplers. These systems may not identify changes in the underlying geology or other data as the area to be delineated expands over time.

- The Mineral Resource estimates may not contain adequate or relevant data if the bauxite is supplied to other refineries, or if processing methods change, or some new analyte is required.

- The older ResTag and GSM estimation procedures, which represent the bulk of the Inferred Mineral Resource inventory, are relatively inflexible, and may not contain the level of detail necessary to adequately support mining optimization studies. This has been largely addressed by the recent move to 3DBM resource estimation techniques, which more easily enable the preparation of models that contain sufficient resolution and detail to support conventional mining optimization studies. These models will allow incremental improvements to address any challenges in meeting target grade specification, resolving reconciliation issues, or tailoring the estimation parameters and procedures to prepare models that better reflect local changes in mineralization characteristics. The 3DBM modelling procedures offer more flexibility in moderating any adverse effects of sampling imprecision compared to the older procedures and in producing grade tonnage curves to meet various impurity constraints (when modelled).

- Further advances in geostatistical estimation may be expected including more use of directional anisotropy (through variograms), and conditional simulation to quantify estimation risk and optimize drill sampling grids.

- A comprehensive program is required to resolve the issue of density estimation. Estimates in the resource models use a simplistic linear regression algorithm for iron rich material based on very few data, and otherwise assumed values. This deficiency is overcome by reconciliation of tonnages of material fed to stockpiles and the subsequent adoption of a downgrading factor (currently 5%) to account for differences to the model estimated density. Technology now becoming available, including volume surveys using drones and truck gantry scanning, wet mass measurement using weightometers on conveyors and LoadRite sensors on mining equipment, and infra-red moisture determination, mean that better *in situ* dry density estimation may become possible if the operation requires it for better refinery feedstock control.

- The grade characteristics of the bauxite profile could be reproduced in the model, enabling optimization techniques to be used for the definition of mining floors and boundaries, better support for ore loss and dilution studies, and more accurate reconciliation studies.

- There is currently significant reliance upon the sample plant results for production scheduling and blending, as well as for assessing the reliability of the Mineral Resource estimates.

The current drill sampling methods have been improved over time, based on independent review, and the requirements for minimum impact on the Darling Range. The assaying methods, including the use of FTIR, have been comprehensively reviewed and validated. The geostatistical estimates of in situ dry tonnages and grades are reasonable and validated by comprehensive reconciliation. The SLR Qualified Person considers that these methods are appropriate to produce the declared Mineral Resources and Mineral Reserves.

12.13.1.2 Generic Mineral Resource uncertainty

- Estimates of Measured and Indicated Mineral Resources are uncertain. The volume and grade of ore actually defined from these as Mineral Reserves is not predictable until mine planning is done to account for all the identified Modifying Factors. Forecasts based on the current transfer price of bauxite, current interpretations of geological data obtained from drill holes, and other information regarding the Modifying Factors, may not necessarily be indicative of future results. A significantly lower bauxite transfer price as a result of a decrease in aluminum prices, increases in operating costs, reductions in metallurgical recovery, or other changes to the Modifying Factors, could result in material write-downs of the value of the Darling Range mines.
- Should changes be required due to exigent circumstances, it may take some years from exploration until commencement of production, during which time the economic feasibility of production may change.
- Alcoa cannot be certain that any part or parts of a deposit or Mineral Resource estimate will ever be confirmed or converted into Regulation S-K Subpart 1300 compliant Mineral Reserves or that mineralization can in the future be economically or legally extracted.

To ameliorate such risks the Mineral Reserves declaration is limited to material for which extraction is currently planned within the next ten-year planning cycle. The Mineral Resources excluding Mineral Reserves indicate the likely potential beyond that time frame, given all the limitations on future knowledge outlined above.

12.14 Classification

12.14.1 Consideration of classification by the QP

Definitions for resource categories used in this report are those defined by the SEC in S-K 1300. Mineral Resources are classified into Measured, Indicated, and Inferred categories.

Mineral Resource classifications have been applied to the various resource models based on consideration of the quality and quantity of the input data, confidence in the geological interpretation, and confidence in the outcomes from the various estimation methods. Factors that impact the Mineral Resource classifications are summarized below.

- Sampling: Alcoa has introduced incremental improvements to their drilling, sampling, sample preparation and assaying procedures since 2015. The sample collection procedures are efficient and optimized to routinely produce large numbers of drill samples and assays consistently that are considered to be fit for purpose.

- Sample preparation: routine sample preparation using a robotic facility which routinely provides an appropriate grind size for samples.
- Assays: the FTIR spectral method is routinely used for all analytes, calibrated and validated with wet chemical Reference Method samples at a frequency of 1:100. The SLR QP has investigated this procedure and considers that appropriate assays and controls are used for the purpose of Public Reporting of a Mineral Resource estimate.
- QA/QC: Quality assurance and quality control procedures have been incrementally improved since 2015. Further systematic refinements of these are expected to enable more data to be routinely collected, but the accuracy and precision demonstrated in Sections 8.5.2 and 8.5.3 respectively are not expected to change.
- Density data: The dry *in situ* bulk density test work data is sparse and not appropriate for the reliable estimation of tonnages. Based on test work from 1992 a simple algorithm using the Fe_2O_3 grade for Caprock and an assumed value of 2.0 t/m^3 for all other ore fed to the refineries has been used. Reconciliations have determined a consistent overestimation of 5%, and a moisture content of 9% provide reliable predicted tonnage estimates over an extended period of operation. In the opinion of the SLR QP the variable nature of the bauxite, especially the porosity, means that any alternative sampling method is unlikely to produce better estimates. Accordingly, the density values applied are not considered a limiting factor for resource classification.
- Drill spacing: Drill hole spacings in the Darling Range vary from 15 m by 15 m up to 120 m by 120 m, with Mineral Resources only declared where drill hole spacings are ≤60 m by 60 m.
- Geological interpretation: The regional geology of the Darling Range project is well understood with bauxite mineralization supporting mining and processing operations since the 1960s. Controls on the mineralization and the mineralogical and physical properties of the Bauxite Zone are well understood and have been adequately incorporated into the Mineral Resource modelling procedures.
- Grade continuity: Grade and lithological continuity studies are routinely conducted by Alcoa for the 3D block models. Variography studies conducted by Alcoa were supported by independent review (Xstract, 2016; SRK 2021a) and indicate that grade and lithological continuity can be demonstrated at the drill spacings supporting the Mineral Resource classification.
- Grade estimation: The majority (80% exclusive of Resources) of the current Mineral Resource inventory has been defined using polygonal techniques that are not industry best practice and can be prone to estimation bias. Consequently, irrespective of the drill hole spacing all estimates based on the Polygonal Method are considered to be of low confidence for local estimates and have been downgraded relative to 3DBM estimates. GSMs are only constructed using 15 m by 15 m spaced drill hole data, and although previously used to support Measured Mineral Resources, has been replaced by the 3DBM method, which as implemented by Alcoa aligns with industry best practice.
- Reconciliation data: Annual reconciliation between mined ore based on the Mineral Resource estimates and received material on the refinery stockpiles (sampled by the sampling towers) show relative differences for both Huntly and Willowdale of within ± 15% for tonnes and all analytes (except SI) since 2010. Reconciliation performance prior to 2010 for some analytes exceeded ±

15%, casting doubt on the reliability of some data and models prior to that date. It is not possible to reconcile blended production data to individual resource models.

- Production history: The integrated bauxite mining and alumina refining is based on appropriate data to ensure long-term supply and short-term management of the ore feed to the mine mouth refineries. The long production history demonstrates effective prediction and control of refinery performance.

SLR considers the primary controlling factors for the classification of the Mineral Resource estimates for the Darling Range Bauxite to be drill hole sample spacing, the quality of data collected, and the resource modelling technique. A 5% tonnage reduction factor is used in the reporting of Mineral Resource tonnages to account for the consistent annual reconciliation outcomes.

12.14.2 Methodology

The primary consideration for classification is confidence in the resource estimate. The Mineral Resource estimate for Darling Range is produced by aggregating many different models, produced using data of different qualities at different drilling densities, modelled using different estimation procedures.

A drill hole spacing study aimed at quantifying the differences in the reliability of local estimates with different drill spacings was undertaken by SRK (2019a) using a similar approach to Alcoa's 3DBM procedures. The SRK study concluded that drill spacings of 30 m by 30 m and 60 m by 60 m were adequate to support the delineation of Measured and Indicated Resources respectively, provided that none of the other limiting factors discussed above were applicable.

The SLR QP considers, on the basis of the previously discussed acceptable sampling and assaying quality, that this drill hole spacing study and other knowledge justifies:

- The classification of Measured where such data is on a 30 by 30 m grid. However where the estimation method is gridded seam modelling (GSM) rather than current industry standard 3D block modelling (3DBM) the Measured material is downgraded to Indicated, unless it is on a tighter drilling grid of 15 by 15 m. The additional data density overcomes any deficiency of the GSM method. Some of the defined Measured material estimated using a significant amount of older (pre-2010) drill sampling was also down-graded to Inferred, reflecting the lower confidence in that older drilling data, since data quality (due to drilling, sampling and assaying procedures) has been upgraded since then.

- Furthermore, based on the same principles (data quality, drilling study, estimation procedures), 60 by 60 m drilling and 3DBM estimation is the basis for classification as Indicated. Estimation using the GSM or Polygonal method was allowed as Indicated where the drill spacing was on a tighter grid of at most 30 by 30 m. The additional data density is considered to overcome the similar deficiency of both these estimation methods, which because of the data configuration are similar to a nearest neighbor estimate.

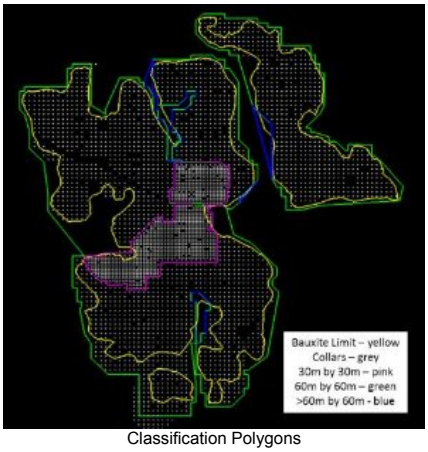
- All Measured and Indicated material already has mining constraints applied, effectively ensuring that reasonable prospects for economic extraction are assure should other required economic viability constraints obtain.

- Where the data spacing is 60 by 60 m and the estimation method is Polygonal the resource estimate is classed as Inferred.

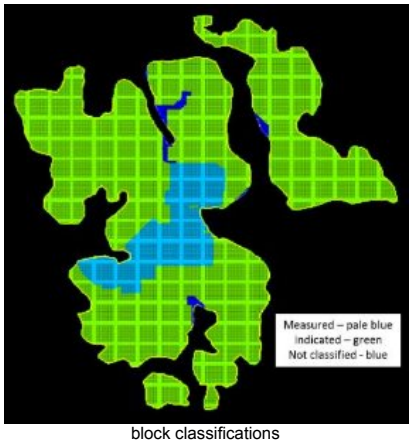
There is a large tonnage estimated of Inferred Resources, partly due to the sufficiency of the current Proven and Probable Mineral Reserves for the ten year mine planning horizon and the immediate availability of additional Measured and Indicated Mineral Resources (reported exclusive of Reserves) to replace them. Further Measured and Indicated Resources may be defined when required from the established Inferred Resource in time, given more closely spaced drilling, estimation using 3DBM techniques, and the further application of cut-off grade and mining criteria.

Resource classification criteria are applied in the horizontal plane and so are consistent for the entire Bauxite Zone vertical profile. Thus, interpretation of the roof and floor of the Bauxite Zone are implicitly assumed to be of similar confidence. In some areas the geological floor may be erratic for Polygonal models and of lower confidence than the roof, but these areas are typically excluded when mining constraints are applied to the GSM and 3DBM resource models.

An example of the resource classification approach is shown in Figure 11-18. Resource classification polygons are created for areas of 15 m, 30 m, 60 m and >60 m parts of the deposit. Note that these polygons can include small areas where the gaps between drill holes are at the next spacing increment. These polygons are then used to assign resource classifications for the full vertical profile of the Bauxite Zone.



Classification Polygons



block classifications

Figure 11-18: Plan view of Resource Classification (SLR, 2021)

12.14.3 Application of classification criteria by the QP

The following classification criteria have been applied to the Mineral Resource estimates:

- **Measured Resources** - areas estimated using:
  - 15 m by 15 m drill data and GSM or 3DBM estimation procedures; and
  - 30 m by 30 m drill data and 3DBM estimation procedures.

- **Indicated Resources** - areas estimated using
    - 30 m by 30 m drill data and estimated using GSM, or Polygonal procedures;
    - 60 m by 60 m drill data and estimated using 3DBM procedures; or
    - meeting the Measured criteria but estimated using a significant amount of pre-2010 drilling data.
- **Inferred Resources** - areas estimated using:
    - 60 m by 60 m drill data and estimated using Polygonal procedures.

12.15 Mineral Resource Reporting

Key refinery target grade requirements for AL, SI, and OX along with practical mining considerations have been taken into account when defining resource blocks using GSM and 3DBM modelling methods. Polygonal resource models do not account for mining constraints other than a 1.5 m minimum thickness.

ML1SA contains some sub-regions for which mining permission has not been granted, due to forestry, environmental, social or other constraints, and Mineral Resources have not been defined in these areas by constraining the Mineral Resource model using the ArcGIS system.

For Mineral Resource reporting, the block tonnage estimates have all been reduced by 5% on the basis that:

- the reconciliation data at both Huntly and Willowdale indicate that the As Mined tonnage estimates over the past 20 years have been consistently higher than the stockpile received tonnages after the sampling tower by approximately 5%; and
- the stockpile estimates are derived from weightometer readings, and the weightometers are regularly checked and calibrated.

12.15.1 Mineral Resource Estimation

A summary of the Mineral Resource estimates (exclusive of Mineral Reserves) for the three ML1SA mining regions is shown in Table 11-4.

Table 11-4: Summary of Mineral Resources exclusive of Mineral Reserves by Mining Region – 31st December 2021

Category	Tonnage (Mt)	A.Al_2O_3 (%)	R.SiO_2 (%)
	HUNTLY		
Measured	20.9	32.7	1.20
Indicated	10.2	32.6	1.25
Inferred	126	34	1.3
	NORTH		
Measured	-	-	-
Indicated	0.8	32.3	1.38

Inferred	15	32	1.0
	WILLOWDALE		
Measured	27.1	33.0	1.05
Indicated	23.8	31.6	1.05
Inferred	179	32	1.2

Notes:

1. The definitions for Mineral Resources in S-K 1300 were followed, which are consistent with JORC (2012) definitions
2. Mineral Resources are 100% attributable to AWAC
3. Mineral Resources are estimated at a geological cut-off grade, which generally approximates to nominal cut-off grades of 27.5% A.Al_2O_3 with less than 3.5% R.SiO_2. Locally the cut-off grade may vary, dependent on operating costs and ore quality for blending. The target grade for mine planning is 32.7% available aluminum oxide (A.Al_2O_3) and 1.0% reactive silica (R.SiO_2)
4. Mineral Resources have been estimated using a three-year trailing average of arms-length sales of bauxite from Darling Range. The price that constrains the estimate for optimisation was discounted to exclude export logistics costs, i.e. the base price was USD24/t, and the discounted price was USD16/t.
5. A minimum total mining thickness of 1.5 m was used
6. *In situ* dry bulk density is variable and is defined for each block in the Mineral Resource model
7. A global downwards adjustment of tonnes by 5% is made to account for density differences based on historic mining performance
8. Mineral Resources are reported exclusive of Mineral Reserves
9. The reference point for the Mineral Resource is the *in situ* predicted dry tonnage and grade of material to be delivered to the refinery stockpile following the application of mining design parameters
10. Metallurgical recovery has not been directly considered in the estimation of Mineral Resources as the Darling Range operations do not include a conventional processing plant, only crushing as described in Section 14.0. The metallurgical recovery of the three refineries (Kwinana, Pinjarra and Wagerup) are beyond the boundaries of the mining operations being the subject of the TRS.
11. Numbers may not add due to rounding.

12.16 QP Opinion

In the opinion of the SLR QP the Mineral Resource classification scheme adopted by Alcoa and accepted by SLR is appropriate in defining expected relative confidence of the Mineral Resource in compliance with the S-K 1300 definitions as follows:

- All sampling, sampling preparation, assaying and database management practices are compliant with current industry good practice and no fatal flaws were identified for all material classed as Mineral Resource
- Appropriate industry good practice geological modelling techniques and variography are used to establish geological and grade continuity from appropriately spaced drill holes
- Industry standard estimation techniques (3D block modelling or seam block modelling) are used for all Measured and Indicated Mineral Resources using appropriate drill spacings
- Appropriate drill spacings, grade continuity and geological continuity are used to define higher confidence material as Measured Mineral Resource.

In the SLR QP's opinion, the condition of Reasonable Prospects For Economic Extraction is met by constraining the Mineral Resource model using the ArcGIS system, by ensuring that the model defines key parameters for the refinery, and by sound reconciliation practices providing feedback at the modelling is appropriate for the purpose.

13.0 MINERAL RESERVE ESTIMATES

13.1 Summary

A Mineral Reserve has been estimated for Alcoa's Darling Range bauxite mining operations in accordance SEC S–K 1300 which are consistent with the guidelines of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Mineral Reserves (The JORC 2012 Code).

The SLR QP inspected the Alcoa Huntly and Willowdale operations on October 14, 2021, and Alcoa's Mine Planning department on October 27, 2021, interviewing relevant personnel on these dates and on other occasions. The QP has had prior exposure to Alcoa's Darling Range operations earlier in his career.

The Mineral Reserve is classified with reference to the classification of the underlying Mineral Resource and with reference to confidence in the informing Modifying Factors. The QP considers the Proven and Probable classification to be appropriate to the deposit and associated mining operations.

The reference point for the Mineral Reserve is prior to the processing plant at the refinery.

The Proven Mineral Reserve is a subset of Measured Resources only. The Proven Mineral Reserve is legally permitted for mining and is included in the Ten-Year Mine Plan.

The Probable Mineral Reserve is estimated from that part of the Mineral Resource that has been classified as Indicated.

Variable cut-off grades are applied in estimation of the Mineral Reserves and these are related to operating cost and the nature of the Mineral Resource in relation to blending requirements. The Mineral Reserve estimate is expressed in relation to available aluminum oxide ($A.Al_2O_3$) and reactive silica ($R.SiO_2$), this being the critical contaminant in relation to the Refinery.

Table 12-1: Summary of Mineral Reserves – Effective 31st December 2021

Region	Class	Tonnage (Mt)	$A.Al_2O_3$(%)	$R.SiO_2$(%)
Huntly	Proven	45.8	32.5	1.05
	Probable	121.1	32.2	1.41
	Total	166.9	32.3	1.31
Willowdale	Proven	62.8	32.4	0.99
	Probable	11.5	31.8	1.09
	Total	74.3	32.3	1.01
Total	Proven	108.6	32.4	1.01
	Probable	132.7	32.2	1.38
	Total	241.3	32.3	1.22

Notes:

1. The definitions for Mineral Reserves in S-K 1300 were followed, which are consistent with JORC definitions.
2. Mineral Reserves are stated on a 100% ownership basis for AWAC although Alcoa's share is 60%.

3. Mineral Reserves are estimated at variable cut-off grades, dependent on operating costs and ore quality for blending. The target grade for mine planning is 32.7% available aluminum oxide (A.Al_2O_3) and around 1.0% reactive silica (R.SiO_2)
4. Mineral Reserves have been estimated using a three-year trailing average of arms-length sales of bauxite from Darling Range. The price that constrains the estimate for optimisation was discounted to exclude export logistics costs, i.e. the base price was USD24/t, and the discounted price was USD16/t.
5. Minimum mining widths are not used due to the surficial nature of the Mineral Resource, rather a minimum mining block size of 15m by 15m by 1m deep is applied.
6. The reference point for the Mineral Reserve is the refinery processing plant gate, with crushing, washing (as applicable), and transportation being the only process employed. As much metallurgical recovery factors are not applicable to the Mineral Reserve estimate.
7. Bulk density is variable, dependent on the nature of the Mineral Resource and is separately estimated in the Mineral Resource model.
8. Numbers may not add due to rounding.

The QP is not aware of any risk factors associated with, or changes to, any aspects of the Modifying Factors such as mining, metallurgical, infrastructure, permitting, or other relevant factors that could materially affect the Mineral Reserve estimate.

The QP considers that the accuracy and confidence in the Mineral Reserve estimate to be appropriate for the classification applied, which is supported by both the conservative operational processes and the long operational history.

The Modifying Factors are summarized as follows:

- Only Measured and Indicated Mineral Resources are considered.
- Only mineralization defined in mine planning work has been considered. This includes Measured and Indicated material, subject to the application of mining Modifying Factors.
- Mineral Resources not scheduled for mining in the current Ten-Year Mine Plan are not considered.
- Indicated Mineral Resources are classified as Probable Mineral Reserves, subject to the Modifying Factors and mine scheduling constraints.
- Measured Mineral Resources are classified as Proven Mineral Reserves, subject to the Modifying Factors and mine scheduling constraints.

13.2 Modifying Factors

A Mineral Reserve is the economically mineable part of a Measured and/or Indicated Mineral Resource. It includes diluting materials and allowances for losses, which may occur when the material is mined or extracted and is defined by application of Modifying Factors that demonstrate that, at the time of reporting, extraction could reasonably be justified.

- Mining – Alcoa's Darling Range mining operations are conventional open pit mines and have been operating for a long time. The practicalities of mining and associated sustaining capital and operating costs are well understood and have been incorporated in Alcoa's technical assessments to the satisfaction of the QP. For a more substantive description of Alcoa's Darling Range mining operations, refer to Section 13.0. The mining schedule is discussed further in Section 12.5.
- Processing – This Mineral Reserve is stated with reference to the refinery processing plant gate, with crushing and conveying being the sole processes employed. Bauxite is refined to alumina in the refinery using the Bayer process, which has been employed at the Darling Range operations for many years and a transfer price is used by Alcoa in its assessment of its mining operations. The

QP is satisfied that the transfer price reasonably incorporates the costs associated with processing of the bauxite ore. For a more substantive description of Alcoa's Darling Range processing operations, refer to Section 14.0.

- Metallurgy – The mining operations are given an ore specification by the sole customers, the refineries. Blending is undertaken at the pit, before the crusher, to ensure that these specifications are met. The QP is satisfied that the procedures employed by mining technical staff have been developed over a lengthy period and are appropriate for the suppression of metallurgically deleterious material in ore sent to the refineries. For a more substantive description of Alcoa's Darling Range metallurgy, refer to Section 10.0.

- Infrastructure – The QP has observed the Darling Range infrastructure to be well established, maintained and complete. The operations are located near a major city, with excellent transportation, facilities, and workforce. Provision is made in Alcoa's Life of Mine (LOM) plans for sustaining capital for infrastructure replacement. For a more substantive description of Alcoa's Darling Range infrastructure, refer to Section 15.0.

- Economic – Revenue for the mines is premised on a transfer price for bauxite ore at the refinery gate. Mining costs are well understood, as the mines have been operated for a long time. The QP is satisfied that the pit optimization, scheduling, and analysis undertaken by mine technical staff is appropriate to the operation and that the costs are well understood. For a more substantive description of Alcoa's Darling Range economics, refer to Section 19.0.

- Marketing – All bauxite is sold to Alcoa's Darling Range refineries, the sole customer for the mines. The refineries produce alumina, which is variously further refined into aluminum metal at Alcoa's aluminum plants or exported. Alumina and aluminum are internationally traded commodities and subject to normal market forces and cycles. For a more substantive description of Darling Range's market aspects, refer to Section 16.0.

- Legal – The QP observes that the Darling Range operations have been in operation for a long time and are licensed in relation to obligations under Western Australian legislation. Mining approval for the Darling Range operations is given by the statutory Mining and Management Program Liaison Group (MMPLG). The MMPLG consists of representatives from across government and is responsible for reviewing mine plans and associated activities and making recommendations to the Western Australian Minister for State Development.

- Environmental - The QP observes that the Darling Range operations have a long history of progressive rehabilitation of mined-out areas. There are restrictions placed on some mining areas that are related to proximity to water catchments, places of social importance and fauna habitat. Operation under these conditions is by approval of the MMPLG. For a more substantive description of Alcoa's Darling Range environmental obligations, refer to Section 17.0.

- Social – The QP observes that the Darling Range operations have long been a major employer and economic contributor to the region and that the operations have numerous well-established community and social initiatives. A skilled workforce resides in the area, as do many service industries. The QP does not consider social risk to be material to the Darling Range operations.

- Governmental – Western Australia and Australia in general are stable, developed democracies with an advanced economy. Governmental relations with the Darling Range operations are

managed by the MMPLG, which has representation from the relevant government departments. The QP does not consider governmental risk to be material to the Darling Range operations.

13.3 Basis of Estimate

Historically, Alcoa did not report material in the Measured Mineral Resource category, reporting mineralization in areas of 15 m by 15 m spaced drilling as Mineral Reserves reported to the prior SEC standard. Alcoa has subsequently incorporated S-K 1300 and JORC Modifying Factor considerations into its mine planning processes and this was observed and confirmed on site.

SLR has used the December 31, 2021 Mineral Resource estimate as the basis for its Mineral Reserve estimate. The bauxite operations are operating mining projects with a long history of production for which establishment capital has been repaid and for which sustaining capital and supported operating costs have been observed to be applied in economic analysis. Consequently, the QP considers that support by a Feasibility Study is demonstrated by the demonstrable history of profitable operation and the level of technical support for the Modifying Factors. The QP has reviewed the operating and planning procedures and parameters for the operations.

Proven Mineral Reserves are derived from scheduled Measured Mineral Resources which are not located within Myara North. Probable Mineral Reserves are derived from scheduled Measured Mineral Resources which are located in Myara North, or from scheduled Indicated Mineral Resources. The Mineral Resource estimate reported in this document (Section 11.0) is exclusive of the Mineral Reserve.

Consequently, Modifying Factors that relate to community and environmental considerations are formally assessed. The QP considers that there is low risk to derive Proven Reserves relating to the project. Alcoa has stated to SLR during the site visit that in recent years there has been no instance of a requirement for Proven mining blocks to be downgraded or abandoned.

The Probable Mineral Reserve has also been defined by 15 m by 15 m drilling but has not yet been presented to the MMPLG for approval. Application of the Modifying Factors is otherwise identical.

The QP has formed an independent view of the Modifying Factors applied in the estimation of the Mineral Reserve. This view is supported by examination and verification of mine planning data and procedures and historic reconciliation information. The QP has interviewed technical staff responsible for Alcoa's operations and reviewed the operating, planning and forecast reports for the operations supplied by Alcoa.

The mine planning process excludes mineralization that is not considered recoverable due to various constraints, defining no Mineral Resource or Mineral Reserve within these zones. Such constrained zones include Aboriginal heritage sites and old-growth forest, however are proactively and dynamically updated by Alcoa through engagement with stakeholders, such as the community, and in response to government requests.

13.4 Dilution and Ore Loss

Dilution and ore loss are not reported separately to the Mineral Reserve. Internal and edge dilution is modelled at the mine planning stage through the application of 15 m by 15 m mining blocks to the Mineral Resource model. These regularized blocks contain proportional estimates of ore and contaminants and are optimized through the application of a Lerchs-Grossman algorithm developed specifically for the operation. This variation of the conventional Lerchs-Grossman algorithm is applied vertically, given that

the shallow nature of the mineralization precludes geotechnical considerations. Blocks that do not satisfy grade and contaminant parameters against revenue are thus excluded from the mine plan.

Mining dilution is controlled by excavation of dilution at the top of the mineralization (a source of oxalate or organic contamination) and the pit floor ($R.SiO_2$ contamination). The upper contact is a sharp geological contact on an undulating surface. GPS-controlled machinery is used to locate these intersections.





Figure 12-1: Undulating Hanging wall hardcap surface; and footwall (white clay, lower right in the floor) (Left: Pearman, 2015 & Right: SLR, 2021)

Organic material reacts with sodium hydroxide in the refinery to form oxalate, which is considered to be a contaminant. Alcoa has developed a process known as Secondary Overburden Removal (SOBR) whereby the soil and clay on top of the hardcap that covers the mineralization and contains this organic material is removed by either scraper, surface miner or small excavator. This removes as much carbonaceous material overlying the undulating hardcap layer as possible. Further description of SOBR is given in Section 13.1.

A surface miner is employed as required at the Huntly mine to cut highly contaminated overburden to the hardcap contact, which results in a 2.9% ore loss, which is considered in the Mineral Reserve estimation.

The lower mineralization contact is gradational and dilution is minimal on contaminants other than $R.SiO_2$. This contact is defined through drilling and chemical analysis and excavation is controlled by GPS to modelled surfaces.

The Grade Control process checks the accuracy of excavation and assesses adherence to excavation of the target floor.

13.5 Extraction and Mine Planning

13.5.1 Ten-Year Mine Plan

Alcoa prepares a Ten-Year Mine plan annually. The first five years of this plan is submitted to the statutory MMPLG for approval of mining areas. The Ten-Year Mine Plan includes a mine production schedule that demonstrates scheduling of mineralization classified as Mineral Resources for estimation as Mineral Reserves. This schedule contemplates higher confidence Mineral Resources during the early production periods, with lower confidence mineralization planned in subsequent periods (Figure 12-2 and Figure 12-3). Note that the Willowdale unclassified material in 2030 and 2031 includes resTAG Inferred material drilled at 60 m spacing.

The schedule has several operational parameters in addition to statutory limitations (refer Section 12.2 above):

- The mineralization lies under haul roads and extraction is delayed until the road is no longer required.
- Mineralization is near a planned crusher location and mining has been delayed until the crusher is installed.
- Contaminants exclude a parcel from blending in the schedule.
- The mining areas are small and demonstrate low mining efficiency and mining has been delayed.

Confidence in the Mineral Reserves is predicated on confidence in the underlying Mineral Resources in the mining schedule. Continuous Mineral Resource definition drilling maintains an inventory of sufficient confidence to maintain Mineral Reserves.

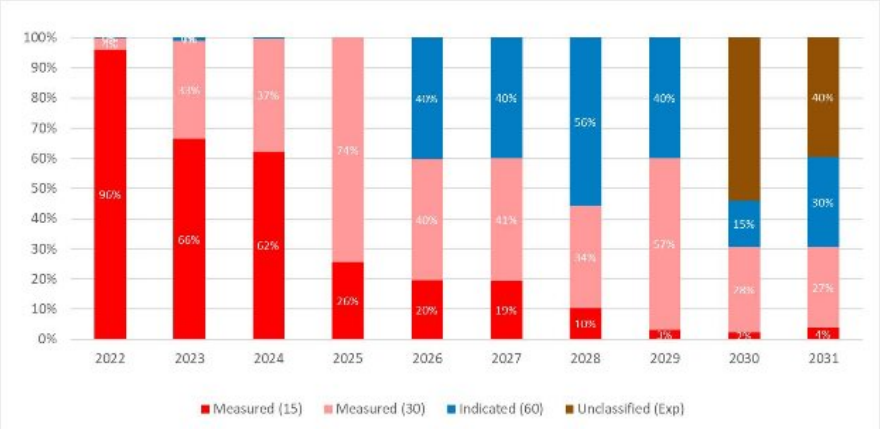


Figure 12-2: Willowdale Ten-Year Mine Plan Resource confidence (drill hole spacing in meters shown in brackets) (SRK, 2021)

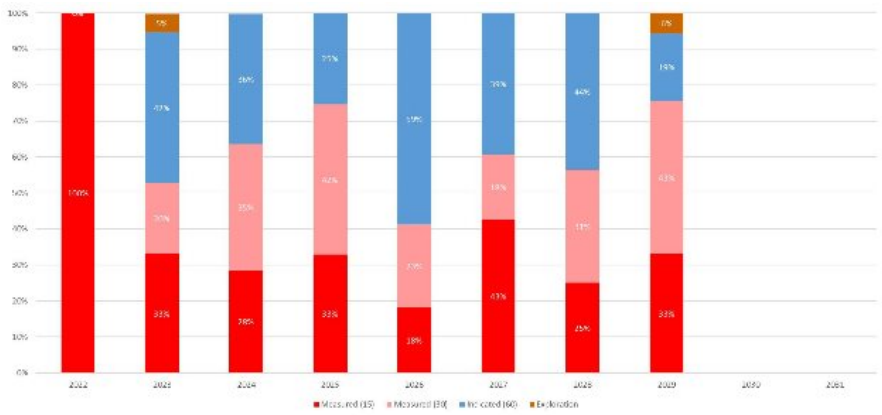


Figure 12-3: Huntly Ten-Year Mine Plan Resource confidence (drill hole spacing in meters shown in brackets) (Alcoa, 2022)

13.5.2 Mine Planning

Alcoa is actively refining the mine planning process in such a way that the Mineral Resource and Mineral Reserve Models are updated continuously using various scripts and a rationalizing of computer software. This process is currently incomplete, but the QP observed its progress both on the mine sites and at the Booragoon mine planning office.

The mine planning process commences with receipt by the mine planning department of the regularized and classified electronic Mineral Resource model from the geologists. The regularization process sees the Mineral Resource blocks agglomerated into blocks of 15 m by 15 m by 0.5 m vertically. Grade, bulk density and contaminant parameters are estimated into the model, which is expressed as a percentage model. This model is then manually checked and validated.

Electronic files are centrally stored, and the master versions are copied by relevant personnel for manipulation.

Optimization of the pits is undertaken using a bespoke variant of the Lerchs-Grossman algorithm designed to operate vertically. The algorithm accumulates blocks vertically on 0.5 m increments to find the pit floor.

The optimization is driven by Net Present Cost (NPC), rather than the conventional Net Present Value (NPV) due to the presence of a flat transfer price for product at the refinery gate.

Geotechnical constraints are not relevant, given that the pits are generally around 4 m in depth and placed on gently undulating country (Section 7.9). Contour mining is applied in areas of topographic relief, whereby mining progresses across the contour, maintaining a level pit floor as much as possible.

Optimization parameters are calculated for each block, including costs associated with drilling, blasting and ripping and haulage cost, which is estimated from major haulage roads and minor pit access roads against gradient. Electronic surface models are prepared to constrain the optimization; these are informed by LiDAR radar surveys and model the topography, the base of overburden and the base of

mineralization, derived from chemical analysis of resource definition drilling samples. Caprock requires drilling and blasting, and modelled surfaces are contoured for thickness, which is derived from examination of drill logs and high-Fe assays.

Pit shells are visually assessed for practicality and minimum mining widths and any impractical pit shells removed. Minimum mining widths vary according to topography and material type.

Individual areas are optimized separately, and the resultant pit shells are combined to provide grade and contaminant specifications for Life of Mine (LOM) scheduling. Haul roads are divided into 50 m segments with appropriate cost increments applied to each segment using commercial haul road optimization software. This process electronically tags each block with haulage cost information as a function of distance of the relevant node (haul road) from the nearest crusher. The software then normalizes the data by calculating the equivalent flat haul distance, maintaining a gradient of less than 8% for all nodes.

The model is then depleted for mined material and blocks that have been otherwise committed for development or have been mined out and also for environmental constraints.

Environmental constraints include proximity to streams, designated heritage areas (both Aboriginal and European) and the water catchment offset. GIS software is used to continuously generate electronic shape files that are converted daily to string files for import into the mine design software. These are then used to deplete the model in relation to environmental constraints.

Mineralization that has been identified as being under infrastructure is scheduled for mining only after that infrastructure has been removed in the LOM plan.

Noise zones are those where noise from the mining operations will potentially exceed allowable levels and the operation actively seeks to maintain lower noise levels than those mandated. Mining in these areas is undertaken by contract miners using smaller equipment on day shift only and attracts higher costs than conventional owner-operator mining, which is applied to most of the operation.

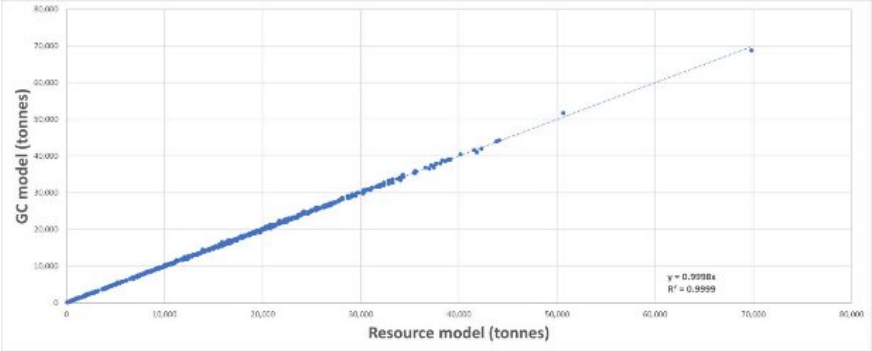
The regularized model is then coded for the above parameters and checked. All the above processes are logged, checked and validated both electronically and visually. Electronic scripts are then run in the mine planning software, resulting in the reporting of Mineral Reserves.

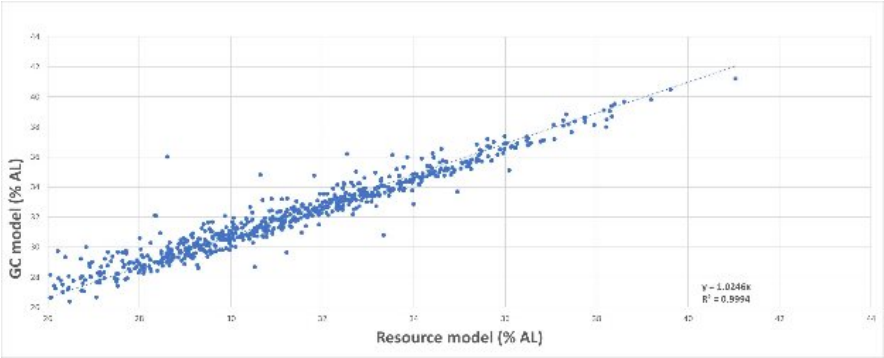
Revenue for the Lerchs-Grossman optimization is applied as a transfer price obtained from Alcoa's Financial Department. This revenue is related to the export price gained for refined alumina and is related to penalties for reactive silica content. Current revenue is around US$24/t. The optimization uses US$0.48 per unit alumina based on the average grades that are agreed with the refineries. A discount rate of 12.4% is mandated by the Finance Department and applied to the NPV scheduler during the mine planning process. Alcoa uses a three-year trailing average of arms-length sales of bauxite from Darling Range. The price that constrains the estimate for optimisation was discounted to exclude export logistics costs, i.e. the base price was USD24/t, and the discounted price was USD16/t.

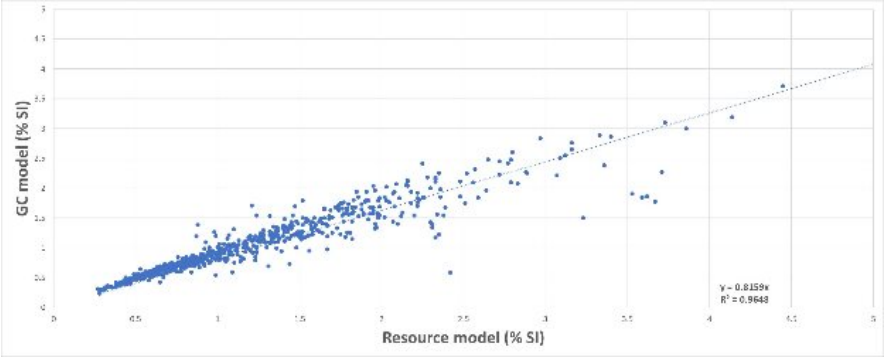
The QP notes that costs and revenues used in this process demonstrate a slow movement over time and that revenue has remained constant over the past year.

In practice, the Grade Control Model is used to direct mining at the bench scale, because it has more up-to-date drilling data than the Mineral Resource Model. Reconciliation is undertaken between the Mineral Resource, Mineral Reserve and Grade Control Models, with the QP observing the reconciliations between Mineral Resource and Grade Control Models to be within acceptable parameters. Reconciliation of the Mineral Reserve model has not been regularly undertaken in the past and this process was observed to be in development.

Figure 12-4 shows an example of the reconciliation between Resource and Grade Control models undertaken regularly by Alcoa.







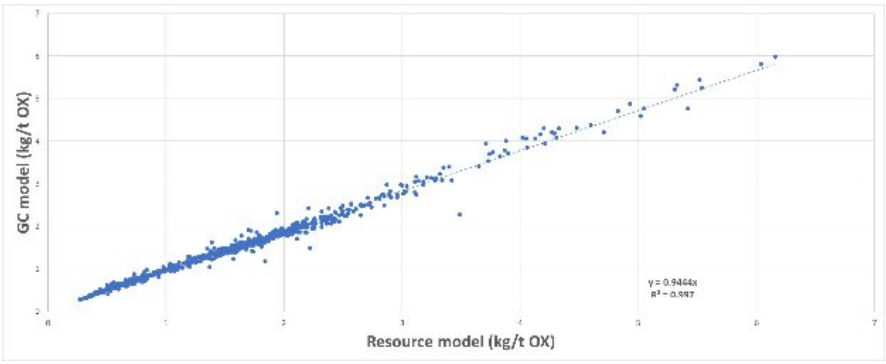


Figure 12-4: Example of reconciliation between Mineral Resource and Grade Control models for tonnage, Al, Si, and OX (Alcoa, 2022)

The resultant pit shells are scheduled using specialist automated mine scheduling software. A text file containing the model and its parameters is exported to the scheduling software, which is programmed with current wait times and the current mining capacity of 26.5 Mtpa. The software calculates and defers, as much as possible, capital haul road development costs for each block and identifies an optimal schedule.

Sustaining capital is calculated and added for haul road maintenance and equipment replacement. Not all machinery is capitalized, some being leased, and this is included the operating cost. Review of ownership costs against leasing is constant and appropriate factors applied to the model.

The resultant model is coded for grade and contaminants and blocks are flagged with the appropriate mining sequence. Mineral Reserve blocks are contained within the ten-year schedule. The model is then re-exported as a text file to the mine planning software and distributed to the relevant mine planning departments and mine closure engineers for detailed planning.

13.5.3 Abandoned Resources

Some planned mining areas that are included in the schedule are unable to be totally mined for a variety of operational reasons. These reasons usually relate to issues with rock outcrops, hard ground, contamination and access difficulties that are encountered when developing a new mining area. This process drives the continuous development of new mining areas to maintain production capacity.

Alcoa's recorded average abandoned mineralization between 2016 to 2019 (inclusive) is estimated at an average of 1.5% of Huntly and 2.0% of Willowdale planned production but can vary materially. These factors are applied to forecast production in the Mineral Reserve estimation process.

13.6 Cut-off Grade

The cut-off grade used for mine production planning is a floating cut-off grade, dependent on capital and operating costs against a fixed product revenue at the refinery gate. These revenues are updated at least

annually by Alcoa's Finance Department and are observed by the QP to remain relatively constant, which is a three-year trailing average of the contractually received export product price.

The cut-off grade is thus cost-driven rather than revenue driven. Operating costs are observed to be driven by haulage distance and the use of contract mining in areas where mining is undertaken on day shift only due to environmental restrictions. Haulage distance is related to the presence or absence of capital haul roads and their maintenance costs.

The current nominal cut-off grades for Alcoa's Darling Range operations are 27.5% for A.Al_2O_3 and 3.5% for R.SiO_2.

13.7 Metallurgical Factors

The Huntly and Willowdale Darling Range mining operations feed three refineries: Kwinana, Wagerup and Pinjarra. The Huntly mine provides feed for the Kwinana and Pinjarra refineries and the Willowdale mine provides feed for the Wagerup refinery. Ore is transported via conveyor belt from the relevant crushers, and mine the battery limit for the mining process is the refinery gate. All three refineries are established, mature and use the conventional low-temperature Bayer refining processes.

The refineries are designed to accommodate long-term average bauxite and impurity grades from the mines. Internal Alcoa specification contracts are established between the refineries and each of the mining operations and these contracts are updated annually and contemplate a five-year mine plan. These contracts set impurity targets, the key impurities being R.SiO_2, oxalate and iron. Mineral processing testing is discussed in Section 10.0, and processing and recovery in Section 14.0.

The internal LOM (nominally 2045) specification for bauxite is based on a 27.5% A.Al_2O_3 cut-off grade, which has not been optimized but is supported by the extensive operating history at the three refineries.

Deleterious elements are managed within contracted limits by blending at each mine, with the aim of minimizing variation. The refineries conduct metallurgical test work to ensure that any potential effects of variance caused by new mining areas are understood.

Geometallurgical analysis is conducted on drill hole samples using FTIR analysis as a primary method. A subset of the samples is assayed using conventional analytical procedures, with the results used for FTIR batch calibration and quality assurance purposes. The Mineral Resource model is coded for geometallurgical grades for available alumina and reactive silica. This information is reported in the Mineral Resource estimate as well as the Mineral Reserve estimate.

The Mineral Reserve is based on geometallurgical criteria that have been set by the refineries as suitable for producing alumina to agreed product marketing specifications.

13.8 QP Opinion

The SLR QP considers that, because of the integrated process by which Measured and Indicated Mineral Resources translate to Mineral Reserves for Alcoa's Darling Range operation, there are no foreseeable risks associated with Modifying Factors (mining, processing, metallurgical, infrastructure, economic, marketing, legal, environment, social, or government) that materially affect the Mineral Reserve estimate at 31 December 2021.

Operational risk associated with the COVID-19 pandemic, this may include labour shortages, disrupted supply chains affecting equipment and parts ordering. This could significantly disrupt operations and may materially and adversely affect Alcoa's business and financial conditions.

Changes in the actual mined grade, lower alumina or higher reactive silica grades are a risk to the overall economics. Grade control is an important process for this type of deposit and effective control on minimising the dilution particularly along ore-waste boundaries is crucial to maintaining expected mined grades.

Haul distance is considered a risk factor due to the hauling cost making up a significant portion of the mining cost. Hauling is also directly linked to fuel cost and maintenance, the combination of an increased hauling distance as well as an increase in fuel cost and maintenance would result in a significant impact on the operational costs. Haul distances to Reserve blocks typical increase over time until such time there is a plant relocation and so there is an expected increase in hauling distance in the medium term.

Alcoa may be unable to obtain or retain necessary permits, which could adversely affect its operations. The Darling Range operation is subject to extensive permitting requirements. The requirements to obtain and/or achieve or maintain full compliance with such permits can be costly and involve extended timelines and possible delays. Alcoa strives to obtain and comply with all required permits but there can be no assurance that all such permits can be obtained and/or always achieve or maintain full compliance with such permits.

14.0 MINING METHODS

14.1 General Description of Operations

The Huntly and Willowdale mines employ conventional open pit mining practices and equipment. The fleet is mixed between contract and owner-operator, depending on the nature of the task at hand. Owner operator equipment is used for mining the bulk of the Mineral Reserve, operating in areas away from those subject to environmental restrictions. Contract mining operates smaller equipment, day shift only, in environmentally (noise) sensitive areas and at the perimeter of the mining area.

The Huntly mine currently operates at a nominal mining capacity up to 27 Mtpa. In recent years, licenses were gained for the export of a proportion of the bauxite produced. The Willowdale mine operates at a nominal production rate of 10 Mtpa.

The Darling Range operations currently have a nominal expected mine life until 2045 (when ML1SA expires), although provision exists for Alcoa to apply for a further mineral lease (Section 3.2). Mine Plans for 10 years of scheduling of mineralization classified as Mineral Resources for estimation as Mineral Reserves (Section 12.5.1). Mining units of 15 m by 15 m by 0.5 m vertically are in use at the operations (Section 12.5.2).

Dilution and ore loss are not reported separately to the Mineral Reserve (Section 12.4). Internal and edge dilution is modelled at the mine planning stage through the application of 15 m by 15 m mining blocks to the Mineral Resource model. These regularized blocks contain proportional estimates of ore and contaminants and are optimized through the application of a Lerchs-Grossman algorithm developed specifically for the operation. This variation of the conventional Lerchs-Grossman algorithm is applied vertically, given that the shallow nature of the mineralization precludes geotechnical considerations. Blocks that do not satisfy grade and contaminant parameters against revenue are thus excluded from the mine plan.

Mining recovery from Huntly and Willowdale are estimated to be 96% and 98%, respectively.

Figure 3-3 shows the outlines of mined areas, Mineral Resources, and Mineral Reserves, which are collectively taken as representing the final pit outline, as currently understood. This does not account for any required extensions or additional licenses and assumes that all Mineral Resources and Mineral Reserves are ultimately mined.

14.1.1 Clearing

Following definition of Mineral Reserve blocks, vegetation is cleared ahead of mining by the Western Australian State Forest Products Commission (FPC), saleable timber being harvested for use. Clearing approval is sought a minimum of three years ahead of mining allowing time for harvesting of saleable timber before vegetation clearing.

14.1.2 Stripping

On receipt of clearance to proceed from the FPC, Alcoa operations commence stripping topsoil and Secondary Overburden Removal (SOBR) using small excavators, scrapers, and trucks. Soil is stockpiled at the site, away from the proposed pit, for rehabilitation purposes. Soil is stockpiled in windrows in such a manner that it maintains its organic viability.

The dieback fungus (*Phytopthora spp*.) is endemic in parts of the mining areas, which are flagged by Alcoa and precautions are taken to contain the fungus, which is lethal to the eucalyptus forest. The QP observed these precautions, which include separation of machinery fleets in areas where dieback is present and washing of machinery before entry into different areas. This represents a minor short-term scheduling challenge, though it is well managed.

14.1.3 SOBR

The SOBR process is specialized and aims to remove as much overburden and organic material from the top of the mineralization as possible. This organic material reacts with NaOH in the refinery to produce oxalates, which are deleterious to the process. After scrapers have removed the topsoil and overburden, two small (60t class) excavators equipped with swivel buckets are used to scrape clay containing organic material from the undulating surface of the hardcap that sits on top of the mineralization. This is later used to backfill mined out areas.



Figure 13-1: SOBR (SLR, 2021)

The SOBR process is applied to those areas where hardcap has been identified by Resource definition drilling, using the drillers' logs. The hardcap is drilled and blasted before mining with the rest of the bauxite sequence.

In areas without hardcap, wheel tractor-scrapers of 24 m^3 capacity remove soil overburden, scraping directly to the top of the mineralization model surface, being controlled by GPS. This material is similarly stockpiled for rehabilitation or used as backfill in exhausted mining areas.



Figure 13-2: Topsoil removal (background), blasting of hardcap and marking of ore (foreground) (SLR, 2021)

A surface miner is employed in limited areas of hardcap in the vicinity of blasting-sensitive infrastructure such as power lines. The surface mining is also employed in lieu of SOBR where appropriate, for example, where there are high levels of contaminants in the hardcap.

14.1.4 Mining

Mining progresses on 4 m benches, utilizing a contour-mining sequence, cutting benches across the topography, working from top to bottom, maintaining the flattest floor obtainable to a maximum gradient of 1:7. Most of the mineralization lies beneath a gently undulating topography and contour mining is minimal.



Figure 13-3: Contour mining (SLR, 2021)

On completion of overburden removal, the exposed surfaces are sheeted with 0.25 m of suitable mineralized material taken from the dozed second cut in adjacent pits. Where hardcap is present, a drill rig is mobilized, and the hardcap drilled and blasted on an appropriate pattern to fragment the hardcap.

Trucks haul the mined ore to fixed crushers, which crush the material to varying sizes (refer to Section 14.0) before conveying down the escarpment to the refinery where it is stockpiled to give surge capacity.

No visual grade control is applied, the ore contacts being gradational. Grade control is achieved by mining to electronic ore surfaces derived from drill assays, control being achieved using GPS equipped equipment, the GPS being regularly calibrated.

Blending takes place at the pit face, before which the crushed ore from different pits is assessed using specialist short-term mine planning software and pit production is scheduled to achieve the desired blend.

The SLR QP is of the opinion that considering the style of mineralization, the average depth of the deposit, and the material characteristics of the overburden material whereby it is amenable to ripping / excavation using conventional earth-moving equipment, the open pit mining method adopted at Darling Range is the most appropriate method for the Mineral Reserves.

14.2 Haul Roads and Infrastructure

14.2.1 Haul Roads

Haul roads are the limiting factor to the mining operations. Major haul roads are established to each mining area, honoring the topography at the least possible gradient. Roads are unsealed and formed by conventional bulldozer and grader and sheeted with appropriate material. Once established, haul road

maintenance was observed to be continuous and forms part of the operating cost for each mining area. Haul roads are observed by the QP to be treated as sustaining capital in an appropriate manner.



Figure 13-4: Truck on haul road (SLR, 2021)



Figure 13-5: Haul roads with berms (SLR, 2021)

Secondary haul roads to individual mining areas are formed in the same manner, with provision for rehabilitation once mining is complete.

The Darling Range climate is subject to wet winter months and trafficability of haul roads during these months is included in mine planning. Redundancy during wet months is planned for, allowing well drained areas to be mined in the wet.

There are some restrictions to the establishment and operation of haul roads, and these are incorporated into the road design and operation:

- Water runoff from the roads is impounded in sumps and these were observed to be well formed and appropriate, being regularly dewatered, emptied of sediment and cleaned. This water is either re-used for dust suppression or road-forming purposes or is decanted for release in an approved manner.
- Dieback control necessitates separation of machinery between that which operates in dieback-prone and dieback-free areas. This presents short-term scheduling challenges that were observed to be well controlled.
- Proximity to a major water catchment restricts the volume of hydrocarbons that may be taken into particular areas around the catchment. This was observed to be adhered to, with particular road rules and scheduled delivery of approved volumes of hydrocarbons along haul roads that are specially formed with impoundments in the event of spillage.

The Qualified Person has observed that Alcoa's Darling Range operations have a well-established system for haul road design, construction, maintenance and regulation and that this does not present a major impediment to mining efficiency.

14.2.2 Infrastructure

The main elements of infrastructure at Alcoa's Darling Range mining operations are the location of crushers and conveyors to the refineries. These crushers form hubs for the mining operations, connected by the primary haul roads and are scheduled to be moved every ten years or so, in accordance with the requirements of the mining schedule and the location of ore as the mines progress. This crusher movement is planned well in advance and is treated as sustaining capital expenditure.

The crushers see relatively light duty for a mining operation and are well maintained. Similarly, the conveyors, which operate all year round and are covered, negating any potential effect of weather.



Figure 13-6: Covered conveyor (SLR, 2021)

Both the crushers and conveyors were observed to be in excellent condition and subject to scheduled maintenance, including replacement of conveyor belts.

Other ancillary equipment includes offices, ablutions, crib-rooms, and workshops, all of which were observed to be in excellent condition.

14.3 Geotechnical and Hydrogeology Considerations

Mining at Alcoa's Darling Range operations is very shallow, pits being an average of 4 m deep. Consequently, geotechnical considerations are negligible other than immaterial localized batter failures. Similarly, the mining areas are elevated and well drained and groundwater and surface water hydrology is not material in these areas other than the catchment, impoundment, and decantation of runoff during the wet winter months. No drainage diversion occurs or is necessary because the mineralization sits between the stream beds and the bauxite occurs above the groundwater table. Deeper bauxite may be

seasonally affected by the water table and is scheduled to be mined in summer. Backfilling of these places occurs before the rain raises the water table.

Contour mining (Figure 13-7) is practiced in areas of relatively steep topography, maintaining access ramps at less than 1:8 gradient and mining across the contour and downwards, creating a flat working floor. Hydrological considerations in these areas include management of runoff during the wet winter months and trafficability.



Figure 13-7: Contour Mining (SLR, 2021)

Mine overburden is progressively backfilled into adjacent exhausted pits (Figure 13-8), topsoiled, landscaped (Figure 13-9), and rehabilitated by re-establishment of native vegetation (Figure 13-10), creating a stable post-mining landform that replicates the pre-existing environment.



Figure 13-8: Soil being returned for backfilling and landscaping the pit (Alcoa, 2018)



Figure 13-9: Landscaped mining area, prior to replanting of forest (SLR, 2021)



Figure 13-10: Rehabilitated pit through re-plantation of native vegetation (SLR, 2021)

14.4 Mine Equipment

Mining is undertaken by 300 t and 200 t-class excavators top-loading 190 t capacity rigid-bodied mining trucks (Figure 13-11). This fleet was observed by the QP at Huntly to be aged. The equipment has undergone relatively light duties for a mining fleet, which prolongs its life. Sustaining capital is being invested in equipment replacement and modernization at Willowdale, progressively working toward Huntly. New equipment includes 250 t-class excavators and 190 t-class trucks.

A full list of equipment at Darling Range is provided in Table 13-1.



Figure 13-11: Ore mining at Darling Range (SLR, 2021)

Table 13-1: Darling Range operations equipment list

Location	Classification	Type	No. Units
Huntly	Primary	Excavator	4x CAT 336D 3x Komatsu PC3000 1x Hitachi 2600-7
		Haul truck 1	8x CAT 789C (190T) 9x CAT 789D (190T) 1x Komatsu 730E (190T)
		Haul truck 2	1x HD1500 (150T)
	Ancillary	Bulldozer / Loader	3x CAT D11R 1x D575 1x CAT 992K 2x CAT 993K 2x WD600 2x WA600
		Grader	2x CAT 16M 1x CAT 24M
		Scrapers	5x CAT 637G
		Low Loaders	1x CAT 785C (250T) 1x CAT 777G (150T)
		Water truck	3x CAT 785C
		Drills	3x Atlas Copco L6 (Blast) 5x WB93 (Exploration)
Willowdale	Primary	Excavator	2x CAT 336D 2x Komatsu PC2000
		Haul truck 1	14x Komatsu 730E (190T)
		Haul truck 2	1x HD1500 (150T)
	Ancillary	Bulldozer / Loader	2x CAT D11T 1x CAT 993K 1x CAT 992G 1x Volvo L90
		Grader	1x CAT 16H 1x CAT 18M
		Scrapers	3x CAT 637G 1x CAT 637E
		Low Loaders	1x CAT 785D (220T)
		Water truck	2x CAT 777F 1x Komatsu 730E
		Drills	2x Epiroc D50 (Blast)

14.4.1 Contractors

Alcoa’s practice in noise sensitive areas such as the perimeter of the operation near residents is to engage contractors. These areas operate on day shift only and attract higher operating costs than the main production areas. The flexibility required in these areas precludes the use of the primary owner-operator

fleet and equipment is dry or wet hired or mining takes place under conventional schedule of rates contracts.

Alcoa also engages contractors for aspects of haul road construction services, in select areas of pit development, and during landscaping activities for rehabilitation after mining.

This practice has led to the establishment of a secondary contracting industry around the Darling Range operations. Contractors are overseen by Alcoa personnel.

14.4.2 Ancillary Equipment

Ancillary equipment at Alcoa's Darling Range operations includes a fleet of bulldozers, graders and loaders that are primarily used for haul road formation, pit development (for the removal of overburden and blasted caprock) and ground preparation for digging, landscaping, clean-up, and road maintenance.

The SOBR process requires small excavators, articulated trucks, scrapers, and specialist skills to grub organic-containing clay from the top of the mineralization.



Figure 13-12: Blasthole drill working on hardcap (SLR, 2021)

All ancillary equipment was observed to be in good and well-maintained conditions, the conditions being relatively light duty in comparison to other Western Australian mining operations.

14.5 Personnel

The main production mining operations are primarily Owner-operated using Alcoa equipment and employees. Contractors are also used for certain activities on site.

Three unions are recognized at the operations:

- The Australian Workers Union (AWU), which covers most of the operations workers
- Australian Metal Workers Union (AMWU), which covers the metal trades, being fitters, boilermakers and mechanics
- Electrical Trades Union (ETU), which covers the electricians

Lost time during strikes is generally uncommon. An agreement with AWU that was made in late 2018 and ratified by Fair Work Australia in early 2019 is in place for a four-year period.

Alcoa's Darling Range operations were observed to have a stable workforce, drawn from the surrounding areas. The location is highly desirable in the Western Australian mining context and skilled personnel are readily attracted to the operations. Primary haul roads are named after personnel with greater than forty years' service and there are many of these.

As of Q4 2021, the Huntly and Willowdale operations together employ a total of 890 employees consisting of 92 Technical, 132 Management and 634 operations employees. Additionally, 32 employees are centrally employed on the combined operations.

A breakdown is shown in Table 13-2 (current vacancies not accounted for).

Table 13-2: Darling Range personnel

Location	Classification	No Personnel
Huntly 557	Technical	50
	Management	66
	Operations	441
Willowdale 301	Technical	42
	Management	66
	Operations	193
Central 32	Technical	21
	Management	7
	Operations	4
Total		890

15.0 PROCESSING AND RECOVERY METHODS

15.1 Process Description

The process plant for the Darling Range operations consists of two separate crushing facilities at the Huntly and Willowdale mines. Both facilities crush the ROM and convey the crushed ore to three separate refineries.

The Willowdale operation consists of a single stage crushing flowsheet and includes a series of conveyors to transport the crushed ore at an annual throughput of 10 Mtpa. The ROM is discharged from trucks on a dump hopper. An apron feeder transfers the ore from the dump hopper to a vibrating grizzly with an aperture of 180 mm. The grizzly oversize is discharged into a single toggle jaw crusher which crushes the ore to a top size of 180 mm. A hydraulic rock breaker is installed at the crusher to break the larger rocks that do not pass through the crusher opening. The crushed product and the grizzly undersize are discharged on to a discharge conveyor and subsequently discharged on to an overland conveyor. The discharge conveyor is fitted with a tramp magnet to remove any metal that is present along with the crushed ore product. The overland conveyor, which is 9.4 km long, transports the crushed ore to an intermediate transfer station. The ore is then transported by a second overland conveyor, 8.8 km long, to the transfer station located at Wagerup. An apron feeder is used to transfer the crushed ore from the Wagerup transfer station on to a stockpile conveyor and subsequently discharge on a stacker conveyor. The stacker conveyor discharges the ore into two separate stockpiles. The crushed ore is then reclaimed from there for processing in the Wagerup refinery. The total capacity of the stockpiles is approximately 0.7 Mt and sufficient for three weeks of feed to the refineries.

A simplified block flow diagram of the Willowdale operation is shown in Figure 14-1.

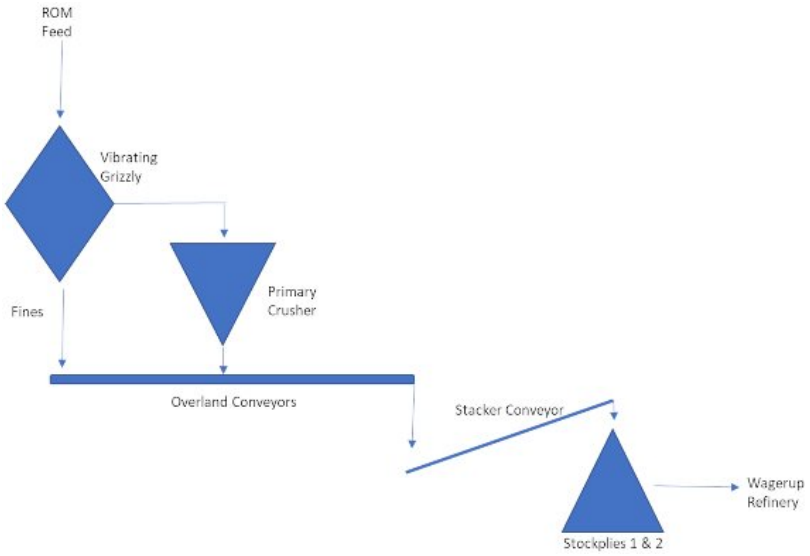


Figure 14-1: Simplified block flow diagram of the Willowdale operation

The Huntly operation consists of multiple stages of crushing and includes a series of conveyors to transport the crushed ore to the refineries at an annual throughput of 25 Mtpa. The primary crushing is achieved by two similar crushing circuits operating in a parallel configuration. The ROM is discharged from trucks on dump hoppers. Apron feeders transfer the ore from the dump hopper to vibrating grizzlies with an aperture of 180 mm. The grizzly oversize fractions are fed to jaw crushers which crush the ore to a top size of 200 mm. The crushed product and the grizzly undersize are discharged on to discharge conveyors and transferred to the secondary crushers (sizers). The discharge conveyors are each fitted with a tramp magnet to remove any metal that is present in the crushed ore. Secondary crushing is achieved in sizers with the objective of reducing the ore particle size to a top size of 100 mm. The secondary crusher product is transported by three overland conveyors (operating in series with two intermediate transfer stations in between) to a transfer station and randomly split into two by a splitter bin.

One fraction from the splitter bin is transferred by another overland conveyor and discharged into a stockpile conveyor via an apron feeder. The stockpile conveyor transfers the ore and subsequently discharges onto a stacker conveyor. The stacker conveyor discharges the ore into two separate stockpiles identified as Stockpile 1 and Stockpile 2. The crushed ore is then reclaimed from there for processing in the Pinjarra refinery. The second fraction of the ore is transported by an overland conveyor to an apron feeder, to a transfer conveyor and then split again to two fractions by a splitter chute located at a separate transfer station. One of the splits from the splitter chute is destined for Kwinana refinery and the other split is destined for Pinjarry refinery.

The fraction for the Pinjarra refinery is transported by stockpile conveyor and subsequently discharged on to two sperate stockpiles (identified as Stockpile 3 and Stockpile 4) via a stacker conveyor. The ore is then

reclaimed from the stockpiles for processing in Pinjarra refinery along with the ore from Stockpile 1 and Stockpile 2.

The split for Kwinana refinery is transported by a conveyor and processed by a tertiary crushing circuit consisting of two roller crushers operating in parallel configuration. The tertiary crusher product with a top size of 25 mm is transferred by a stockpile conveyor and discharged into two separate stockpiles identified as Stockpile 5 and Stockpile 6 via a stacker conveyor. The crushed ore from Stockpiles 5 and Stockpile 6 is reclaimed and transferred by a reclaim conveyor to a surge bin for subsequent loading and transport to the refinery by train. A simplified block flow diagram of the Huntly operation is shown in Figure 14-2.

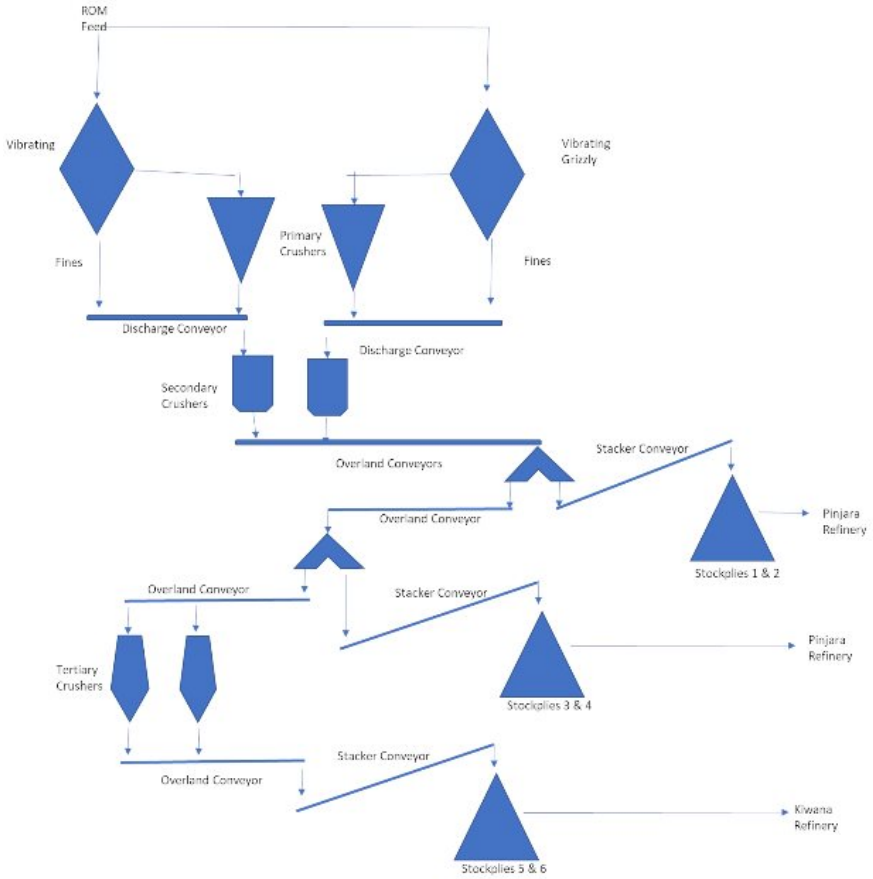


Figure 14-2: Simplified block flow diagram of the Huntly operation

15.2 Primary Equipment List

The primary equipment lists of the Willowdale, and Huntly operations are shown in Table 14-1 and Table 14-2.

OhTable 14-1: Primary equipment list (Willowdale)

Equipment	Quantity	Installed Power (kW)
Apron feeder	1	264
Vibrating grizzly	1	75
Primary Crusher	1	355
Discharge conveyor	1	132
Overland conveyor	1	2500
Overland conveyor	1	1800
Apron feeder	1	75
Stockpile conveyor	1	300
Stacker boom conveyor	1	110

Table 14-2: Primary equipment list (Huntly)

Equipment	Quantity	Installed Power (kW)
Apron feeder	1	260
Vibrating grizzly	1	55
Primary Crusher	1	250
Discharge conveyor	1	140
Secondary crusher	1	1000
Apron feeder	1	260
Vibrating grizzly	1	75
Primary Crusher	1	250
Discharge conveyor	1	140
Secondary crusher	1	1000
Overland conveyor	1	7500
Overland conveyor	1	5000
Overland conveyor	1	6100
Apron feeder	1	75
Overland conveyor	1	1500
Apron feeder	1	55

Equipment	Quantity	Installed Power (kW)
Apron feeder	1	75
Overland conveyor	1	1350
Apron feeder	1	110
Stockpile conveyor	1	225
Stacker boom conveyor	1	110
Yard conveyor	1	250
Stockpile conveyor	1	150
Stacker boom conveyor	1	110
Conveyor	1	250
Apron feeder	1	75
Tertiary crusher	1	370
Apron feeder	1	75
Tertiary crusher	1	370
Stockpile conveyor	1	300
Stockpile boom conveyor	1	110
Bucket wheel reclaimer	1	264
Reclaim bridge conveyor	1	110
Transfer conveyor	1	280
Reclaim conveyor	1	280
Reclaim conveyor	1	900

15.3 Consumables and Power

The power consumption of the Huntly operation is approximately 8,000 MWh to 9,000 MWh per month. The Willowdale power consumption is approximately 2,000 MWh per month.

The process plant is a dry crushing operation and therefore water is only required for dust suppression and is included as part of mine water consumption. Water is not required as a consumable for the plant.

Other consumables of the process plant include crusher liners, screen panels and spares for feeders and conveyors. These are kept on site and replaced as part of the routine maintenance schedule according to manufacturer's guidelines.

Personnel requirements for the operation and maintenance of the plant as described are included in Table 13-2.

15.4 QP Opinion

SLR has the opinion that selected processing method and the flowsheet is suitable for Darling Range operations. It is important to note that the ore head grades meet the refinery specifications for processing

in terms of Al_2O_3 grades and SiO_2 grades, this means the ore can be directly shipped to the refinery for further processing without any upgrading in the mineral processing plant. The crushing circuit reduces the particle size suitable for conveying as well as to meet particle size specified by the refinery.

16.0 INFRASTRUCTURE

The infrastructure for the mining operations is established and operational. In 2021, the infrastructure hub for Willowdale was relocated 16 km southwards from Orion (after having been based there for 21 years) to the Larego Hub which is located about 20 km north-east of the town of Harvey. The hub hosts administrative offices, as well as crushing facilities and maintenance facilities. The Orion Hub site is currently being rehabilitated.

The mining hubs are relocated periodically as production moves away from the hub and thus transportation costs increase. Alcoa plans for the Larego Hub to be in place for approximately 20 years, though this is the 4th relocation since the mines opened in the 1970s/80s (approximately 13 years on average). The mining hub relocations are well-understood with planning and associated budgeting occurring well in advance of relocations; production restarted seven days after the shutdown.

An extensive haul road network, rail, and overland conveyors transport crushed bauxite from the Hub to the refineries on the coast (namely Kwinana, Wagerup and Pinjarra). Bauxite is transferred from each mine to the refineries primarily via long distance conveyor belt, apart from the Kwinana refinery which receives bauxite via railway. The Alumina produced by the three refineries is then shipped to external and internal smelter customers through the Kwinana and Bunbury ports.

The infrastructure layout for the Darling Range operations is shown below (Figure 15-1).

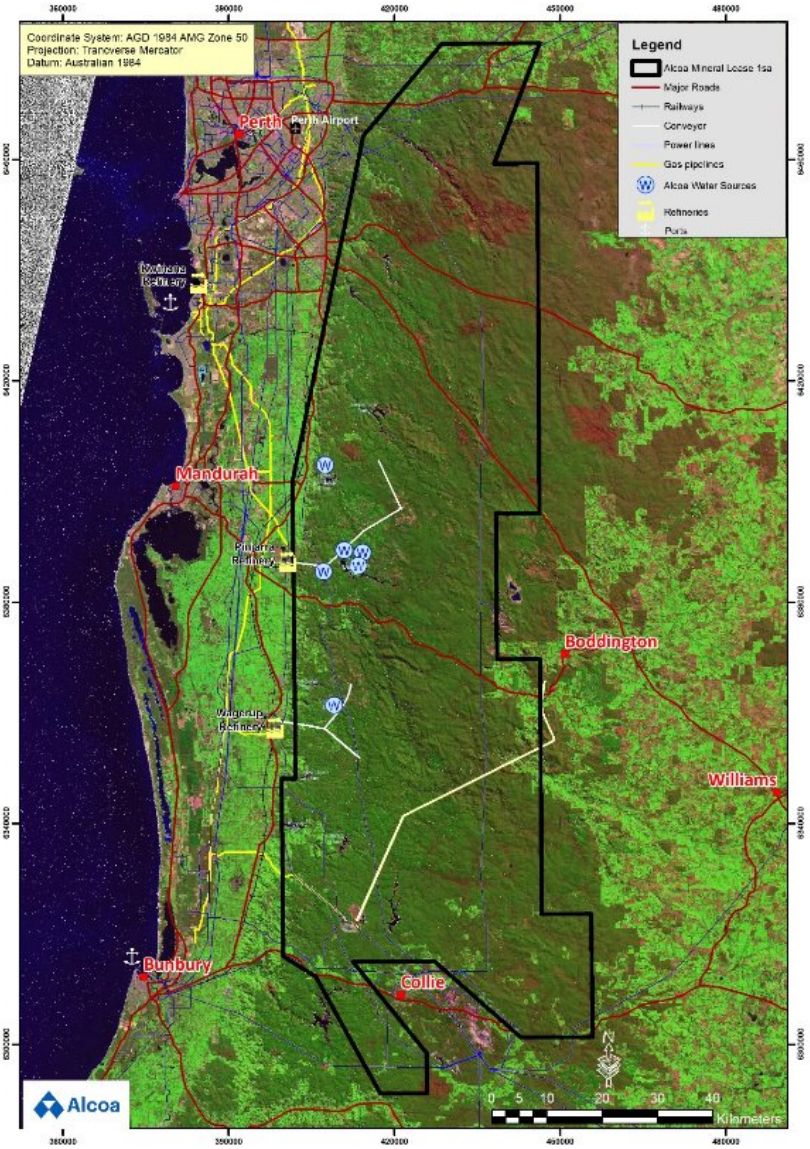

Coordinate System: AGD 1984 AMG Zone 50
Projection: Tranverse Mercator
Datum: Australian 1984
Legend
Alcoa Mineral Lease 1sa
Major Roads
Railways
Conveyor
Power lines
Gas pipelines
Alcoa Water Sources
Refineries
Ports
Perth
Perth Airport
Kwinana Refinery
Mandurah
Pinjarra Refinery
Boddington
Wagerup Refinery
Williams
Bunbury
Collie
Alcoa
0 5 10 20 30 40
Kilometers

Figure 15-1: Infrastructure Layout (Alcoa, 2022)

16.1 Access Roads

The Darling Range is readily accessible via road from Perth and surrounding areas. The mines are near the towns of Pinjarra and Waroona. Both towns are easily accessible via the national South Western Highway, a sealed single carriageway road, which starts on the southern side of Perth and continues for almost 400 km to the southwest corner of Western Australia.

The Huntly mining area is accessible from the South Western Highway via Del Park Road, a sealed single carriageway road which connects the town of North Dandalup in the north with Dwellingup in the south. From Del Park Road, a further sealed road which follows the route of the bauxite conveyor to the Pinjarra refinery provides access to the Huntly site.

The Willowdale mining area is similarly accessible from the South Western Highway via Nanga Brook Road, a sealed single carriageway road to the east of Waroona.

Major haul roads have been established to each mining area. Roads are unsealed and require continuous ongoing maintenance which was observed during the site visit. Secondary haul roads, also unsealed, cross-cut each individual mining plateau.

16.2 Power

The Darling Range's Pinjarra refinery receives power from the South West Interconnected System (SWIS). The refinery also has internal generation capacity of 100 MW from 4 steam driven turbine alternators, with steam produced by gas fired boilers and a gas turbine Heat Recovery Steam Generator (HRSG). The refinery supplies power to the Huntly Mine by three different power supply lines (a single 33 kV and two 13.8 kV).

Willowdale Mine has a single 22 kV power supply fed from the Wagerup refinery. The Wagerup refinery is a net exporter of power to the SWIS, with internal generation capacity of 108 MW from three steam driven turbine alternators and one gas turbine. The steam is produced by gas fired boilers.

The power consumption of the Huntly operation is approximately 8,000 MWh to 9,000 MWh per month. The Willowdale power consumption is approximately 2,000 MWh per month.

16.3 Water

Water is used on the mines for dust suppression, dieback washdown, vehicle washdown, workshops, conveyor belt wash, construction, and domestic purposes. The water supplies for mining consist of licensed surface water sources supplemented with treated wastewater from vehicle washdowns, stormwater runoff and maintenance workshops.

The WA mines are licensed by the Department of Water and Environmental Regulation (DWER) to draw surface water from five locations to meet their water supply requirements. The Huntly mine draws water from Banksiadale Dam and Boronia Waterhole. Huntly mine also holds a license to draw water from Pig Swamp and Marrinup, however these resources are retained as a backup water supply and have not been utilized in recent years. Huntly mine is also permitted to draw water from South Dandalup Dam under an agreement with the Water Corporation. A pumpback facility from South Dandalup Dam to Banksiadale Dam is used to raise levels in Banksiadale Dam during periods of low rainfall runoff. Willowdale Mine draws water from Samson Dam.

Table 14-2 summarizes the license allocation for water usage. In 2020, water abstraction comprised approximately 15% of the total DWER license allocation (for those sites where abstraction occurred). An additional 534,975 kL was also abstracted from South Dandalup Dam under the agreement with Water Corporation.

Table 15-1: Water Abstraction License Volumes

Site	Water source	Surface Water license	Annual Water Entitlement
Huntly	South Dandalup Dam	N/A	N/A
Huntly	Banksiadale Dam	SWL63409	500,000
Huntly	Pig Swamp Waterhole	SWL153635	30,000
Huntly	Boronia Waterholeon Marrinup Brook	SWL83356	70,000
Marrinup Nursery	Lot 908 on Marrinup Brook	SWL68893	45,000
Willowdale	Samson Dam	SWL61024	450,000

16.4 Accommodation Camp

There are no Alcoa accommodation facilities within the Darling Range. As described above, the Huntly and Willowdale mining areas are within proximity to established population centres including Pinjarra approximately 25 km to the West of Huntly and Waroona approximately 20 km West of Willowdale.

On site facilities includes offices, ablutions, crib-rooms, and workshops, all of which were observed to be in excellent condition.

16.5 Mine Waste Management

16.5.1 Tailings disposal

No tailings are generated within the boundaries of the mining operations. The management of tailings generated downstream at the refineries is beyond the boundaries of the Darling Range mining operations and are therefore not considered in this TRS.

16.5.2 Waste rock disposal

Alcoa's Darling Range mining operations do not produce mine waste or "mullock" in the same manner as conventional mining operations and waste dumps are not constructed.

Overburden from Darling Range ore blocks is carefully segregated for later rehabilitation of adjacent, completed mining operations. Non-viable rock is used to backfill these shallow, completed pits and the viable topsoil spread on top and contoured. Jarrah forest is then re-established through seeding and the planting of nursery-raised seedlings. Water runoff from active and backfilled mining areas is contained and directed toward settlement ponds, which are later rehabilitated and seeded.

To date, some 20,000 ha of mined areas have been backfilled and reforested, which represents 77% of the area mined since 1966, including areas reserved for long-term infrastructure. Rehabilitation standards

are described in Alcoa's 2016 statutory Bauxite Mine Rehabilitation Completion Criteria. These completion criteria have been progressively revised since inception in the 1990s.

17.0 MARKET STUDIES

17.1 Overview

Alcoa Corporation is a vertically integrated aluminum company comprising bauxite mining, alumina refining, aluminum production (smelting and casting), and energy generation.

Through direct and indirect ownership, Alcoa Corporation has 28 operating locations in nine countries around the world, situated primarily in Australia, Brazil, Canada, Iceland, Norway, Spain, and the United States. Governmental policies, laws and regulations, and other economic factors, including inflation and fluctuations in foreign currency exchange rates and interest rates, affect the results of operations in these countries.

There are three commodities in the vertically integrated system: bauxite, alumina, and aluminum, with each having their own market and related price and impacted by their own market fundamentals. Bauxite, which contains various aluminum hydroxide minerals, is the principal raw material used to produce alumina. Bauxite is refined using the Bayer process to produce alumina, a compound of aluminum and oxygen, which in turn is the raw material used by smelters to produce aluminum metal.

Alcoa obtains bauxite from its own resources and processes over 85% of its combined bauxite production into alumina. The remainder is sold to the third-party market. In 2021, total Alcoa production was 47.6 million dmt (dry metric tonne) of bauxite.

Aluminum is a commodity that is traded freely on the London Metal Exchange (LME) and priced daily. Pricing for primary aluminum products is typically composed of three components:

(i) The published LME aluminum price for commodity grade P1020 aluminum;

(ii) The published regional premium applicable to the delivery locale; and

(iii) A negotiated product premium that accounts for factors such as shape and alloy.

Further, alumina is subject to market pricing through the Alumina Price Index (API), which is calculated by the Company based on the weighted average of a prior month's daily spot prices published by the following three indices: CRU Metallurgical Grade Alumina Price; Platts Metals Daily Alumina PAX Price; and Metal Bulletin Non-Ferrous Metals Alumina Index. As a result, the price of both aluminum and alumina is subject to significant volatility and, therefore, influences the operating results of Alcoa Corporation.

Unlike alumina and aluminum, bauxite is not a standard commodity traded on an index. Bauxite's grades and characteristics vary significantly by deposit location and the value of bauxite deposits for each downstream refinery could be different, based upon:

- refinery technology;
- the location of each refinery in relation to the ore deposit; and
- the cost of related raw materials to each refinery.

As such, there is no widely accepted index for bauxite. Most bauxite traded on the third-party market is priced using a value-in-use methodology. The key assumption for the value-in-use methodology is that both the (1) offered bauxite and the (2) comparative bauxite being used in the target refinery will generate the same refining cost. As such, using the known price for the comparative bauxite used in the target

refinery, the offered bauxite price will then be derived by considering the bauxite characteristics and quality differences between the offered and comparative bauxite.

17.1.1 Market Fundamentals

Bauxite is the principal ore of alumina (Al_2O_3), which is used to produce aluminum. Bauxite mining and alumina refining are the upstream operations of primary aluminum production. China is the largest third-party seaborne bauxite market and accounts for more than 90% of all bauxite traded. Bauxite is sourced primarily from Australia, Guinea, and Indonesia on the third-party market. In the long run, China is expected to continue to be the largest consumer of third-party bauxite with Guinea expected to be the majority supplier. Further, third-party traded bauxite is expected to be in surplus over the next decade, with most new mining projects announced recently being located in Guinea.

Bauxite characteristics and variations in quality heavily impact the selection of refining technology and refinery operating cost. A market bauxite with high impurities could limit the customer volume an existing refinery could use, resulting in a discount applied to the value-in-use price basis.

Besides quality and geography, market fundamentals, including macroeconomic trends – the prices of raw materials, like caustic soda and energy, the prices of Alumina and Aluminum, and the cost of freight – will also play a role in bauxite prices.

17.2 Market: Darling Range

17.2.1 Operation

The Darling Range mines are part of an integrated operation of two mines, three refineries and two ports. Prior to 2016, production from the Darling Range mines (Huntly and Willowdale) was used exclusively for consumption by the integrated refineries.

Bauxite is transferred from each mine to the refineries primarily via long distance conveyor belt, apart from the Kwinana refinery, which receives bauxite via railway. The Alumina produced by the three refineries is then shipped to external and internal smelter customers through two ports, based in Kwinana and Bunbury.

In 2016, Darling Range entered into a 5-year third-party sales contract with a major alumina producer in China. The volume exported was immaterial compared to the total production of the two mines and was immaterial to the overall operation. In 2021, less than 4% of the Darling Range bauxite was sold externally. Following the expiration of the third-party sales contract at the end of 2021, all bauxite production from Huntly and Willowdale will be consumed internally by the Darling Range refineries and there are no current plans for further bauxite export.

17.2.2 Pricing

The pricing mechanism of the third-party sales contract was based on a value-in-use methodology (as described in Section 16-1) that was anchored to the customer's other bauxite sources at the time of execution, with a market adjustment factor linked to the Alumina price.

As discussed in Section 16.2.1 above, all Western Australia bauxite production will be sold internally to Western Australia refineries following the expiration of the third-party sales contract in 2021. In 2021, the Western Australia internal bauxite transfer price referenced this third-party sales contract as a three-year trailing average.

17.3 Contracts

All Darling Range production is shipped via conveyor or train to one of the Alcoa's three Western Australia refineries.

Major operational contracts that are in place include, but are not limited to the following:

- Railway contract: Alcoa has a long-term contractual agreement with a third-party to deliver bauxite to one of its refineries. Pricing is based on a fixed rate schedule, payable on volume of bauxite delivered.
- Mining contractor contract: Alcoa has a long-term contractual agreement with a third-party to operate a designated mine region. The contractor is responsible for development, mining, hauling and rehabilitation of the designated mine pits; the contract runs a day-only operation. Pricing is based on a fixed rate schedule, payable on production tonnes.
- Rehabilitation contract: Alcoa has a long-term contractual agreement with a third-party to rehabilitate certain mined areas, ready for closure. Pricing is based on a fixed rate schedule, payable on equipment and labor hire rates.
- Fuel contract: Alcoa has a mid-term contractual agreement with a third-party to supply diesel fuel for mining operations. Pricing is based on market pricing for diesel, payable on volume consumed.

These types of contracts are typical of other similar mining operations.

18.0 ENVIRONMENTAL STUDIES, PERMITTING, AND PLANS, NEGOTIATIONS, OR AGREEMENTS WITH LOCAL INDIVIDUALS OR GROUPS

18.1 Environmental Studies

Alcoa has established practices and processes for ensuring conformance to environmental requirements. Sensitive areas are identified and managed ahead of disturbance. Environmental factors are taken into account prior to infill drilling; hence, mining blocks carrying environmental risks do not feature in the Mineral Reserves (for example, areas around granite outcrops and water courses have a buffer applied and essentially no-go areas from a mining perspective).

The environmental reviews and approvals form part of the MMPLG approvals process outlined in Section 3.6.

Additional baseline studies are understood to be in progress to support the Environmental Protection Act 1986 (WA) and the Environment Protection and Biodiversity Conservation Act 1999 (Cth) approvals for future extensions to the mining footprint. Baseline studies are guided by the requirements of the Environmental Protection Authority (WA) and are well understood.

The threat of bushfires is the only significant naturally occurring risk identified. Bushfires have occurred in the past, but to date have not had a material impact on production.

The current plans are considered adequate and there are no other environmental, social, or permitting risks that affect mine operability or Reserve estimation. Risk of environmental approvals not being received are very low due to the nature of the state agreement and the environmental constraints on the resource itself being applied before deposit definition drilling (i.e. only includes material above the water table, that does not require redirection of surface water courses, impact heritage listed sites, etc).

18.2 Waste and Tailings Disposal, Site Monitoring, and Water Management

18.2.1 Waste and Tailings Disposal

No tailings are generated within the boundaries of the mining operations as bauxite processing residue is only generated at the refineries. Similarly, Alcoa's Darling Range mining operations do not produce mine waste or "mullock" in the same manner as conventional mining operations and as such waste dumps are not constructed.

Overburden from Darling Range ore blocks is carefully segregated for later contouring and rehabilitation of adjacent, completed mining operations. Caprock and other non-viable rock is used to backfill these shallow, completed pits and the viable topsoil spread on top, contoured, and revegetated.

As such, there is no requirement for the monitoring of any tailings or mine waste dumps associated within the mining operations as all tailings are processed outside the mine lease boundary.

18.2.2 Site Monitoring

Alcoa's mine sites are monitored in accordance with conditions of Government authorizations and its operational licenses at Huntly (L6210/1991/10) and Willowdale (L6465/1989/10). Environmental

management and monitoring commitments exist for the following environmental aspects which have been assessed as being significant and therefore require operational controls as a minimum. The significant environmental aspects for which monitoring and/or management undertaken are:

- Chemical releases including loss of containment prevention and response and dangerous goods storage. All underground storage tanks have been removed from Alcoa's operations and are prohibited.
- Waste management and minimization.
- Catchment protection through the management of mining within the lower rainfall zone to minimize risks of salinization of land and water resources.
- Water as detailed in Section 17.2.3
- Air emissions including:
    - Smoke pollution associated with wood waste
    - An ambient dust monitoring program to identify and quantify fugitive dust emissions from operating areas
    - Ozone depleting substances
- Hazardous materials management including asbestos, synthetic mineral fiber, polychlorinated biphenyls
- Land including:
    - Recordkeeping and Geographical Information System (GIS) mapping of the location and timing of all soil removal, landscaping, soil return, ripping and seeding
    - Rehabilitation area monitoring to ensure the number of established plants meet the completion criteria targets associated with species enrichment, weed outbreaks and erosion
    - Dieback management, mapping and field identification
    - Forest and land clearing
- Flora and fauna.
- Aboriginal and European heritage.
- Environmental value of national parks, nature reserves and native forests.
- Visual amenity.
- Noise.

Outcomes of and compliance with the management and monitoring programs are tracked within Alcoa's Environmental Management System and reported within the Annual Environmental Review report. Review of the most recent report, published as a triennial report for the period from 2018 to 2020 largely reported compliance with environmental commitments and success of operational controls to managed environmental objectives with only the following non-compliances noted:

- Several dieback breaches were reported resulting in a downgrade to dieback status of vegetation, the majority of which were associated with drainage failures following significant rainfall events

resulting in surface water flow from dieback areas into dieback free areas. All incidences were investigated with corrective actions addressing the root causes actioned.

- Several recordings of elevated turbidity were recorded for a period exceeding 1 hour above the reporting criteria (25 NTU), however only a small fraction of these events was confirmed to have a contribution from mining activities. All incidences were investigated with corrective actions addressing the root causes actioned where mining contributions were identified.

- Alcoa reported one incident under Section 72 (s.72) of the *Environmental Protection Act 1986* in 2019, and ten incidents in 2020. During the reporting period, Alcoa commenced voluntary reporting of the releases of C6 Aqueous Film Forming Foams (AFFF) to unsealed operational areas, due to low-level presence of per- and polyfluoroalkyl substances (PFAS). The Huntly mine reported two AFFF releases, one turbidity event and one release of hydrocarbon contaminated stormwater. Willowdale mine reported three releases of wastewater containing low concentrations of PFAS and four AFFF releases. Alcoa has since developed and implemented an *Interim PFAS Water Management Strategy* across its WA mining operations with the key commitment to manage PFAS affected water to minimise impact to the drinking water catchment and the environment.

Alcoa is proactively working with key regulatory agencies to address operational non-compliances and implement operational improvements to reduce releases to the environment. None of the reportable non-compliances represent a risk that could adversely affect its license to operate.

18.2.3 Water Management

Alcoa implements a comprehensive water management and monitoring program in accordance with the requirements of its abstraction and operational licenses. Key components of Alcoa's water management and monitoring program include:

- Treatment of stormwater that may contain traces of hydrocarbons via a wastewater treatment system to concentrations that meet DWER license requirements prior to release

- Turbidity monitoring along tributaries to key catchments to prevent contaminated or turbid runoff into the drinking water supply

- Wastewater treatment and monitoring to meet DWER license requirements prior to release including treated water quality monitoring prior to release and continuous discharge volumes

- Surface water drainage management to prevent uncontrolled surface water runoff from operations to the surrounding forest and/or surface water bodies

- Implementation of the *Interim PFAS Water Management Strategy*

- Drainage protection management through the implementation of a *Water Resource Sensitive Zone Management Plan*

- Sewage management though a biological aeration treatment unit (BioMAX)

- Monitoring of cumulative water abstraction volumes at licensed and unlicensed surface water abstraction points in accordance with the *Surface Water License Operating Strategies* for Huntly and Samson Dam

- Potable water monitoring for identification of possible biological or chemical contamination

- Ecological water requirements (EWRs) have not been defined for the site however, Alcoa undertakes monitoring of the downstream environments to ensure no unacceptable impact. This is completed via photographic monitoring for Banksiadale Dam, Pig Swamp Waterhole, Boronia Dam and Marrinup Nursery
- Water use efficiency programs are implemented pertaining to wastewater recycling, efficient watering of haul roads, pumping and reusing water from roadside sumps, and effective mining planning to reduce dust suppression requirements

Alcoa's WA Mining operations have no groundwater monitoring programs associated with legislation, licenses, or approvals. Additional groundwater monitoring may be required if:

- Groundwater quality or quantity has been identified as potentially at risk due to mining activities, or
- Potential exists for mining to impact offsite/private groundwater supply quantity or quality.

Alcoa has a long-term groundwater research project within the Intermediate Rainfall Zone to evaluate potential impacts of clearing on groundwater salinization.

18.3 Project Permitting

The environmental reviews and approvals form part of the MMPLG approvals process outlined in Section 3.6. Compliance with the MMPLG is demonstrated through an annual report submitted to the Department of Jobs, Tourism, Science and Innovation.

Operational matters at the Willowdale and Huntly mines are licensed by the Department of Water and Environmental Regulation via instruments L6465/1989/10 and L6210/1991/10, respectively. These licenses condition the processing of ore and reporting is required annually to DWER describing the total volume of bauxite crushed and any non-compliance. The latest available reporting at the time of writing is for calendar year 2020.

Compliance with the Alcoa ISO14001 accredited EMS was audited in December 2021, with recertification expected in April 2022.

There are no known requirements to post performance or reclamation bonds.

18.4 Social or Community Requirements

Alcoa has established systems and processes for maintaining its social license to operate and was admitted to ICMM in 2019, aligning to its social performance requirements. Related to the requirements of the MMPLG, Alcoa's actions in relation to social performance include an annual 5-year consultation process aligned with the 5 Year Mine Plan. The consultation process involves engaging with affected landowners. Alcoa's consultation extends to shires, as well as state and local government members.

Where appropriate, the mine plan accommodates community requirements, in particular, concerns related to noise, dust, etc., and allows for buffer zones and modified working hours.

Community consultation results (both in-bound [e.g. noise complaints] and out-bound [e.g. Alcoa-initiated engagement with stakeholder groups]) are recorded in the Community Consultation System (CCS). Annual targets for consultation are set based on current and proposed mine plans. CCS allocates and tracks follow-up actions.

A stakeholder perception survey was undertaken in 2021; results were not available for consideration at the time of writing. The move towards formal, publicly scrutinized environmental impact assessment and approval under the State and Federal acts (section 3.6) is considered likely to expand the focus of consultation beyond the previous "neighbor" approach to a broader approach, more consistent with that expected from other major mining operators in the State of WA.

As described in 17.1, the threat of bushfires is a risk to operation and the local communities. Bushfire mitigation and firefighting activities within state forest are managed by the Department of Biodiversity Conservation and Attractions (DBCA). Alcoa maintains fire access tracks as required by the working arrangement with DBCA and complies with requirements of the Bushfires Act including seeking exemptions for certain activities during Total Fire Bans. Asset protection zones are not mandated although Alcoa do maintain them around infrastructure as per internal standards to mitigate risk.

Alcoa owned private property is maintained to local government requirements as per the requirements of the Bushfire Act.

Alcoa operations look to add value to the communities where it operates and beyond. Through a drive for sustainable development and desire to support reputable non-profit and community based organizations, community investment supports partnerships and initiatives that look to long-term community benefits.

Each year the community partnership program invests in a wide variety of community programs at the local, state and national level. Some of these partnerships, including the acclaimed Three Rivers, One Estuary initiative are supported by Alcoa's global Alcoa Foundation.

The strategic focus is on partnerships targeting one or more of the following categories:

- Sustainable environment
- Community health and safety
- Community capacity and resilience
- Tomorrow's workforce and leaders

In addition to community partnerships, employees are encouraged to participate each year in Alcoa Volunteers (volunteering as teams during work time) and employee giving programs.

18.5 Mine Closure Requirements

Alcoa's Closure Planning group for Darling Range (located within the Global Planning Team) is responsible for developing the closure planning process as well as the subsequent Long-Term Mine Closure Plans (LTMCPs) of Alcoa's WA Mining Operations (Huntly and Willowdale). Closure Strategies, Schedules and Cost Estimates are being developed across organizational divisions and includes multidisciplinary inputs from Operations, Mid- and Short-term Planning, Finance, Centre for Excellence, Environment and Asset Management (both Fixed and Mobile Plant).

The agreed closure requirements for Darling Range centres around the return of Jarrah Forest across the site. End land uses are required to comply with the State's Forest Management Plan and include water catchment protection, timber production and biodiversity conservation. Closure criteria were revised in 2015 by the MMPLG for rehabilitation works commencing in and after 2016. These criteria do not apply to areas which commenced rehabilitation prior to 2015, and represent a 'step forward' in rehabilitation practices at Darling Rage. The criteria are structured into the following broad steps, with documented guidelines for acceptance, standards and corrective active actions:

- Planning
- Rehabilitation Earth Works
- Early Establishment – first 5 years
- Vegetation 12 years and Over.

As described in Section 15.5.2, overburden is used to backfill adjacent, completed mining operations and the topsoil spread on top and contoured. Maximum slopes (angle and length) are defined in the 2015 Criteria. If topsoil has been harvested and stored for up to three months prior to use as a rehabilitation input is it considered 'direct-return' and seeding may not be undertaken. If it is older than 3 months it is considered 'fallow' and requires seeding. Nursery-raised seedlings are also used in rehabilitated areas.

Current rehabilitation practices and closure planning have evolved positively since the 1990s.

Mine closure costs are described in Section 18.0.

18.6 Local Procurement and Hiring

The Alcoa procurement system defines "local" as the localities of Dwellingup, Harvey, Pinjarra, Waroona, Coolup, North Dandalup, and Yarloop. Within Alcoa's guidelines of safe, ethical, and competitive business practices, they state they will:

- *Invite capable local business to bid on locally supplied or manufactured goods or services.*
- *Give preference to local business in a competitive situation.*
- *Work with local business interest groups to identify and utilize local suppliers.*
- *Where possible, structure bids to enable local supplier participation*.

19.0 CAPITAL AND OPERATING COSTS

Alcoa forecasts its capital and operating costs estimates based on annual budgets and historical actuals over the long life of the current operation. All values are presented in United States Dollars ($) unless otherwise stated.

19.1 Capital Costs

The operation is well-established, and the LOM plan does not envisage any significant change of the production rate. Anticipated future major capital expenditure is related to major mine moves and sustaining the on-going operations.

Projected capital expenditure over the next seven years of mine life is estimated to total $349.3 million. Of this total, $160 million is associated with the completion of the mine move to the Myara North site. Capital for the Holyoake move will be incurred from 2027 to 2030 and is not include in this TRS cashflow.

A breakdown of the major expenditure areas and other sustaining capital expenditure over the next seven years of mine life is shown in Table 18-1.

Table 18-1: LOM Sustaining Capital Costs by Area

Project	Cost $ Million	Percentage of Total
Myara North Mine Moves	160	62%
Conveyor Belt Replacements	25	7%
Haul Road Improvements	51	15%
Other Sustaining capital	113	32%
Total	**349**	**100%**

Other capital costs are for replacement of conveyors, haul road improvements and other sustaining capital needed to continue the operations.

Alcoa's sustaining capital estimates for Darling Range are derived from annual budgets and historical actuals over the long life of the current operation. According to the American Association of Cost Engineers (AACE) International, these estimates would be classified as Class 1 with an accuracy range of -3% to -10% to +3% to +15%.

19.2 Operating Costs

The main production mining operations are primarily Owner-operated using Alcoa equipment and employees. Contractors are also used for certain activities on site.

Operating costs for the current LOM of seven years are based on the 2022 budget.

No items have been identified that would significantly impact operating costs either positively or negatively over the life of mine. Minor year-to-year variations should be expected based upon maintenance outages and production schedules. Forecast costs for 2022 and average mine operating costs the seven-year LOM are shown below in Table 18-2.

Table 18-2: LOM Mine Operating Costs by Category

Cost Centre	2022 ($/wmt)	Average LOM ($/wmt)	Percentage of Operating Cost
Direct Labor	$3.44	$4.26	31%
Services	$1.56	$3.80	27%
Other	$1.73	$2.37	17%
Corporate Chargebacks for support services	$0.53	$0.61	4%
Energy	$0.30	$0.36	3%
Fuel	$0.35	$0.53	4%
Operating Supplies and Spare Parts	$0.61	$0.72	5%
Maintenance (fixed plant and mobile fleet	$1.08	$1.26	9%
Mine Operating Cash Cost ($/wmt)	**$9.63**	**$13.90**	**100%**
Off-site Costs			
G & A, selling and other expenses	$0.20	0.18	
R & D Corporate Chargebacks	$0.22	0.22	
Other Costs of Goods Sold	0.03	0.03	
Total Cash Operating Costs	**$10.07**	**$14.33**	

Services costs includes contractor costs for certain mining activities such as in noise sensitive areas and for haul road construction services, in select areas of pit development, and during landscaping activities for rehabilitation after mining.

As of Q4 2021, the Huntly and Willowdale operations together employ a total of 890 employees consisting of 92 Technical, 132 Management and 634 operations employees. Additionally, 32 employees are centrally employed on the combined operations.

Table 18-3 summarizes the current workforce for the operations.

Table 18-3: Workforce Summary

Category	Technical	Management	Operations	Total
Huntly	50	66	441	557
Willowdale	42	66	193	301
Central	21	7	4	32
Total	**113**	**139**	**634**	**890**

As regards mine closure, compensation for vegetation clearing is paid in advance and rehabilitation is an ongoing process that is incorporated into the mining cost (as part of Asset Retirement Obligations (ARO)).

20.0 ECONOMIC ANALYSIS

20.1 Economic Criteria

Alcoa prepares a rolling operational Ten-Year Mine plan for the purposes of long-term mine and business planning. The LOM plan is based on mining first the estimated Proven and Probable Mineral Reserves followed by lower confidence Mineral Resources that are expected to be annually converted to Mineral Reserves following further definition drilling, and before the current Mineral Reserves are fully depleted.

In accordance with the requirements of SK-1300, the economic analysis presented in this section of the TRS is based solely on mining the estimated Proven and Probable Mineral Reserves, which generate a current mine life of seven years (2022 to 2028 inclusive) at an average production rate of 34.5 Mtpa.

SLR recognizes that Alcoa undertakes on-going infill drilling to annually convert Mineral Resources to Reserves and based on Alcoa's long operating history at the mine, the scale of the deposits available and the historic success of resource to reserve conversion, SLR sees no reason why the life of the operation will not be extended well beyond 2027.

The assumptions used in the analysis are current at the end of December 2021.

An un-escalated technical-economic model was prepared on an after-tax DCF basis, the results of which are presented in this section.

The cashflow is presented on a 100% attributable basis. Alcoa uses a 9% discount rate for DCF analysis. SLR is of the opinion that a 9% discount/hurdle rate for after-tax cash flow discounting of such large-scale bauxite operations in Western Australia is reasonable and appropriate.

Key criteria used in the analysis are discussed elsewhere throughout this TRS. General assumptions used are summarized in Table 19-1.

Table 19-1: Technical-Economic Assumptions

Description	Value
Start Date	January 1, 2022
Mine Life based on Mineral Reserves	7 years
Average LOM Price Assumption	$25.49
Total Operating Costs	$3,259.8 million
Sustaining Capital over seven years	$349.3 million
Income tax	$867.4 million
Discount Rate	9%
Discounting Basis	End of Period
Inflation	0%
Corporate Income Tax Rate	30%

Table 19-2 provides a summary of the estimated mine production over the seven-year mine life.

Table 19-2: LOM Production Summary

Description	Units	Value
Total ROM Ore	Mt	241.3
Waste Mined	Mt	6.8
Total Material Moved	Mt	248.1
Annual Average Ore Mining Rate	Mtpa	34.5

20.2 Cash Flow Analysis

The indicative economic analysis results, presented in Table 19-3, indicate an after-tax NPV of $1,315.2 million at a 9% discount rate and an average bauxite price of $25.49/t.

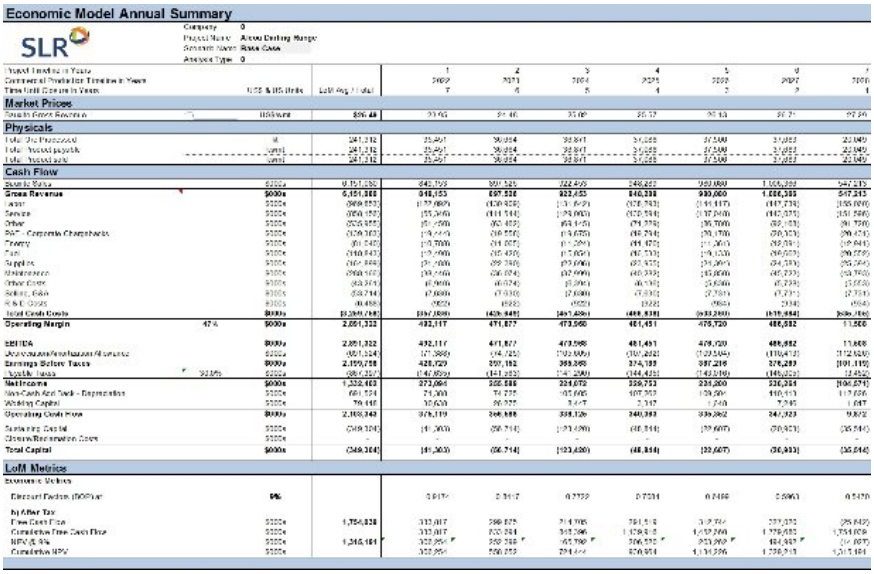
The cashflow is presented on a 100% attributable basis.

Capital identified in the economics is for sustaining operations and plant rebuilds as necessary.

Project economic results and estimated cash costs are summarized in Table 19-3. Annual estimates of mine production with associated cash flows are provided for years 2022 to 2028, based on Proven and Probable Reserves only.

The economic analysis was performed using the estimates presented in this TRS and confirms that the outcome is a positive cash flow that supports the statement of Mineral Reserves.

Table 19-3: LOM Indicative Economic Results



Economic Model Annual Summary									
SLR	Company: 0 Project Name: Arroyo Dorking Range Scenario Name: Base Case Analysis Type: 0								
Project Timeline in Years			1	2	3	4	5	6	7
Commercial Production Timeline in Years			2022	2023	2024	2025	2026	2027	2028
Time Until Event in Years	US$ & US Units	LoM Avg / Total	0	1	2	3	4	5	6
Market Prices									
Realized Metal Revenue	US$/unit	$96.48	93.66	94.46	95.09	96.12	96.83	97.21	97.94
Physicals									
Total Ore Processed	kt	241,312	25,457	38,014	38,841	34,068	37,588	37,852	29,492
Total Treated Payable	Unit	241,312	25,457	38,014	38,841	34,068	37,588	37,852	29,492
Life Treated Ore	Unit	241,312	25,457	38,014	38,841	34,068	37,588	37,852	29,492
Cash Flow									
Royalty Status	$000s	9,151,280	840,729	991,525	922,429	848,822	969,889	1,006,388	947,243
Gross Revenue	**$000s**	**9,151,280**	**840,153**	**897,530**	**922,453**	**848,238**	**930,000**	**1,006,388**	**947,243**
Labor	$000s	(869,553)	(77,980)	(130,826)	(131,649)	(108,793)	(146,817)	(107,276)	(105,999)
Service	$000s	(856,150)	(55,249)	(111,144)	(109,063)	(120,594)	(117,249)	(142,371)	(151,580)
Other	$000s	(626,855)	(51,299)	(62,402)	(69,145)	(74,378)	(86,709)	(88,183)	(94,726)
R&D - Corporate Charge-backs	$000s	(329,162)	(19,444)	(39,556)	(19,670)	(40,294)	(39,179)	(59,323)	(99,474)
Energy	$000s	(91,540)	(10,709)	(14,007)	(11,284)	(11,470)	(11,261)	(12,784)	(10,644)
Fuel	$000s	(210,842)	(17,299)	(35,430)	(17,697)	(42,733)	(19,133)	(36,023)	(39,558)
Supplies	$000s	(267,844)	(21,299)	(39,740)	(23,696)	(37,337)	(34,267)	(34,784)	(26,264)
Maintenance	$000s	(268,167)	(20,749)	(36,074)	(37,999)	(40,339)	(35,809)	(46,233)	(53,763)
Other Costs	$000s	(63,963)	(4,999)	(8,074)	(8,296)	(8,139)	(5,696)	(8,733)	(19,026)
Selling, G&A	$000s	(58,744)	(7,999)	(7,999)	(7,999)	(7,999)	(7,731)	(7,731)	(12,731)
R&D Costs	$000s	(6,499)	(500)	(500)	(500)	(500)	(500)	(500)	(2,499)
Total Cash Costs	$000s	(3,281,718)	(317,696)	(435,441)	(451,436)	(488,198)	(533,280)	(570,644)	(606,264)
Operating Margin	**42%**	**5,869,562**	**522,457**	**462,089**	**470,917**	**360,040**	**396,720**	**435,744**	**340,979**
EBITDA	$000s	2,851,322	492,117	471,877	473,560	481,451	475,720	486,582	313,500
Depreciation/Amortization/Allowance	$000s	(651,324)	(21,000)	(14,725)	(102,000)	(107,203)	(139,544)	(110,473)	(112,624)
Earnings Before Taxes	**$000s**	**2,199,758**	**471,117**	**457,152**	**371,560**	**374,188**	**336,176**	**376,109**	**200,876**
Taxable Taxes	$000s	(659,927)	(141,335)	(137,146)	(111,468)	(112,256)	(100,853)	(112,833)	(60,263)
Net Income	**$000s**	**1,539,831**	**329,782**	**320,006**	**260,092**	**261,932**	**235,323**	**263,276**	**140,613**
Non-Cash Add Back - Depreciation	$000s	651,324	21,000	14,725	102,000	107,203	139,544	110,473	112,624
Working Capital	$000s	79,148	10,000	39,000	3,467	2,247	1,240	3,240	1,047
Operating Cash Flow	**$000s**	**2,269,343**	**360,782**	**373,731**	**365,559**	**371,382**	**376,107**	**376,989**	**254,284**
Sustaining Capital	$000s	(349,304)	(41,300)	(59,714)	(103,430)	(48,844)	(39,607)	(36,933)	(35,844)
Closure/Reclamation Costs	$000s	-	-	-	-	-	-	-	-
Total Capital	**$000s**	**(349,304)**	**(41,300)**	**(59,714)**	**(103,430)**	**(48,844)**	**(39,607)**	**(36,933)**	**(35,844)**
LoM Metrics									
Economic Metrics									
Discount Factors (DCF) per	5%		0.9524	0.9070	0.8638	0.8227	0.7835	0.7462	0.7107
NPV After Tax									
Free Cash Flow	$000s	1,754,828	333,917	356,925	314,705	291,518	317,744	277,370	255,649
Cumulative Free Cash Flow	$000s		333,917	690,841	945,546	1,329,915	1,647,660	1,925,030	1,754,828
NPV @ 5%	$000s	1,345,184	322,954	369,288	407,790	396,532	353,969	484,987	291,657
Cumulative NPV	$000s		322,954	690,253	914,044	870,904	1,191,296	1,396,513	1,201,184

20.3 Sensitivity Analysis

Project risks can be identified in both economic and non-economic terms. Key economic risks were examined by running cash flow sensitivities. The operation is nominally most sensitive to operating costs followed by market prices (revenues).

21.0 ADJACENT PROPERTIES

The Darling Range has no material adjacent properties.

22.0 OTHER RELEVANT DATA AND INFORMATION

No additional information or explanation is necessary to make this Technical Report Summary understandable and not misleading.

23.0 INTERPRETATION AND CONCLUSIONS

23.1 Geology and Mineral Resources

- SLR is independently declaring the 31 December 2021 Mineral Resources for the defined bauxites located within Alcoa's Darling Range deposits. The Mineral Resource models were prepared by Alcoa using their in-house estimation procedures and reviewed extensively by SLR.

- As of December 31, 2021, exclusive of Mineral Reserves, as summarized in Table 11-4 at an appropriate level of precision reflecting confidence, the Measured Mineral Resources are estimated to be 48.0 Mt at a grade of 32.9% available alumina ($A.Al_2O_3$) and 1.11% reactive silica ($R.SiO_2$). Similarly the Indicated Mineral Resources are estimated to be 34.8 Mt at 31.9% $A.Al_2O_3$ and 1.12% $R.SiO_2$, and the Inferred Mineral Resources are estimated to be 320 Mt at 33.0% $A.Al_2O_3$ and 1.2% $R.SiO_2$.

- The large Inferred Resource is sampled at a broad drill spacing. The lower confidence in the estimation of this material means that it is not used in any mine planning or reflected in the Mineral Reserves declared by SLR. However, all this material is considered to be defined by appropriate sampling and constrained so that the QP considers it meets the criteria of having reasonable prospects for economic exploitation. Alcoa has a well-established record of transforming Inferred to Indicated and Indicated to Measured Resources, where appropriate, in a timely manner through further drill sampling. Due to the inherent risks in resource estimation discussed subsequently (see Section 11.13), there can be no expectation that Inferred Resources will ultimately become Measured Resources (or Proven Reserves).

- Compared to conventional Mineral Resource delineation and reporting practices, the Mineral Resource estimates prepared using the 3DBM and GSM procedures are constrained to material within a notional mine design, using mining criteria (minimum mining height, maximum slope, as discussed in Section 13.0). This may impose a degree of conservatism on the estimates, but this is appropriate because all mine production is tied to local Alcoa alumina refineries. The cut-off grades used to define in situ dry tonnages and report average grades of alumina and silica use procedures designed to reflect the performance of the Kwinana, Pinjarra, and Wagerup refineries. Alcoa has conducted bauxite mining in the region since the mid-1960s and has developed an integrated approach to data acquisition, ore delineation, and mining procedures, which is appropriate for the mineralization characteristics of the ore and the requirements of the local refineries.

- Alcoa has consistently used drilling, sampling and estimation procedures that are appropriate to the requirement of identifying, delineating, and producing Darling Range ore for their adjacent refineries. The procedures have been progressively improved and modernized over time as industry practices have evolved. While not all data and estimates are at the same standard, the resource classification system indicate the level of confidence of the estimates. All material declared as Mineral Reserves meets the requirements for mine planning to define consistent, appropriate refinery feedstock within the next ten-year planning cycle. All material declared as Measured or Indicated Mineral Reserves is additional material for which there is a reasonable expectation that Mineral Reserves can be defined, contingent on meeting all required Modifying Factors (in short, that it will be economically viable and socially acceptable to mine them at that time).

- SLR considers that, because of the integrated process by which Measured and Indicated Mineral Resources translate to Mineral Reserves for Alcoa's Darling Range operation, there are no foreseeable risks associated with Modifying Factors (mining, processing, metallurgical, infrastructure, economic, marketing, legal, environment, social, or government) that materially affect the Mineral Reserve estimate at 31 December 2021.

Specific conclusions reached by the SLR QP and provided in the body of this report in Sections 6, 7, 8. 9, and 11 are aggregated here as follows:

- In the SLR QP's opinion, the drill sampling and sample control procedures at Alcoa's Darling Range Bauxite Operations are adequate and appropriate for use in the estimation of Mineral Resources. The defined volumes and grades of mineralization are not expected to be systematically impacted (biased) by errors in either the collar location or the 3D sample location.
- In the opinion of the SLR QP, the QA/QC of sample preparation and assaying is adequate and the assay results are suitable for use in Mineral Resource estimation.
- It is the opinion of the SLR QP that the analytical procedures used for the Alcoa Mineral Resource comprises part of conventional industry practice. FTIR is not widely used yet in the bauxite industry but is becoming more widely accepted and applied to more operations. At Alcoa the method has been consistently applied successfully for a decade and is routinely validated by industry standard XRF and wet chemical procedures as discussed in Section 8.3 and 8.4.
- It is the opinion of the SLR QP from the studies on FTIR repeatability discussed above that the overall precision and accuracy of the FTIR assaying is acceptable.
- The SLR QP is of the opinion that the database is adequate and the data is appropriate for the purpose of Mineral Resource estimation.
- In SLR's opinion the dry bulk density data is less well controlled than other analytes, but the long history of mining production and stockpile reconciliation means that the assumed values are adequate for resource estimation.
- In the SLR QP's opinion, the condition of Reasonable Prospects For Economic Extraction is met by constraining the Mineral Resource model using the ArcGIS system, by ensuring that the model defines key parameters for the refinery, and by sound reconciliation practices providing feedback at the modelling is appropriate for the purpose.

23.2 Mining and Mineral Reserves

- As of December 31, 2021, Proven Mineral Reserves are estimated to total 108.6 Mt at 32.4% A.Al_2O_3 and 1.01% R.SiO_2 and Probable Mineral Reserves are estimated to total 132.7 Mt at 32.2% A.Al_2O_3 and 1.38% R.SiO_2.
- SLR has used the December 31, 2021 Mineral Resource estimate as the basis for its Mineral Reserve estimate. The bauxite operations are operating mining projects with a long history of production for which establishment capital has been repaid and for which sustaining capital and supported operating costs have been observed to be applied in economic analysis. Consequently, the QP considers that support by a Feasibility Study is demonstrated by the demonstrable history of profitable operation and the level of technical support for the Modifying Factors. The QP has reviewed the operating and planning procedures and parameters for the operations.

- The QP considers that the accuracy and confidence in the Mineral Reserve estimate to be appropriate for the classification applied, which is supported by both the conservative operational processes and the long operational history.
- The QP is not aware of any risk factors associated with, or changes to, any aspects of the Modifying Factors such as mining, metallurgical, infrastructure, permitting, or other relevant factors that could materially affect the Mineral Reserve estimate.

23.3 Mineral Processing

- The operating data between 2010 to 2020 indicates that the product from the Darling Range operations consisted of an average A.Al_2O_3 grade of 33%, with R.SiO_2 below the target for refinery feed.
- SLR is of the opinion that the Darling range operation demonstrated that ore can be effectively crushed and supplied to a refinery for further upgrading to produce Alumina. The historical operational data confirmed that the ore consistently met refinery specifications without any deleterious elements.
    - Based on this, and additional information provided by Alcoa regarding the mine plan, it is reasonable to assume that the ore from Darling range can be economically processed for the next 10 years.

23.4 Infrastructure

- The Darling Range mining operations have established and operational infrastructure, with mining hubs that host administrative offices, as well as crushing facilities and maintenance facilities.
    - Hubs are relocated periodically as production moves away from the hub and transportation costs increase. These relocations are well-understood with planning and associated budgeting occurring well in advance of relocations; production restarted seven days after the shutdown.
- An extensive haul road network, rail, and overland conveyors transport crushed bauxite from the Hub to the refineries.
    - Bauxite is transferred from each mine to the refineries primarily via long distance conveyor belt, apart from the Kwinana refinery which receives bauxite via railway. The
    - Alumina produced by the three refineries is then shipped to external and internal smelter customers through the Kwinana and Bunbury ports.
- The Huntly and Willowdale mines are located near the towns of Pinjarra and Waroona respectively. These are easily accessible via the national South Western Highway, a sealed single carriageway road, spanning almost 400 km from the southern side of Perth to the southwest corner of Western Australia.
- Major haul roads have been established to each mining area, while secondary haul roads, cross-cut each individual mining plateau. Roads are unsealed and require continuous maintenance.
- The Darling Range's Pinjarra refinery receives power from the South West Interconnected System (SWIS), but also has internal generation capacity of 100 MW from four steam driven turbine

alternators, with steam produced by gas fired boilers and a gas turbine Heat Recovery Steam Generator (HRSG).

  - The refinery supplies power to the Huntly Mine by a 33,000 volt power supply line and two 13,800 volt lines.

- The Wagerup refinery is a net exporter of power to the SWIS, with internal generation capacity of 108 MW from three steam driven turbine alternators and one gas turbine; steam being generated by gas fired boilers.

  - The refinery supplies power to the Willowdale Mine by a single 22,000 volt power supply.

- Water is used on the mines for dust suppression, dieback washdown, vehicle washdown, workshops, conveyor belt wash, construction, and domestic purposes.

  - The water supplies for mining consist of licensed surface water sources supplemented with treated wastewater from vehicle washdowns, stormwater runoff and maintenance workshops.

  - In 2020, water abstraction comprised approximately 15% of the total Department of Water and Environmental Regulation license allocation (for those sites where abstraction occurred). An additional 534,975 kL was also abstracted from South Dandalup Dam under the agreement with Water Corporation.

- On site facilities include offices, ablutions, crib-rooms, and workshops, however there are no Alcoa accommodation facilities, as the Huntly and Willowdale mining areas are close to established population centers.

- No tailings are generated within the boundaries of the mining operations. The management of tailings generated downstream at the refineries is beyond the boundaries of the Darling Range mining operations and are therefore not considered in this TRS. Waste rock is used to backfill shallow completed before covering with topsoil and reforesting.

23.5 Environment

- Alcoa has established processes to facilitate conformance with environmental requirements, while identifying sensitive areas ahead of time enables them to be managed ahead of disturbance.

- Overburden is carefully segregated for later contouring and rehabilitation of adjacent, completed mining operations. Caprock and other non-viable rock is used to backfill these shallow, completed pits and the viable topsoil spread on top, contoured, and revegetated.

- Bauxite processing residue is only generated at the Refineries, with no tailings generated within the boundaries of the mining operations. Absence of mine waste prevents the need for waste dump construction and monitoring.

- Site monitoring is completed in accordance with conditions of government authorizations and operational licenses at Huntly and Willowdale.

- Alcoa implements a comprehensive water management and monitoring program in accordance with the requirements of its abstraction and operational licenses.

- The Darling Range operations have no groundwater monitoring programs associated with legislation, licenses or approvals.

- Additional groundwater monitoring may be required if groundwater quality or quantity has been identified as potentially at risk due to mining activities, or potential exists for mining to impact offsite/private groundwater supply quantity or quality.
- Alcoa has a long-term groundwater research project within the Intermediate Rainfall Zone to evaluate potential impacts of clearing on groundwater salinization.

- Outcomes of and compliance with the management and monitoring programs are tracked and reported within a Triennial Environmental Review report.
  - Review of the most recent report, published for the period from 2018 to 2020 largely reported compliance with environmental commitments and success of operational controls to managed environmental objectives.
- Only a small number of non-compliances were noted; none of which represent a risk that could adversely affect its license to operate.

24.0 RECOMMENDATIONS

24.1 Geology and Mineral Resources

It is apparent to the SLR QP that the long history of exploration, development and mining of Alcoa's Darling Range bauxite tenements have established sound knowledge and understanding of the geology and mineral endowment. The QP has not identified any fatal flaws in the current practices of mapping (based on the ArcGIS system), drill sampling (based on progressive continuous improvement), assaying (based on calibrated and validated FTIR, with reasonable Quality Control), estimation (3DBM), database management (using acQuire), the application of mining criteria that assure Reasonable Prospects for Economic Extraction (RPEE), and the application of Modifying Factors (again using the ArcGIS system to establish forestry, heritage and noise constraints). The following recommendations are offered as suggestions for further improvement, aligned with Alcoa's comprehensive approach to research and development (seen for example in the evolution of their drilling, sampling and assaying technologies). These recommendations are prioritized in terms of their perceived value to the overall operation:

- More effort on the 3D block modelling methodology, leading to a script-based semi-automated approach will enable more robust rapid model building over the Indicated and Inferred Resources. The validation of interpolation parameters using risk-based (conditional simulation) techniques to quantify confidence should be considered.
- More rapid infill drilling of the 60 by 60 m and 30 by 30 m drill grids.
- Further redrilling or where viable re-assaying of pulps
- Moving away from the having drill holes notionally at the centroids of the 15 by 15 m grid map sheet system would mean that the use of offset grids and more flexible grid spacings would be viable.
- Implementation of a mine wide reconciliation system should be considered as a way to overcome the issue of density estimation. This could be integrated with the extensive production tracking data already available from the current fleet management system and operational control system (covering the mining equipment, crushers, conveyors, sampling towers, stockpile stackers and reclaimers).
- Technology now becoming available, including volume surveys using drones and truck gantry scanning, wet mass measurement using weightometers on conveyors and LoadRite sensors on mining equipment, and infra-red moisture determination, mean that better in situ dry density estimation may become possible if the operation requires it for better refinery feedstock control.

Specific recommendations noted in previous Sections are reiterated here:

- The SLR QP considers that twinned hole studies are of limited value and should only be implemented once the sample splitting and preparation demonstrates good repeatability, using Field Duplicates (or the equivalent STE samples). They may be of value to investigate specific issues under closely supervised conditions.
- While the STE procedure could be retained for specific studies, in the SLR QP's opinion, the reintroduction of Field Duplicates using appropriate riffle splitters under supervision should be considered.

- The grade characteristics of the bauxite profile could be reproduced in the model, enabling optimization techniques to be used for the definition of mining floors and boundaries, better support for ore loss and dilution studies, and more accurate reconciliation studies.

24.2 Mining and Mineral Reserves

- Currently a dilution and mining recovery factor is applied to the final Reserves to reconcile the tonnes and grade. The SLR QP recommends applying dilution and ore loss at the re-blocked model level before performing the optimization and reporting these values independently.
- The life-of-mine scheduling requires further refinement with regards to sequencing of the different mining areas and assigning the scheduled years back to the orebest model.
- The SLR QP recommends detailed haulage analysis focusing on haulage profiles and cycle times to provide more accurate operating costs.
- The SLR QP noted the mining models were in both a 2D grid and 3D model system. Aligning all the mining models within the same 3D mining model system will provide clarity and consistency across Darling Range project with regards to evaluation and reporting processes.

24.3 Mineral Processing

As mentioned in Section 22.3, the historical operational data for the Darling Range demonstrate that ore consistently met refinery specifications. SLR make the following recommendations regarding processing:

- SLR recommends independent verification of the sample analysis by a certified laboratory, on a structured program to ensure the QA/QC aspects of the internal analysis.
- It is recommended that a proportion of samples from each batch could be sent to the independent laboratory for analysis and the results can be compared with the internal analysis.

24.4 Infrastructure

As mentioned in Section 22.4, the Darling Range mining operations have well established infrastructure, with mining hubs that are periodically moved to reduce transportation distances between mining operations and the hubs. SLR make no recommendations regarding infrastructure.

24.5 Environment

As mentioned in Section 22.5, Alcoa has established systems to facilitate adherence to environmental commitments. SLR recommend that the following actions are taken to monitor previously enacted corrective actions, made in response to minor environmental incidents:

- Monitor efficacy of corrective actions made following drainage failures related to significant rainfall events, which resulted in surface water flow from dieback areas into dieback free areas.
- Monitor efficacy of corrective actions made following recordings of elevated turbidity for a period exceeding the compliance criteria (25 NTU).
- Monitor efficacy of Interim PFAS Water Management Strategy implemented in response to incidents involving PFAS and AFFF contamination.

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26.0 RELIANCE ON INFORMATION PROVIDED BY THE REGISTRANT

This report has been prepared by SLR for Alcoa. The information, conclusions, opinions, and estimates contained herein are based on:

- Information available to SLR at the time of preparation of this report,
- Assumptions, conditions, and qualifications as set forth in this report, and
- Data, reports, and other information supplied by Alcoa and other third party sources.

For the purpose of this report, SLR has relied on ownership information provided by Alcoa in a legal opinion by Paul Volich, Managing Counsel – Australia, dated February 10, 2022, entitled Alcoa of Australia to SLR Corporation - ML1SA in good standing. SLR has not researched property title or mineral rights for the Darling Range as we consider it reasonable to rely on Alcoa's legal counsel who is responsible for maintaining this information.

SLR has relied on Alcoa for guidance on applicable taxes, royalties, and other government levies or interests, applicable to revenue or income from Darling Range in the Executive Summary and Section 19. As Darling Range has been in operation for over ten years, Alcoa has considerable experience in this area.

The Qualified Persons have taken all appropriate steps, in their professional opinion, to ensure that the above information from Alcoa is sound.

Except for the purposes legislated under provincial securities laws, any use of this report by any third party is at that party's sole risk.

27.0 DATE AND SIGNATURE PAGE

This report titled “Technical Report Summary on the Darling Range, Western Australia, S-K 1300 Report” with an effective date of December 31, 2021 was prepared and signed by:

SLR International Corporation

(Signed) *SLR International Corporation.*

Dated in WA, USA
February 24, 2022

Technical Report Summary on the Juruti Bauxite Mine, Brazil S-K 1300 Report

Alcoa Corporation

SLR Project No: 425.01184.00071

February 24, 2022



Technical Report Summary on the Juruti Bauxite Mine, Brazil

SLR Project No: 425.01184.00071

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2.0 EXECUTIVE SUMMARY

2.1 Summary

SLR International Corporation (SLR) was retained by Alcoa Corporation (Alcoa) to prepare an independent Technical Report Summary (TRS) on the Juruti Bauxite Mine (the Mine or Juruti), located in Brazil. The purpose is to report on the Mineral Resources and Mineral Reserves of the Project as of December 31, 2021. This Technical Report Summary conforms to United States Securities and Exchange Commission's (SEC) Modernized Property Disclosure Requirements for Mining Registrants as described in Subpart 229.1300 of Regulation S-K, Disclosure by Registrants Engaged in Mining Operations (S-K 1300) and Item 601 (b)(96) Technical Report Summary of Regulation S-K. SLR visited the property from October 18 to 21, 2021. SLR notes that the effective date of the technical information contained herein is December 31, 2021.

Alcoa is one of the world's largest aluminum producers and a publicly traded company on the New York Stock Exchange (NYSE). Alcoa owns and operates integrated bauxite mining, alumina refining and aluminum smelting operations at numerous assets globally including in Australia, Brazil, Canada, and the United States. Alcoa is also a joint venture partner for several other integrated operations in Brazil, Canada, Guinea, and Saudi Arabia.

The Juruti Bauxite Mine, located in the west of Pará State near the Amazon River, is owned and operated by Alcoa through a 100% ownership of Alcoa World Alumina Brasil Ltda. (AWA Brasil). AWA Brasil is a subsidiary of Alcoa World Alumina and Chemicals (AWAC). AWAC is an unincorporated global joint venture between Alcoa Corporation and Alumina Limited, a company incorporated under the laws of the Commonwealth of Australia and listed on the Australian Securities Exchange. AWAC comprises several affiliated entities that own, operate, or have an interest in bauxite mines and alumina refineries, as well as an aluminum smelter, in seven countries. Alcoa Corporation owns 60% and Alumina Limited owns 40% of these entities, directly or indirectly, with such entities being consolidated by Alcoa Corporation for financial reporting purposes. The same approach has been taken by SLR when reporting Mineral Resources and Mineral Reserves.

The Juruti Bauxite Mine represents an established mining operation which commenced commercial production of bauxite in 2009. In Brazil, Alcoa also owns bauxite mining operations at Poços de Caldas (located in Minas Gerais State in southwest Brazil) and holds an interest in Trombetas (located on the northern shore of the Amazon, 70 kilometers (km) northwest of Juruti).

The bauxite deposit of the Juruti Bauxite Mine consist of several lateritic bauxite plateaus which exist across areas of higher elevations (70 meters to 190 meters), capped by iron-rich laterite deposits, which formed through in-situ weathering of sediment deposits of the Amazon basin. There are a total of six bauxite plateaus, namely the Capiranga Central, Mauari, Mutum, Nhamundá, Santarém, and São Francisco which are the subject of this report. Two other plateaus, Capiranga and Guaraná, are being mined but are not included in the Mineral Resource and Mineral Reserves estimates on the basis that the remaining production is not deemed material to Alcoa's business.

The Juruti Bauxite Mine produced approximately 7.2 million tonnes (Mt) of bauxite in 2020 with ore being shipped for aluminum production at the Alumar Refinery in the city of São Luis, located in the north of Maranhão State, approximately 1,900 km by road and boat due east of Juruti along Brazil's northern coastline.

2.1.1 Conclusions

The SLR QP has the following conclusions by area.

2.1.1.1 Geology and Mineral Resources

- As of December 31, 2021, exclusive of Mineral Reserves, Measured Mineral Resources are estimated to total 5.66 Mt at 44.53% available alumina (A.Al2O3) and 5.28% of reactive silica (R.SiO2) for washed and unwashed material, and Indicated Mineral Resources are estimated to total 58.59 Mt at 45.34% A.Al2O3and 4.42% R.SiO2 for washed and unwashed material. In addition, Inferred Mineral Resources are estimated to total 563.79 Mt at 45.69% A.Al2O3and 4.72% R.SiO2. Mineral Resources are reported on a 100% Alcoa attributable ownership basis for consolidated reporting purposes.
- Juruti is a lateritic bauxite deposit formed through a combination of intense weathering and geochemical alteration, leaching by meteoric waters, and accumulation of alumina and iron-rich horizons. Periodic erosion and redeposition is also known to have occurred.
- The lateritic deposits have originated from the Alter-do-Chao Formation; Cretaceous fluvial-lacustrine deposits of sandstone, siltstones, mudstones, and quartz breccia. Weathering and alteration of these parent rocks is estimated to have taken place during the Eocene.
- Bauxitization has occurred through the formation of gibbsite crystals which form massive bauxite horizons which exist as plateaus across the Juruti region. In comparison to their lateral extent over tens of kilometers, the overall thickness of the bauxite deposits are relatively thin being only several metres thick.
- Geological interpretation of the Juruti deposit has been possible through extensive exploration drilling, detailed geological logging, sampling, and the results of chemical analysis.
- Mutum, Santarém, São Francisco and Nhamundá are plateaus drilled by auger, and to a less extent wells which support the estimation of Mineral Resources. SLR has reviewed this information and it is reasonable, however there is not a complete statistical study comparing these methodologies with more accurate air core (AC) drilling procedures. The R.SiO2 negative bias for auger holes identified in a preliminary block modelling comparison is a known risk. Consequently, no reserves are estimated for plateaus with auger data.
- Protocols for drilling, sampling preparation and analysis, verification, and security meet industry standard practices and are appropriate for the purposes of Mineral Resource estimation.
- Juruti technical staff do not use the short-term drilling information for the long term models due to different QA/QC and sampling methodologies used. Therefore the long term models do not have any detailed information that can confirm the continuity of the bauxite layer or change the Key Economic Variable (KEV) grades.
- In the SLR QPs' opinion, the QA/QC program as designed and implemented at Juruti is being improved continuously, and the assay results within the database are suitable for use in a Mineral Resource estimate.
- The drill hole database used for geological modelling has been reviewed by the SLR QP and is deemed suitable for Mineral Resource estimation.

- The impact of the current low and top cutting approach may be that areas reflecting either low or high values of economic and deleterious elements, as well as wash recovery values are underrepresented in some block models locally.
- For the Mineral Resources classification indicator kriging (IK) and conditional simulations are used to quantify the uncertainty related with geological modelling and grade estimation.
- The final Mineral Resource estimate is obtained through a benefit calculation that considers a future bauxite price, exchange rate, the three KEV grades, 100% of the metal recovery, and maximum mining selectivity, without consideration of a minimum thickness.
- The SLR QP reviewed the Mineral Resources assumptions, geological modelling and estimation workflows, data consistency and reporting procedures, and is of the opinion that the Mineral Resource estimate is appropriate for the style of the mineralization, and that the block model is reasonable and acceptable to support the December 31, 2021 Mineral Resource estimate.

2.1.1.2 Mining and Mineral Reserves

- As of December 31, 2021, Proven Reserves are estimated to total 50.94 dry Mt at 47.68% A.Al_2O_3 and 3.52% of R.SiO_2 for washed and unwashed material and Probable Reserves are estimated to total 37.94 dry Mt at 46.32% A.$Al_2O_3$and 3.41% R.SiO_2 for washed and unwashed material.
- A cut-off value is determined using the Mineral Reserve bauxite price, recovery, transport, treatment and mine operating costs. The bauxite price used for the Mineral Reserves is based on a contract established with Alumar Refinery (Alcoa), as 90% of the production is shipped to this refinery. This price is updated annually, based on the clients' offtake requirements, the proportion of internal demand to exported bauxite, and bonus, and penalties applied according to the quality of the product.
- The Juruti Mine operations are based on the use of conventional strip mining. Each plateau is divided into panels and regular strips of 20 m width x 200 m length within which a number of sequential mining activities including land clearance, topsoil removal, overburden stripping and waste backfill, and bauxite mining take place.
- The life of mine (LOM) plan has the production from 2022 through 2035 totalling approximately 127.6 wet Mt of ROM ore producing 100.9 wet Mt of washed and unwashed bauxite with average grades of 47.10 % A.Al_2O_3, 3.48% R.SiO_2, and 16.47% Fe.
- Strip ratio for the LOM is 4.2 m^3/t.
- Dilution and extraction factors follow the historical trend and are considered appropriate for the type of mining methods employed at Juruti.
- The amount of dilution will likely increase if the methodology is changed to incorporate surveyed floor pickups as opposed to using lithological wireframes as a constraint as the pit floor, incorporates a small proportion of waste along the ore waste contact. This does not represent a significant risk to the Mineral Reserve estimate, as the dilution is considered minimal. Focus should be placed on the mining operations to reduce this dilution by mining only to the ore waste contact.

2.1.1.3 Mineral Processing

- The Juruti Bauxite Mine's processing plant has been in operation since 2009 and uses a simple comminution (crushing), washing, and wet screening circuit to produce washed bauxite for shipping, in addition to an unwashed bauxite product (direct shipping ore, or DSO). The plant flowsheet is designed for the removal of silt and clay (fine particles) using a scrubber and hydrocyclone which are subsequently deposited into tailings storage facilities.
- The production capacity of the process plant is 6.2 Mtpa of washed and 1.3 Mtpa of unwashed bauxite. The current global mass recovery of the plant is approximately 75% and the final product specification has 47.5 ± 1% of available alumina content (A.Al_2O_3) and 4.1 ± 0.5% of reactive silica (R.SiO_2) content.
- The SLR QP is of the opinion that the process flowsheet is straightforward as it comprises only comminution and washing and that it is appropriately aligned to the ore feed material.
- The SLR QP is also of the opinion that the samples previously used for comminution test work were representative of the Juruti project ore at the time, and that test work results indicated that the ore is moderately hard and can be ground to the required product sizes without any challenges. More complex or extensive test work is deemed not to be required given the simple process flowsheet. The comminution results are sufficient for the initial mill sizing and ongoing benchmarking exercises.
- On the basis that the process plant at the Juruti Bauxite Mine has been in operation since 2009, the SLR QP is satisfied that the existing flowsheet is appropriate for the continued processing of Juruti ore.
- The SLR QP is satisfied that according to Alcoa, plant consumables are kept on site and replaced as part of the routine maintenance schedule.

2.1.1.4 Infrastructure and Tailings

Infrastructure

- The infrastructure required to support the ongoing mining operations at the Juruti Bauxite Mine is well established. Most is located within the surface infrastructure area at the mine site itself, including the bauxite processing / beneficiation plant, bulk power generation and water supply, mine waste facilities, railroad siding and materials handling/loading equipment, in addition to ancillary buildings.
- Power is supplied by Thermoelectric Units (UTE)at the mine site and port under a supply contract. Water for the mine site, principally used in the processing plant, is supplied from water collection pumps installed in the Juruti Grande stream to the north then via an approximately 9 km overland pipeline. Water is also recovered from the tailings ponds where possible and recirculated for use in the plant. SLR is satisfied that the power and water supplies to the Juruti Bauxite Mine are in place and have been demonstrated through past production to be sufficiently reliable to support ongoing operations.
- Off-site infrastructure is similarly well established and comprises the materials handling and ship loading equipment at Juruti port used for bauxite product export along the Amazon River. The

mine site is connected to the port by a dedicated railroad approximately 55 km in length, serviced by two locomotives.

- The Juruti Bauxite Mine is accessible via a public road from Juruti town which connects to a dedicated mine access road. This road provides the primary means of access to the site for personnel living in Juruti town. Given the remote location of Juruti within Pará State, access to other regions by road is limited. Juruti port therefore, in addition to Juruti Airport, serves as the primary transportation route for equipment, materials and supplies from other regions of Brazil, or internationally.
- The SLR QPs were able to confirm the suitability of infrastructure during a site visit and are satisfied that the equipment and facilities required to sustain the proposed bauxite mining activities are available.

Tailings

- Based on an annual washed bauxite production of 6 Mtpa, the tailings generated annually are in the order of 1.93 Mtpa (dry tonnage). The Juruti Bauxite Mine currently has eight tailings storage facilities (TSFs) which comprise thickening ponds and tailings disposal ponds (TP).
- No design or construction documentation was made available for the review, however, it is understood that relevant engineering records are available. It has not been possible to verify the extent to which Alcoa's corporate policy requirements have been implemented for the management of the Juruti TSF.
- The TSFs are classified and audited in accordance with Brazilian regulation and the Brazilian National Mining Agency standards are being used. The SLR QP relies on the conclusions provided in the published database and correspondence with Alcoa's team, and therefore provides no conclusions or opinions regarding the stability of the listed dams and impoundments.
- To support ongoing operations, one new tailings pond is planned every two years based on current disposal technology i.e., the use of thickening and disposal ponds. The total planned disposal capacity is 51 Mm^3. Alcoa is assessing other technologies to dewater and disposal Juruti bauxite tailings. Preliminary studies show that the "dry backfill" alternative has technical and financial potential to be competitive.
- Closure concepts and cost estimates based on preliminary assessment have been developed for TP1 and TP2 which will be closed first. The rest of the facilities will be closed progressively throughout the mine life.
- Overall, the SLR QP is of the opinion that the current method of tailings disposal is conventional and that alternative technologies for future disposal are being considered by Alcoa. The SLR QP is also satisfied that Alcoa has established or plans to establish sufficient tailings disposal capacity requirements for the next 15 years of operation and is actively addressing the closure of existing facilities at full capacity.

2.1.1.5 Environment

- Juruti has several permit renewals that are outstanding, however Alcoa has confirmed that applications for renewal were lodged 120 days prior to expiry as required by law. Alcoa follows up on these overdue permits with the regulators, but the renewal processes are hampered by

capacity limits of the authorities. Evidently this is a widespread problem affecting many other companies in Pará state.

- Alcoa reports annually to the regulators in compliance with operating licence requirements and no compliance issues were identified with regards to compliance with licence conditions.
- The SLR QP has made recommendations regarding continuing to follow up with the regulators on permit renewals that are long overdue, updating environmental and social management plans, improving the water balance accuracy, and adding information in the closure plan on the management of mine tailings and waste rock facilities and to state the closure objectives.
- The SLR QP notes that Alcoa is experiencing issues with the community despite having signed an agreement with community representatives and regulators in February 2018, however Alcoa continues efforts to negotiate with community representatives to honour the agreement.
- The community disrupted environmental monitoring in 2019 but Alcoa was able to resolve the issue and environmental monitoring was resumed.

In the SLR QP's opinion Alcoa manages permitting adequately within the context of the regulator's capacity limitations by applying for renewals according to legal requirements and following up on overdue renewals. Provided that Juruti personnel maintain auditable records of written and verbal communication with authorities regarding the overdue renewals and respond promptly to any requests for additional information, this risk should be appropriately managed. Alcoa continues to negotiate on the key issue of setting up a foundation to manage royalty payments to the communities.

2.1.2 Recommendations

SLR QPs have the following recommendations by area.

2.1.2.1 Geology and Mineral Resources

1. SLR's QP has reviewed and agrees with Alcoa's proposed plan to confirm the historical exploration drilling data from auger and wells in Mutum, Santarém, São Francisco, and Nhamundá plateaus with AC drill hole data. Phase I of the recommended work program will include a significant amount of exploration and infill AC drilling and Phase II a Preliminary Economic Assessment (PEA) also known as an Initial Assessment (currently in progress).
2. Review the low and top cut values and grade restriction approach for all variables.
3. Implement a procedure to avoid the estimation of values outside the low and top cut range.
4. Review wireframe parameters to improve the modelled bauxite layer continuity and address gaps in the mineralization layer where there are no drill holes. In some areas the drill hole spacing is not regular resulting in incorrect geological interpretation of the continuity of the bauxite layer.
5. For the future works, revise Mineral Resource classification criteria to correlate with drill hole spacing as it relates to geological and mineralization continuity.
6. Use the short-term drill hole information to update the long-term models, with consideration of the quality and confidence of the database.
7. Investigate the discrepancies between the samples and block model results for reactive silica, as well as the high dispersion in the standards Quality Assurance/Quality Control (QA/QC) charts for

this variable. As mining commences at Capiranga Central and Maurari, work should be carried out to improve the accuracy and precision of the reactive silica testwork in both the analytical results and in the short-term model, and carefully monitor performance.

8. Develop a robust monthly QA/QC report, which includes a summary of performance and related actions to improve results as needed.

9. Work towards Brazilian and/or international accreditation for quality management (such as ISO 9001) and analytical techniques (such as ISO 17025 or ISO 14000) at the onsite Juruti laboratory.

10. Continue to work with an inter-disciplinary team to develop and improve the reconciliation process and establish reconciliation factors to consider for future long and short-term block model calibration.

11. Continue to explore prospective plateaus with mineralization indicated through well or auger drill hole results (historical information) and to replace them with AC drill holes.

2.1.2.2 Mining and Mineral Reserves

1. Convert the sub-cell Resource block model to a Selective Mining Unit (SMU) regularised block model with the ore lithology. This will account for the operating dilution prior to calculating the Net Smelter Return (NSR) value. Currently the NSR calculation for each sub-cell block does not account for operating dilution.

2. Apply dilution and mining recovery factors prior to pit optimization and mining scheduling.

3. Implement a proper reconciliation process, taking into consideration the creation of 3D solids of each type of material being mined, and increasing the accuracy of dilution and mining recovery factors. Those modifying factors should be calculated for each panel and a weighted average should be calculated for each plateau and applied respectively on the block with the plateau.

4. Haulage distance is calculated based on regressions. In the future, SLR recommends using the entrance haul road design for the plateau and use the entry point as the reference point to be used for each block, increasing the level of accuracy.

5. Prepare a trade-off study to determine the most economical ratio of washed to unwashed product.

2.1.2.3 Mineral Processing

1. Reduce the R.SiO_2 grades by potential process improvements such as reverse flotation to increase the quality of the product.

2. SLR understands that all the analysis for the Juruti operation is conducted internally by Alcoa and recommends that independent verification of the sample analysis by a certified laboratory. This program can be conducted on a structured basis to ensure the QA/QC aspects of the internal analysis.

2.1.2.4 Infrastructure

1. Updated dam breach assessments for the TSFs were previously recommended during independent reviews in 2021. These were ongoing at the time of reporting and therefore SLR

recommends that the outcomes of these assessments are evaluated for adherence to existing designs and ongoing monitoring/maintenance requirements.

2. Continue with the implementation of the Global Industry Standard on Tailings Management (GISTM) requirements, the assessment of alternative dry tailings disposal technologies, as well as the closure plan of the facilities that reach their full capacity.

3. SLR is satisfied that the infrastructure required to support ongoing mining and processing operations are established and have demonstrated suitability. As such, SLR has no specific recommendations with regards to surface or mining infrastructure.

2.1.2.5 Environment

1. Regularly update the Social and Environmental Management Plan in response to monitoring information to ensure that environmental and social impacts are managed as effectively as possible.

2. Ensure that renewal applications are lodged for all approvals that are due to expire soon and continue to follow up on renewals that are long overdue with the regulator.

3. Develop an integrated water balance and management plan that includes all Project facilities. This is necessary because the current water balance does not include all Project facilities and has various uncertainties. Maintaining an accurate water balance is imperative to understand how water is stored in the various facilities and identify when there is risk of overflows or unplanned discharge.

4. It is recommended as per industry good practice that the mine develop and maintain a list of external stakeholders and their interests, and setup and maintain a system to receive, document and address community complaints or grievances.

5. Continue negotiations with Acorjuve to set up the foundation to manage royalties paid to the communities.

6. Develop an integrated Mine Closure Plan (MCP) and associated cost estimate for closure, covering all mine facilities including mining areas, tailings and waste rock facilities, process plant and other infrastructure. The integrated MCP should include land use objectives for closure and should address social aspects of closure.

2.2 Economic Analysis

The economic analysis contained in this Technical Report Summary is based on Alcoa's Mineral Reserves reported on a 100% basis (Alcoa Corporation owns 60%), economic assumptions provided by Alcoa, and the capital and operating costs as presented in Section 18.0 of this Technical Report Summary.

Alcoa is a vertically integrated aluminum company comprised of bauxite mining, alumina refining, aluminum production (smelting and casting), and energy generation. In Brazil, Alcoa primarily operates the Alumar Refinery, located in São Luis, as a joint venture between Alcoa, South32 and Rio Tinto.

Alcoa obtains bauxite from its own resources and in 2021, around 89% of Juruti bauxite was shipped to the Alumar Refinery, with the remaining supplying third-party customers in the Atlantic region.

The transfer price mechanism from Juruti to Alumar is determined by a weighted-average price of the previous year's third-party sales. The remaining Juruti bauxite sold externally to the third-party market is based on both near-term (1 year) and long-term (exceeding 1 year) contract terms, or spot prices.

2.2.1 Economic Criteria

An un-escalated technical-economic model was prepared on an after-tax discounted cash flow (DCF) basis, the results of which are presented in the following sections.

Alcoa uses a 9% discount rate for DCF analysis. SLR is of the opinion that a 9% discount/hurdle rate for after-tax cash flow discounting for the well-established, large-scale bauxite operations at Juruti is reasonable and appropriate.

The cashflow is presented on a 100% attributable basis.

Key criteria used in the analysis are discussed elsewhere throughout this TRS. General assumptions used are summarized in Table 1-1.

Table 1-1: LOM Technical-Economic Assumptions

Description	Value
Start Date	January 1, 2022
Mine Life based on Mineral Reserves	11 years
Average Price Assumption	$31.66/t
Total Operating Costs	$14.90/t
Sustaining Capital	$330.1 million
Production Box Cuts	$114.6 million
Mine Closure/Reclamation Costs	$62.0 million
Discount Rate	9%
Discounting Basis	Beginning of Period
Inflation	0%
Royalty + CFEM	4.5%

Table 1-2 provides a summary of the LOM Production.

Table 1-2: LOM Production Summary

Description	Units	Total LOM
LOM	Years	11
Total Mined	Mt	113.3
Waste Mined	Mm^3	472.1
Average Strip Ratio	m^3/t	3.61
Average LOM Annual Mining Rate	Mtpa	9.4
Average LOM Annual Product Tonnage	Mtpa	7.4
LOM Washed Product	Mt	72.4
LOM Unwashed Product (DSO) Product	Mt	16.0
Total Product (washed + unwashed) sold	Mt	88.5
Average Product Available Al_2O_3 Grade	%	47.12
Average Product Reactive SiO_2 Grade	%	3.45

2.2.2 Cash Flow Analysis

The indicative economic analysis results, presented in Table 1-3, indicate an after-tax free cash flow of $343.2 million and an after-tax Net Present Value (NPV), using a 9% discount rate of $224.0 million at an average selling price of $31.66/tonne.

Annual estimates of mine production for years 2022 to 2035, and the current LOM, are based on Proven and Probable Reserves only.

Capital identified in the economics is for sustaining the operations over the mine life and covers construction costs for new tailings storage facilities (TSF), capitalised costs for excavation of future box cuts, and haul roads and the set up and start of mining operations on the Capiranga Central plateau.

The economic analysis was performed using the estimates presented in this TRS and confirms that the operation has a positive cash flow that supports the statement of Mineral Reserves.

Table 1-3: LOM Indicative Economic Results

Description	Units	Total LOM
Average LOM Price	$/t	31.66
Total Product sold	Mt	88.5
Gross Revenue	**$ Millions**	**2,800.7**
Mining	$ Millions	(853.2)
Processing	$ Millions	(190.4)
General & Administration	$ Millions	(346.5)

Description	Units	Total LOM
Rail Freight Cost	$ Millions	(68.1)
Transportation Costs	$ Millions	(233.6)
Royalty + CFEM	$ Millions	(126.0)
Total Operating Costs	**$ Millions**	**(1,817.8)**
Corporate Income Tax	$ Millions	(132.9)
Net Income after Taxes	**$ Millions**	**347.3**
Sustaining Capital	$ Millions	330.1
Closure Costs & box cuts	$ Millions	176.7
Free Cash Flow	$ Millions	**343.2**
NPV @ 9%	**$ Millions**	**224.0**

2.2.3 Sensitivity Analysis

Project risks can be identified in both economic and non-economic terms. Key economic risks were examined by preparing cash flow sensitivities. The operation is nominally most sensitive to market prices (revenues) followed by operating cost.

2.3 Technical Summary

2.3.1 Property Description

The Juruti Bauxite Mine has been in commercial production since 2009 and in 2020 produced approximately 7.2 Mt of bauxite with ore being shipped for aluminum production at the Alumar Refinery, operated by Consorcia de Aluminio do Maranhão S.A., in the city of São Luis, located in the north of Maranhão State, approximately 1,900 km due east by road and boat of Juruti along Brazil's northern coastline.

The bauxite deposit of the Juruti Bauxite Mine consist of several lateritic bauxite plateaus which exist across areas of higher elevations, capped by iron-rich laterite deposits, which formed through in-situ weathering of sediment deposits of the Amazon basin. There are a total of six bauxite plateaus, namely the Capiranga Central, Mauari, Mutum, Nhamundá, Santarém, and São Francisco which are the subject of this report. The approximate coordinates of the mining area for the Capiranga Central, Mauari, São Francisco, Mutum and Santarém plateaus are 618,879 m East and 9,721,768 m North, and for the Nhamundá plateau are 521,657 m East and 9,773,299 m North.

The mine is in the west of Pará State in northern Brazil. It is located approximately 55 km south from the town of Juruti on the southern shore of the Amazon River connected by a road (PA-257) and railway via which ore is transported for ship loading and export along the Amazon River from Juruti port.

The nearest major city to the town of Juruti is Santarém, approximately 160 km to the east which is only accessible by either boat or by air from Juruti Airport (JRT). National roads connect Santarém to wider Pará State including the port city of Belém on Brazil's northern coast, approximately 1,400 km by road.

The Juruti Bauxite Mine is in the northern region of Brazil in the Amazon River Sedimentary Basin and catchment area which experiences one of the highest rainfall rates in the country. Annual rainfall is typically highest in the months of February to April and lowest in the months of August to October. Vegetation across the mining area is characterized as being within the Amazon rainforest, the world's largest area of tropical rainforest with high floral and faunal diversity.

Mining at Juruti operates 24 hours per day and 7 days per week. Therefore, its operating hours are not considered to be influenced or dictated by seasonality.

2.3.2 Land Tenure

The Juruti Bauxite Mine is owned and operated by Alcoa through Alcoa World Alumina Brasil Ltda. (AWA Brasil). AWA Brasil is itself a subsidiary of Alcoa World Alumina and Chemicals (AWAC) which is a global joint venture between Alcoa Corporation (60%), and Alumina Limited (40%). The Juruti Bauxite Mine represents an established mining operation which commenced commercial production of bauxite in 2009.

At Juruti, there are three continuous mining rights with an aggregated 29,426 hectares (ha), where current Mineral Reserves are determined from the Capiranga Central and Mauari plateaus. It is however recognized that a small area of overlap exists between concessions 808.954/1975 and 850.010/1991 which reduces the total mining concession area to 29,410 ha.

In addition to the mining rights, there are thirteen requests for mining concessions, fourteen exploration permits, and two requests for exploration permits. The aggregated area for these permits is 197,866 ha. SLR is not aware of any other overlapping permits areas which may affect the total area of these permits. Two additional claim areas are reported by Alcoa to have been dropped (a total area of 15,344 ha).

Alcoa has stated that all necessary mineral rights, licenses, and permits for Juruti are valid in accordance with the ANM's requirements, including for the Capiranga Central, Mauari, São Francisco, Mutum, Nhamundá, and Santarém plateaus. The licenses and permits are currently being renewed with the Pará State environmental authority (Secretario de Estado de Meio Ambiente do Pará, or SEMAS/PA). According to the resolution of the Brazilian National Environment Council (CONAMA) 237/97, the environmental license is still valid (even when expired) since the renewal applications were lodged 120 days before the expiration date.

The process is now being reviewed by the competent environmental agency. Permitting aspects of the Juruti Bauxite Mine are discussed in more detail in Section 17.6 of this Technical Report Summary.

The mining operations at Juruti take place on third-party land, and in accordance with the Mining Concession requirements Alcoa has agreements in place with the respective landowners meaning there is no current need to purchase third-party land. This agreement forms a "mining easement", which grants Alcoa access to the mining areas in exchange for compensation payments and as a result there are no other titles, claims, leases, or options applicable to the exploration or mining permit areas which may limit Alcoa's rights.

2.3.3 History

Prior to acquisition by Alcoa in 2000, the Juruti mining area was previously under ownership of Pechiney S.A., a French exploration and development company, now known as Rio Tinto Alcan.

Initial prospecting and exploration across the Juruti deposits were originally undertaken in 1972 and 1973 by previous owners. The first drilling of the deposit is known to have been completed by Reynolds Group Holdings. The Juruti project was later acquired by Alcoa in 2000 and following further exploration and technical evaluation, production first commenced in 2009.

2.3.4 Geological Setting, Mineralization, and Deposit

The Juruti area is located in the lower part of the Amazonian basin, south of the Amazon River, between the Guyana and Brazilian Shields. Parent deposits which form the base of the bauxite sequence belong to the Alter-do-Chao Formation comprising continental sedimentary deposits that accumulated in a fluvial-lacustrine environment and consist of sandstones, siltstones, mudstones, and quartz breccias. Bauxites are known to have formed during intense lateritic alteration of the Cretaceous (145 to 66 million years ago, Ma) siliciclastic parent deposits which is estimated to have occurred during the Eocene (56 to 34 Ma). Cretaceous deposits were later covered by tropical soils as a product of root activity resulting in a kaolinitic and alumina-goethite deposited during flooding events in the Miocene (23 to 5 Ma).

The evolution of bauxite in this region is generally accepted to have occurred through a combination of intense weathering and geochemical alteration, leaching by meteoric waters, and accumulation of alumina and iron-rich horizons, in addition to periodic erosion and redeposition of upper horizons. These horizons form gently undulating plateaus ranging from 100 m to 170 m above the level of the Amazon, surrounded by drainage erosion channels. While these plateaus cover extensive areas both north and south of the Amazon, not all are bauxitic, despite being within the same geomorphological and climatic area on top of the same sedimentary formation.

Bauxite mineralization principally occurs as microcrystalline gibbsite ($Al(OH)_3$), along with accessory minerals of hematite (Fe_2O_3), goethite ($FeO(OH)$), kaolinite ($Al_2Si_2O_5(OH)_4$), and anatase (TiO_2). The mineralization of each of the stratigraphic horizons observed across the Juruti deposits are classified

based on a combination of visual inspection during drilling and sampling, and the results of chemical analysis.

The stratigraphy is comprised of, with increasing depth, a mottled clay horizon at the base topped with a massive bauxite layer, overlain by a ferricrete crust with hematite and gibbsite nodules, and an overlying yellow clay at surface. In comparison to their lateral extent over tens of kilometers, the overall thickness of the bauxite deposits is relatively thin with the depth of drilling typically in order of 20 m.

2.3.5 Exploration

Limited details on regional and exploration drilling procedures conducted by previous operators are available. SLR understands that the Nhamundá plateau is characterized by a combination of historical well and auger type drill holes and some recent air-core holes completed by Alcoa. Plateaus Mutum, Santarém, and São Francisco are characterized using historical auger type drill holes. Since acquisition in 2000, exploration drilling by Alcoa has focused on Capiranga, Capiranga Central, Mauari, and Guaraná, and results have superseded the historical data.

Alcoa exploration is focussed on initial mapping to define the extents of each plateau and follow up drilling at wide spacing to confirm mineralization. Prospective areas defined from this drilling are infilled in line with company objectives.

The primary means of exploration by Alcoa has been through AC type drilling, in which drill cuttings are recovered as a sample through the injection of compressed air into the drill hole. This method is a common technique in unconsolidated ground, and the SLR QP is of the opinion that it is appropriate for use in the exploration of bauxite.

Drilling across the numerous plateaus that comprise the Juruti mining area have been predominantly undertaken from 2007 to 2021. A total of 3,146 drill holes for 50,628 m of drilling has been undertaken across the plateaus that are the subject of this report.

Initial exploration drilling campaigns are performed on an 800 m grid over the plateaus. Prospective results are followed up with infill drilling campaigns of 400 m and finally 200 m grid spacing. In the months ahead of scheduled mining, Alcoa consolidates the drilling results on a 50 m by 100 m grid. This drilling, called short-term drilling, is used to create a short-term model for mine planning and is not integrated into the long-term model.

Current drill spacings across each plateau is variable, however, the Capiranga Central and Mauari plateaus are the most advanced with drill spacing is mainly defined on a regular grid pattern of 200 m by 200 m. In the other plateaus where spacings are more commonly 400 m or 800 m spacings, Alcoa plans to reduce this spacing to the targeted 200 m using air core drilling within the next decade. The plan covers the all the plateaus where Alcoa has mining permits and will replace the historical drilling information (auger and well) with more accurate drilling and sampling methodologies. Alcoa plans to complete over 6,500 holes for around 110,000 m of drilling at an anticipated cost of US$27.7 M between 2022 and 2032.

All holes completed by Alcoa across the plateaus have been drilled vertically and given the shallow nature of the deposit, no downhole surveys have been undertaken on any of the holes. Samples are collected from the coring barrel into plastic PVC tubes, sealed and labelled at both ends. Geological logging is undertaken by Alcoa's on-site geologists. Samples are logged, weighed, and stored in sealed plastic bags each of which is clearly labelled and barcoded before being sent for assaying. All drill cores are photographed on completion.

It is the QP's opinion that there are no known drilling, sampling or recovery factors that could materially affect the accuracy and reliability of the results and that the results are suitable for use in the Mineral Resource estimation.

2.3.6 Mineral Resource Estimates

The Mineral Resource estimate for the Juruti Bauxite Mine, as of December 31, 2021, using all data available was completed by Alcoa staff and reviewed and accepted by the SLR QP.

The geological models were built in Leapfrog Geo™ software using wireframes from the top of each lithology, interpolated through implicit modelling, and honoring the stratigraphy. In this way the top of one lithology is the basis of the above lithology. The assays intervals used to define each lithology were classified in a geological and geochemical approach. The snap tool and a 20 m wireframe resolution, with adaptative mode, was used to get an adequate level of detail for the block models.

Each plateau has a single block model, except for Nhamundá that has five block models in order to use the best information available in each region (auger, wells or AC drill holes). Just Mauari has a rotated block model, and the block dimensions are the same for all the plateaus, 50 m x 50 m x 0.5 m.

For the grade estimation the ordinary kriging (OK) algorithm was used, and the estimated grade validation was done using Q-Q plots (between OK and nearest neighbor grades), cross sections comparing the grades in the blocks and the samples, cross validation, swath plots, and histograms and statistical data from samples and block models.

The Mineral Resource classification workflow comprises two approaches, indicator kriging (IK) and Turning Bands conditional simulation to calculate the uncertainties related with geological interpretation and grade estimation in each block. Regarding the IK, the kriging result indicates the most likely lithology (ore or waste) and the kriging variance indicates the level of confidence of this assumption, so both parameters were used through the risk index (RI) methodology. For the conditional simulations the accumulated variables are simulated, and the maximum estimation error (MEE) is calculated for each variable and an average of each MEE is used for the result. The final classification represents the most conservative result between RI and that based on the MEE.

The SLR QP reviewed the Mineral Resource assumptions, input parameters, geological interpretation, block modelling and reporting procedures, and is of the opinion that the Mineral Resource estimate is appropriate for the style of mineralization and that the block models are reasonable and acceptable to support the December 31, 2021 Mineral Resource estimate.

The Mineral Resource estimate for Juruti, as of December 31, 2021, is summarized in Table 1-4. Mineral Resource estimates for each individual plateau are included in Section 11.12.

Mineral Resources have been classified in accordance with the definitions for Mineral Resources in S-K 1300, which are consistent with Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Definition Standards for Mineral Resources and Mineral Reserves dated May 10, 2014 (CIM (2014) definitions). The estimate is presented on a 100% ownership basis to AWAC for consolidated reporting purposes.

The Mineral Resources bauxite price is defined as 30% higher than the Mineral Reserves bauxite price. The Mineral Reserves bauxite price is based on contracts between Juruti Mine and Alumar Refinery (Alcoa), since 90% of the bauxite production is shipped to this refinery. The contract is reviewed annually and is based on factors relating to internal and external demand for bauxite, as well as bonus and penalties depending on the product quality. The transfer price mechanism from Juruti to Alumar is determined by

a weighted-average price of the previous year's third-party sales. For example, the 2021 internal transfer price from Juruti to Alumar will be the weighted-average price of 2020 third-party sales.

Table 1-4: Summary of Juruti Bauxite Mine Mineral Resources – December 31, 2021

Bauxite Product	Washed Bauxite			Unwashed Bauxite			Washed + Unwashed Bauxite		
Classification	Tonnage (M dmt)	A.Al_2O_3 (%)	R.SiO_2 (%)	Tonnage (M dmt)	A.Al_2O_3 (%)	R.SiO_2 (%)	Tonnage (M dmt)	A.Al_2O_3 (%)	R.SiO_2 (%)
Measured	5.27	44.66	5.45	0.38	42.83	3.02	5.66	44.53	5.28
Indicated	56.97	45.39	4.47	1.62	43.53	2.82	58.59	45.34	4.42
Measured + Indicated	62.24	45.33	4.55	2.00	43.40	2.86	64.24	45.27	4.50
Inferred	562.75	45.70	4.72	1.04	43.42	2.71	563.79	45.69	4.72

Notes:

1. The definitions for Mineral Resources in S-K 13000 were followed.
2. Mineral Resources are estimated using a long-term bauxite price of US$35.33 per tonne (wet base), and a R$:US$ exchange rate of R$5.34:US$1.00, considering 100% of metal recovery for the washed and unwashed material.
3. Mineral Resources are estimated at a pit discard cut-off value based on a benefit calculation that determines whether a block is economically viable.
4. The washed bauxite tonnage has been derived by SLR from an in-situ tonnage multiplied by the wash recovery.
5. There is no minimum mining width for Mineral Resources.
6. Bulk density is interpolated or assigned and averages 1.30 t/m^3.
7. Mineral Resources are exclusive of Mineral Reserves.
8. Mineral Resources that are not Mineral Reserves and do not have demonstrated economic viability.
9. Mineral Resources are stated on a 100% ownership basis for AWAC. Alcoa's share is 60%
10. Numbers may not add due to rounding.

The SLR QP is of the opinion that, with consideration of the recommendations summarized in this section, any issues relating to all relevant technical and economic factors likely to influence the prospect of economic extraction can be resolved with further work.

2.3.7 Mineral Reserve Estimates

Mineral Reserves to be mined from 2022 onwards to 2035 were estimated at 88.5 Mt at 47.10% A.Al_2O_3 and 3.47% R.SiO_2. The estimate is presented on a 100% ownership basis to AWAC for consolidated reporting purposes.

The Mineral Reserve estimate, as of December 31, 2021, is summarised in Table 1-5.

Table 1-5: Summary of Mineral Reserves – December 31, 2021

Category (Washed + Unwashed Bauxite)	Tonnage (Mt)	A.Al_2O_3 (%)	R. SiO_2 (%)
Proven	50.9	47.68	3.52
Probable	37.7	46.32	3.39
Total Proven + Probable	**88.5**	**47.10**	**3.47**

Notes:

1. The definitions for Mineral Reserves in S-K 1300 were followed for Mineral Reserves which are consistent with CIM (2014) definitions.
2. Mineral Reserves are estimated at a pit discard cut-off value of the mining related costs. A Benefit calculation is applied to determine whether a block is economically viable whereby Benefit is the revenue less the mining related costs.
3. Mineral Reserves are estimated using an average long-term bauxite price of US$27.18 per tonne (based on a contractual price given 90% of bauxite is supplied directly to Alcoa's refinery) and a US$/R$ exchange rate of R$5.34:US$1.00.
4. Bulk density is 1.30 t/m3.
5. Mineral Resources are stated on a 100% ownership basis for AWAC. Alcoa's share is 60%
6. Numbers may not add due to rounding.

The SLR QP is not aware of any risk factors associated with, or changes to, any aspect of the modifying factors such as mining, processing, infrastructure, permitting, or other relevant factors that could materially affect the Mineral Reserve estimate.

2.3.8 Mining Methods

The Juruti Mine operations are based on the use of conventional strip mining. Each plateau is divided into panels and regular strips of 20 m width x 200 m long within which a number of sequential mining activities including land clearance, topsoil removal, overburden stripping and waste backfill, and bauxite mining take place.

The majority of the waste is backfilled by pushing the overburden back into the previously excavated cut with dozers. A suitable period of drying and consolidation of the fines is allowed before overburden is replaced. The returned overburden surface will be contoured with dozers to create an acceptable final topography. Shortly thereafter, topsoil stocks will be distributed over the overburden in preparation for landform rehabilitation.

No geotechnical and hydrogeological models are used for Juruti. The depth of excavation at Juruti is shallow (20 m or less) and the method of overburden removal by bulldozers results in shallow slope angles. The geotechnical aspect of mine design is therefore not a major consideration for the deposit and a formal geotechnical investigation has not been completed for the open pits.

SLR is satisfied that this does not preclude the estimation of Mineral Reserves. The safe operation of the pits can be properly managed through the application of appropriate work procedures and training.

As the mine is very shallow, no dewatering of the pits is required. Drainage systems are placed around the plateaus to avoid rainwater flowing into the pit. The water inside the mining areas is pumped to sumps nearby and after some time of settling the water flows to natural drainage.

2.3.9 Processing and Recovery Methods

The Juruti Bauxite Mine's processing plant has been in operation since 2009 and uses a simple comminution and washing circuit to produce washed bauxite for shipping along with the unwashed bauxite (direct shipping ore or DSO) that is suitable for refining at an Al_2O_3 grade of 47.5%.

The primary processing involved in this plant is removal of silt and clay (fine particles) from the ore and includes crushing, washing and wet screening. The removed fines are initially deposited in a thickening pond for settling and water recovery (for reuse in the washing plant) then discarded in tailings ponds.

The current production capacity of the process plant is 6.2 million tonnes a year (Mtpa) of washed bauxite and 1.3 Mtpa of unwashed bauxite as a Direct Shipping Ore (DSO).

The current global mass recovery of the plant is 75% ± 1%. The final product specification has 47.5 ± 1% A.Al_2O_3 and 4.1 ± 0.5% R.SiO_2. The residual moisture content of the final product is 13% ± 1%.

The average annual power and water consumptions of the process plant are approximately 47,000 MWh and 18 million cubic meters (Mm^3).

2.3.10 Project Infrastructure

The in-situ and operating infrastructure at the Juruti Bauxite Mine includes the following:

- Rail siding and rail loading facilities for the transportation of ore and product
- Bauxite beneficiation plant comprising ore crushing and washing equipment
- Mine waste facilities including tailings thickening lagoons and tailings disposal ponds
- Stockpiles and material handling equipment including conveyors
- Ancillary buildings including administrative and mine site offices, warehouses, laboratory, and workshops
- Fuel station
- Site access road
- Water supply system comprising water collection pumps installed on a raft in the Juruti Grande stream north on the mining infrastructure and plant area, and a water pipeline corridor of approximately 9 km.
- Power generation through Thermoelectric Units (UTE) located at the mine site and port.
- Surface water management and pumping systems, including a wastewater (effluent) treatment plant.
- Off-site rail corridor connecting the mine to Juruti port and access road
- Port facilities including rail siding, materials handling equipment/conveyors, and ship loader
- There is no on-site accommodation due to the proximity to town of Juruti.

Tailings at the Juruti Bauxite Mine are generated from beneficiation of the bauxite ore at the processing plant which involves removing silt and clay (fine particles) by a simple washing process. Based on an annual washed bauxite production of 6 Mtpa, the tailings generated annually are in the order of 1.93 Mtpa (dry tonnage).

The tailings disposal system relies on the use of thickening ponds and tailings disposal ponds. The tailings produced in the processing of bauxite in the washing plant are fed into the thickening pond as a pulp with 6% to 8% of solid content on average. After a period of solid sedimentation, the water is pumped and reclaimed for reuse in the system. Settled solids are dredged and deposited into the tailings disposal ponds. The Juruti Bauxite Mine currently has eight tailings storage facilities which comprise one thickening pond and seven tailings disposal ponds in operation. The ninth tailings disposal pond is under construction and will be in operation in 2022.

SLR relies on the conclusions provided in the published database and email correspondence with Alcoa's team and therefore provides no conclusions or opinions regarding the stability of the listed dams and impoundments.

Alcoa's Tailings Master Plan for tailings management provides a 15-year plan for sustaining production with the current wet tailings disposal method. One new tailings pond is planned every two years from 2021 until 2036. Alternative technology involving dry tailings disposal is being investigated. The base-case

considers sustaining the production for at least 5 years with current technology. The potential technology switch to dry disposal is envisaged starting year 2026.

2.3.11 Market Studies

Alcoa Corporation is a vertically integrated aluminum company comprised of bauxite mining, alumina refining, aluminum production (smelting and casting), and energy generation. Bauxite mining and alumina refining are the upstream operations of primary aluminum production. Alcoa obtains bauxite from its own resources and processes over 85% of its combined bauxite production into alumina. The remainder is sold to the third-party market.

Unlike alumina and aluminum, bauxite is not a standard commodity traded on an index or metal exchange. Bauxite's grades and characteristics vary significantly by deposit location and the value of bauxite deposits for each downstream refinery could be different. Most bauxite traded on the third-party market is priced using a value-in-use methodology.

Besides quality and geography, market fundamentals, including macroeconomic trends; the prices of raw materials, like caustic soda and energy; the prices of alumina and aluminum; and, the cost of freight, will also play a role in bauxite prices.

The Juruti Bauxite Mine, which produces both a washed and unwashed (DSO) product, serves primarily to supply bauxite to the integrated Alumar refinery, a joint venture between Alcoa, South32 and Rio Tinto, as well as to supply third-party customers in the Atlantic region. The Alumar refinery has been designed to consume Amazon bauxite for its unique quality, composition, and other characteristics. In 2021, approximately 89% of Juruti bauxite was shipped to the Alumar refinery.

The transfer price mechanism from Juruti to Alumar is determined by a weighted-average price of the previous year's third-party sales. The remaining Juruti bauxite was sold externally to the third-party market. The sales contracts for these third-party sales include both near-term (1 year) and long-term (exceeding 1 year) contract terms, or spot prices.

Market information is based on industry analysis and historical pricing information of bauxite sold by Juruti to the Alumar refinery prepared by Alcoa.

SLR is satisfied that the pricing mechanism is appropriate for the estimation of Mineral Reserves.

2.3.12 Environmental Studies, Permitting and Plans, Negotiations, or Agreements with Local Individuals or Groups

- Environmental studies: The Juruti Bauxite Mine EIA Report was compiled in 2004 by CNEC Engenharia SA (CNEC) in order to obtain a Preliminary Environmental License (LP). Impacts assessed as having a high significance include vegetation clearing, vegetation degradation by increased human activity and a decrease in local fauna populations due to habitat destruction.
- Managing environmental and social impacts: Alcoa prepared a Social and Environmental Management Plan (PGSA) based on the requirements of its operations license. SLR was not provided with this PGSA, however the Alcoa annual reports submitted to the regulator include some environmental control plans. Juruti has detailed management processes for vegetation removal and rescue of fauna as well as rehabilitation and recovery of degraded areas and monitoring thereof. These management processes therefore focus on the impacts that were identified as having a high significance in the EIA.

Environmental monitoring is conducted and includes climatological monitoring, air quality, noise, surface water quality, effluent quality, groundwater quality and ecological monitoring.

- Mineralized waste: The mine has tailings storage facilities and a waste rock dump. The tailings storage facilities are covered by the National Dam Safety Policy (PNSB) and routine inspections are conducted. Alcoa samples the tailings in the thickening pond to characterize this waste material on an annual basis. The latest results comply with the Brazilian Association of Technical Standards 10004 (November 2004) and the tailings material was determined to be inert. The mine has a small waste rock dump from the first boxcut. This facility does not have stability concerns due to its limited size.

- Water management: Water is reused at the mine site and only treated sewage effluent is discharged at the mine to land and at the port to the Amazon River. Alcoa reports on the quality of the effluent and no significant compliance issues have been identified. It is noted that there are various uncertainties in the water balance model and SLR cannot verify the information provided.

- Incident reporting: Alcoa conducted an environmental assessment and reported on the impacts of two environmental incidents that occurred in December 2020 and March 2021. These incidents occurred during heavy rainfall over 24 hours which led to siltation of downstream watercourses. The assessment was comprehensive and addressed ecology, water and social impacts. Alcoa has therefore demonstrated that the mine reports and addresses non-compliance issues and incidents.

- Permitting and approvals: Alcoa has indicated that all the required permits are in place. It should be noted that 14 approvals have exceeded the stated expiry dates, and some renewals are very long overdue. Alcoa has confirmed that renewal applications were lodged 120 days prior to expiry as required by law for all approvals, except the vegetation suppression or removal and fauna activities permits which have to be applied for every year. Alcoa does follow up on these overdue renewals regularly by engaging with the regulator, however the lack of capacity at the regulator is a significant issue hampering the issuing of renewals in a timely manner.

- Social and community requirements: Alcoa has defined its area of influence, and this includes the municipality of Juruti and communities surrounding the Grande River. Alcoa has not provided information on stakeholders identified other than Alcoa technical teams. Alcoa reports that it works with the consent of the surface owners and there is no current need to purchase third-party land. Alcoa does not seem to have a community complaint or grievance system in place.

  There are no Indigenous Communities or escaped slave (Quilombola) communities directly affected by the Juruti Mine. However, there are agro-extractive traditional communities that are affected and are included in the list of groups covered by the concept of “Indigenous people” in terms of the Indigenous and Tribal Peoples Convention (ILO Convention) 169 of 1989, to which Brazil is a signatory. Alcoa therefore consulted with and established agreements with the traditional communities in Juruti Velho. These communities are represented by the Association of Communities of the Juruti Velho Region (ACORJUVE) and this representation includes landownership rights. In February 2018, ACORJUVE, the National Institute of Colonization and Agrarian Reform (INCRA), federal and state prosecutors and Alcoa signed a social, environmental and economic agreement on common land use, shared value and sustainable mining in the Amazon region. Alcoa reports that in the third quarter of 2019, the representatives of ACORJUVE decided not to follow the agreed-upon path to transition royalties to a foundation to be set up to ensure good governance. Alcoa states that it continues to urge the association to engage in dialogue with the expectation of completing the foundation’s by-laws as soon as possible.

Thirty-two families were relocated for the mine development, specifically in the port area. Alcoa continues to monitor families who remain vulnerable and makes some effort to obtain employment for some family members in contracted companies.

There were some disruptions to environmental monitoring when the local community objected to the social programs and dissemination of information from Alcoa in September 2019. Alcoa reportedly came to an agreement with the parties and environmental monitoring and dissemination of information resumed in April 2021.

Alcoa implements local hiring and procurement policies and implements a labor training program in partnership with SENAI. Alcoa also implements social uplift programs and has completed 50 initiates, with four still in progress. These initiates aim to improve the quality of life of the local population by supporting and encouraging the carrying out of rural and urban infrastructure building works and other actions for strengthening health, education, culture, the environment, public security and justice and social assistance.

- Mine closure planning: Alcoa has compiled an updated closure plan which addresses closure and post-closure. This plan also discusses the management measures being implemented during operations to manage impacts with a view towards closure. Closure objectives are not clearly stated in the plan. The plan also does not describe how the tailings facilities, or the waste rock dump will be decommissioned and closed. A mine closure plan has been prepared by Alcoa and total LOM costs are estimated to be $62.0 million.

In SLR's opinion Alcoa manages permitting adequately within the context of the regulator's capacity limitations by applying for renewals according to legal requirements and following up on overdue renewals. Provided that Juruti personnel maintain auditable records of written and verbal communication with authorities regarding the overdue renewals and respond promptly to any requests for additional information, this risk should be appropriately managed. Alcoa continues to negotiate on the key issue of setting up a foundation to manage royalty payments to the communities.

2.3.13 Capital and Operating Cost Estimates

The operation is well-established and since the LOM plan does not envisage any significant change of the mining and production rate, capital expenditures anticipated by Alcoa are related to sustaining and continuing the current operations.

An estimated $183.5 million is required for the construction of new tailings storage facilities, of which one new facility is needed every two years of future mine life. Other sustaining capital over the remaining LOM is estimated to be $135.4 million

Allowances are included for the construction of new haul roads and the costs of establishing future mining operations on the Capiranga Central Plateau.

The operational costs for opening up new box cuts to sustain production amount to $114.6 million.

The mining area is progressively rehabilitated during mining with on-going rehabilitation of mined-out areas. A mine closure plan has been prepared by Alcoa and total LOM costs are estimated to be $62.0 million.

Alcoa's sustaining capital estimates for Juruti are derived from annual budgets and historical actuals over the long life of the current operation. According to the American Association of Cost Engineers (AACE)

International, these estimates would be classified as Class 1 with an accuracy range of -3% to -10% to +3% to +15%.

The mining area is progressively rehabilitated during mining with on-going rehabilitation of mined-out areas. A mine closure plan has been prepared by Alcoa and total LOM costs are estimated to be $62.0 million.

Mine production is carried out by contractors. Company personnel carry out the geology, planning and grade control activities. Administrative and technical support personnel work on a five by two, 8-hour shift roster while mine production staff work 12-hour shifts.

Operating expenditures include labour, fuel, energy, contracted services, mining contracts, maintenance, processing, transportation, and offsite services.

The operating costs estimates are derived from annual budgets and historical actual costs over the long life of the current operation and are shown in Table 1-6.

Table 1-6: LOM Operating Costs

Cost Centre	2022 ($/t product)	LOM Average ($/t product)
Mining	5.56	5.91
Processing	1.78	2.11
General & Administration	2.97	3.54
Concentrate Rail Freight Cost	0.61	0.75
Transportation Cost	2.17	2.59
Total Cost	**13.09**	**14.90**

3.0 INTRODUCTION

SLR International Corporation (SLR) was appointed by Alcoa Corporation (Alcoa) to prepare an independent Technical Report Summary on the Juruti Bauxite Mine located in the west of Pará State, northern Brazil. The purpose of this report is to support the disclosure of Mineral Resource and Mineral Reserve estimates for the mine as of December 31, 2021. This Technical Report Summary conforms to the United States Securities and Exchange Commission's (SEC) Modernized Property Disclosure Requirements for Mining Registrants as described in Subpart 1300 of Regulation S-K, Disclosure by Registrants Engaged in Mining Operations (S-K 1300) and Item 601 (b)(96) of Regulation S-K.

Alcoa is one of the world's largest aluminum producers and a publicly traded company on the New York Stock Exchange (NYSE). Alcoa owns and operates integrated bauxite mining, alumina refining and aluminum smelting operations at numerous assets globally including in Australia, Brazil, Canada, and the United States. Alcoa is also a joint venture partner for several other integrated operations in Brazil, Canada, Guinea, and Saudi Arabia.

The Juruti Bauxite Mine, located in the west of Pará State near the Amazon River, is owned and operated by Alcoa through Alcoa World Alumina Brasil Ltda. (AWA Brasil). AWA Brasil is itself a subsidiary of Alcoa World Alumina and Chemicals (AWAC) which is a global joint venture between Alcoa Corporation (60%), and Alumina Limited (40%). The Juruti Bauxite Mine represents an established mining operation which commenced commercial production of bauxite in 2009. In Brazil, Alcoa also owns the bauxite mining operations at Poços de Caldas (located in Minas Gerais State in southwest Brazil) and holds an interest in Trombetas (located on the northern shore of the Amazon, 70 kilometers (km) northwest of Juruti). The same approach has been taken by SLR when reporting Mineral Resources and Mineral Reserves

The bauxite deposit of the Juruti Bauxite Mine consists of several lateritic bauxite plateaus which exist across areas of higher elevations (70 meters (m) to 190 m), capped by iron-rich laterite deposits, which formed through in-situ weathering of sediment deposits of the Amazon basin. There are a total of six bauxite plateaus, namely the Capiranga Central, Mauari, Mutum, Nhamundá, Santarém, and São Francisco which are the subject of this report. Two other plateaus, Capiranga and Guaraná, are being mined but are not included in the Mineral Resource and Mineral Reserves estimates on the basis that the remaining production is not deemed material to Alcoa's business.

The Juruti Bauxite Mine produced approximately 7.2 million tonnes (Mt) of bauxite in 2020 with ore being shipped for aluminum production at the Alumar Refinery in the city of São Luis, located in the north of Maranhão State, approximately 1,900 km due east by road and boat of Juruti along Brazil's northern coastline.

3.1 Site Visits

SLR Qualified Persons (QPs) visited the site on October 18 to 21, 2021. During the site visit, SLR QPs reviewed the procedures related to geology and mining, visited the core shed, tailings facilities, mine operation, processing plant, internal laboratory, exploration areas, examined drill holes and ore faces in the mine and had meetings with the key persons for the main areas to discuss the workflow and methodology adopted for the Mineral Resources and Mineral Reserves in Juruti.

During the site visit the most relevant information was collected and discussed with the Alcoa's technical staff, and it was used as the basis for this report.

3.2 Sources of Information

During the preparation of this Technical Report, discussions were held with personnel from Alcoa:

- Octávio Guimarães, Mine Planning Manager, Global Planning – Brazil region
- Carlos Filho, Geologist, Global Planning – Brazil region
- Flávio Silva, Mine Planning Engineer; Geostatistician, Global Planning – Brazil region
- Saulo da Silva Nunes, Exploration Geologist, Juruti
- Otávio Yokoyama, Exploration Supervisor, Juruti
- Carolina Polastro, Geologist, Juruti
- Henrique Santos, Mine Operation Manager, Juruti
- Gustavo Correia, Tailings Engineer, Juruti
- Rafaela Oliveira, Mineral Processing Engineer, Juruti

This Technical Report Summary was prepared by SLR QPs. The documentation reviewed, and other sources of information, are listed at the end of this report in Section 24.0 References.

3.3 List of Abbreviations

Units of measurement used in this report conform to the metric system. All currency in this report is US dollars (US$) unless otherwise noted.

Abbreviation	Description
°C	degree Celsius
°F	degree Fahrenheit
a	annum
A	ampere
A.Al_2O_3	Available Alumina
ABNT	Brazilian Association of Technical Standards
AC	Air Core (drilling method)
Acorjuve	Association of Communities of the Juruti Velho Region
Alcoa	Alcoa Corporation
ANA	Federal Water Agency
ANM	Agência Nacional de Mineração (National Mining Agency)
API	Alumina Price Index
APRAS	Association of Rural Producers of the Socó I settlement
ASI	Aluminum Stewardship Initiative
AWA Brasil Ltda.	Alcoa World Alumina Brasil Ltda
AWAC	Alcoa World Alumina and Chemicals
bbl	barrels
Btu	British thermal units
BWI	Bond ball mill work index
C$	Canadian dollars
cal	calorie
CF	Cumulative Frequency
CFEM	Compensacao Financeira pela Exploracao de Recursos Minerais
cfm	cubic feet per minute
CIM	Canadian Institute of Mining, Metallurgy and Petroleum
cm	centimeter
cm^2	square centimeter
CNEC	CNEC Engenharia SA
CONAMA	Conselho Nacional de Meio Ambiente (National Environmental Council, Brazil)
d	day
DCF	Discounted Cashflow
dia	diameter
DL	Detection Limit
dmt	dry metric tonne
dmt	Dry metric tonnes
DNPM	National Department of Mineral Production
DSO	Direct Shipping Ore

Abbreviation	Description
DTM	Digital Terrain Model
dwt	dead-weight ton
EIA	Environmental Impact Assessment
EoR	Engineer of Record
ERP	Emergency Response Plan
FEL2	Front End Loading
FOB	Free On Board
ft	foot
ft/s	foot per second
ft^2	square foot
ft^3	cubic foot
FTIR	Fourier Transform Infrared Spectroscopy
g	gram
G	Giga (billion)
G&A	General and Administrative
g/L	gram per liter
g/t	gram per tonne
gal	Imperial gallon
GISTM	Global Industry Standard on Tailings Management
gpm	Imperial gallons per minute
GPS	Global Positional System
gr/ft^3	grain per cubic foot
gr/m^3	grain per cubic meter
ha	hectare
HARD	Half Average Relative Difference
HDA Servicos	HDA Servicos S/C Ltda
hp	horsepower
hr	hour
Hz	hertz
IBAMA	Agência Ambiental Federal (Federal Environmental Agency)
ICMM	International Mining and Metals Council
ID3	Inverse Distance (to third power)
IJUS	Sustainable Juruti Institute ()
IK	Indicator Kriging
ILO Convention	Indigenous and Tribal Peoples Convention ()
in.	inch
in^2	square inch
INCRA	National Institute of Colonization and Agrarian Reform
INMETRO	National Institute of Metrology, Standardization, and Industrial Quality
IRR	Internal Rate of Return
ISO	International Organization for Standardization

Abbreviation	Description
ITAK	Brazilian chemical laboratory
J	joule
JRT	Juruti Airport
k	kilo (thousand)
kcal	kilocalorie
KEV	Key Economic Variables
kg	kilogram
km	kilometer
km/h	kilometer per hour
km^2	square kilometer
kPa	kilopascal
kVA	kilovolt-amperes
kW	kilowatt
kWh	kilowatt-hour
L	liter
L/s	liters per second
lb	pound
LI	Licença de Instalação (Installation Permit)
LiDAR	Light Detecting and Ranging
LIMS	Laboratory Information Management System
LME	London Metal Exchange
LO	Licença de Operação (Operating Permit)
LOI	Loss on Ignition
LOM	Life of Mine
LP	Preliminary Environmental License
µm	micron
m	meter
M	mega (million); molar
m^2	square meter
m^3	cubic meter
m^3/h	cubic meters per hour
Ma	Million years ago
MASL	Meters above sea level
µg	microgram
mi	mile
min	minute
µm	micrometer
mm	millimeter
Mm^3	Million cubic meters
MME	Maximum Estimation Error
mph	miles per hour

Abbreviation	Description
MRN	Mineração Rio Do Norte
Mt	Million tonnes
Mtpa	Million tonnes per annum
MVA	megavolt-amperes
MW	megawatt
MWh	megawatt-hour
NBR	Brazilian National Standard
NN	Nearest Neighbor
NOx	Nitrogen Oxides
NPV	Net Present Value
NSR	Net Smelter Return
NYSE	New York Stock Exchange
OK	Ordinary Kriging
OMS	Operations, Maintenance and Surveillance
oz	Troy ounce (31.1035g)
oz/st, opt	ounce per short ton
PEA	Preliminary Economic Assessment
PFM or MCP	Plano de Fechamento de Mina (Mining Closure Plan)
PGSA	Social and Environmental Management Plan
PNSB	National Dam Safety Policy
ppb	part per billion
ppm	part per million
PSI	Pollutant Standards Index ()
psia	pound per square inch absolute
psig	pound per square inch gauge
PVC	Polyvinyl chloride
QA/QC	Quality Assurance / Quality Control
QP	Qualified Person
R$	Reais
R.SiO_2	Reactive Silica
RAL	Annual Mining Report
RCG	Global Mass Recovery
RI	Risk Index
RIMA	Relatório de Impacto Ambiental (Environmental Impact Report)
RL	relative elevation
RMSEC	Root Mean Square Error of Calibration
RMSEV	Root Mean Square Error of Validation
RoM	Run of Mine
RTFE	Resonsible Tailings Facility Engineer
RWI	Bond rod mill work index
s	second

Abbreviation	Description
SEC	Securities and Exchange Commission
SEMAS/PA	Secretario de Estado de Meio Ambiente do Pará (Secretary of State for Environment and Sustainability, Pará)
SENAI	National Industrial Apprenticeship Service of Pará
SGS	SGS Laboratories
SGS Geosol	SGS Geosol Laboratorios Ltda
SIGBM	Integrated Mining Dam Safety Management System
SIRGAS	Geocentric Reference System for South America
SLR	SLR International Corporation
SMU	Selective Mining Units
SO_2	Sulphur dioxide
SR	Strip Ratio
SRTM	Shuttle Radar Topography Mission
st	short ton
STM	Santarém-Maestro Wilson Fonseca Airport
stpa	short ton per year
stpd	short ton per day
t	metric tonne
TARP	Triggers Action Response Plans
TCFA	Taxa de Controle e Fiscalização Ambiental (Environmental Control and Inspection Fee)
TP	Tailings Pond
tpa	metric tonne per year
tpd	metric tonne per day
tph	tonnes per hour
TRS	Technical Report Summary
TSF	Tailings Storage Facility
US EPA	United States Environmental Protection Agency
US$	United States Dollar
USg	United States gallon
USgpm	United States gallon per minute
UTE	Thermoelectric unit
UTM	Universal Transverse Mercator
V	volt
VCE	VCE Consultoria Mineral
W	watt
wmt	wet metric tonne
wt%	weight percent
yd^3	cubic yard
yr	Year

4.0 PROPERTY DESCRIPTION

4.1 Location

The Juruti Bauxite Mine is located in the west of Pará State in northern Brazil. The mine is approximately 55 km south from the town of Juruti on the southern shore of the Amazon River connected by a road and railway for the transport of personnel, equipment, and mined bauxite ore (Figure 3-1). A rail siding, material handling, and ship loading facilities are all located at Juruti port, immediately adjacent to the south of the town.

Juruti has only very limited connections by road to other nearby settlements, predominantly with the village of Socorro approximately 140 km to the east via a mainly unpaved road. Juruti is otherwise more widely connected by boat along the Amazon River or via short internal flights. The nearest city to Juruti is Santarém, approximately 160 km due east, accessible by boat (approximately 260 km taking 6 hours) or by air (under 1 hour).

The Alumar Refinery, operated by Consortium de Aluminio do Maranhão S.A., is approximately 30 km south of the city of São Luis in Maranhão State, northeast Brazil.

All spatial data used for the Mineral Resource and Mineral Reserve estimation are reported using a local grid based on SIRGAS (Geocentric Reference System for South America) 2000 (21S). The approximate coordinates of the mining area for the Capiranga Central, Mauari, São Francisco, Mutum and Santarém plateaus are 618,879mE and 9,721,768mN, and for the Nhamundá plateau are 521,657mE and 9,773,299mN. The relative location of the permits associated with the Juruti Bauxite Mine plateaus are illustrated below, highlighting the location of Nhamundá on the northern shore of the Amazon River.



Figure 3-1: Juruti Location and Access (SLR, 2021)

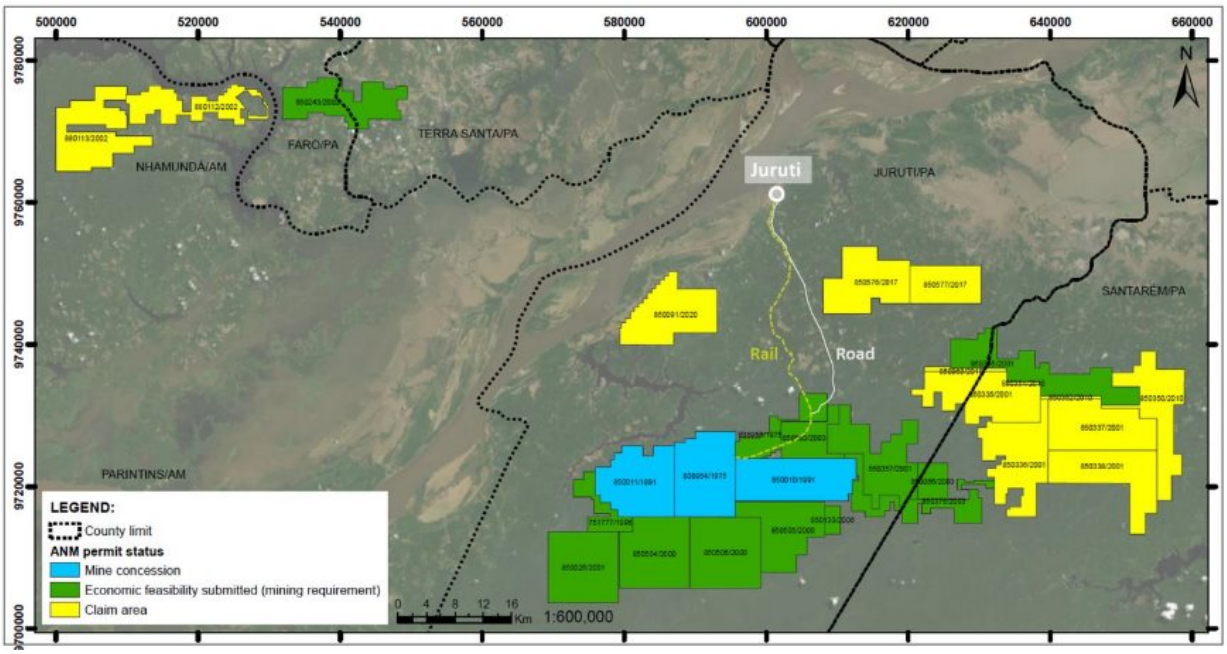


Figure 3-2: Juruti Bauxite Mine Permits (Alcoa, 2021, adapted by SLR)

4.2 Land Tenure

Mining and mineral rights in Brazil are regulated by the Mining Code, Decree 227, February 27, 1967 and further managed by the National Mining Agency, Agência Nacional de Mineração (ANM), established in place of the National Department of Mineral Production (DNPM). All exploration and mining activity are managed by the ANM under the Mining Code, and subject to the permits.

Permits granted by the ANM principally fall into two categories:

- Exploration Permit: available for application by individuals or companies established in Brazil, exploration permits are initially granted for three years, with the potential to apply for a second three-year term. On submittal of an approved Exploration Report, the holder is then granted one year to present a Mining Plan as a precursor to obtaining a Mining Concession. To be approved, the Exploration Report must sufficiently detail the data collected during exploration and include the results of a technical and economic study.

The application for exploration permit requires an application fee, and the submission by a registered geology or mining engineer professional. For retention of the Permit, the holder is required to pay an annual fee to the ANM, present / declare exploration expenditures on an annual basis, and pay a survey visit fee to ANM. During the period of tenue, the holder will also typically advise the ANM regarding ongoing exploration activities and commence landowner agreements and start environmental licensing.

- Mining Concession: following submittal of a Mining Plan and a request for use of the proposed mining areas, a Mining Concession enables exploitation once the associated Environmental Permits / Licenses have been granted. Mining Concessions are not time bound but require mining activities to commence within 6 months from being granted.

Concession holders are required to submit annual mining reports (RAL) to ANM, pay compensation to landowners, in addition to Brazilian Mineral Royalty payments (Compensacao Financeira pela Exploracao de Recursos Minerais, or CFEM).

At Juruti, there are three continuous mining concessions with an aggregated 29,426 ha, where current Mineral Reserves are determined from the Capiranga Central and Mauari plateaus. It is however recognized that a small area of overlap exists between concessions 808.954/1975 and 850.010/1991 (visible in Figure 3- below) which reduces the total mining concession area to 29,410 ha.

In addition to the mining rights, there are thirteen requests for mining concessions, fourteen exploration permits, and two requests for exploration permits. The aggregated area for these permits is 197,866 ha. SLR is not aware of any other overlapping permits areas which may affect the total area of these permits. Two additional claim areas are reported by Alcoa to have been dropped (a total area of 15,344 ha).

Table 3-1 below provides a list of the currently held Mining Concessions and Exploration Permits held by Alcoa World Alumina Brasil Ltda. (AWA), Alcoa's entity in Brazil, or Matapu Sociedade de Mineraçao Ltda., a wholly owned subsidiary of AWA.

The operation licenses are divided into four areas and the latest versions are listed below:

- Mining: operation license # 9638/2015; expired in December 2017 (renewal required in August 2017);
- Beneficiation: operation license # 9636/2015; expired in December 2017 (renewal required in August 2017);
- Railroad: operation license # 8995/2015; expired in January 2018 (renewal required in August 2017);
- Port: operation license # 9273/2015; expired in May 2018 (renewal required in August 2017).

Alcoa has stated that all necessary mineral rights, licenses, and permits for Juruti are valid in accordance with the ANM's requirements, including for the Capiranga Central, Mauari, São Francisco, Mutum, Nhamundá, and Santarém plateaus. The licenses and permits are currently being renewed with SEMAS/PA. According to the resolution CONAMA 237/97, the environmental license is still valid (even when expired) since the renewal applications were lodged 120 days before the expiration date.

The process is now being reviewed by the competent environmental agency, however, a lack of capacity at the national regulator is a significant issue hampering the issuing of renewals in a timely manner and as such SLR is not able to confirm the expected date of issue. Permitting aspects of the Juruti Bauxite Mine are discussed in more detail in Section 17.6 of this Technical Report Summary.

The mining operations at Juruti take place on third-party land, and in accordance with the Mining Concession requirements Alcoa has agreements in place with the respective landowners meaning there is no current need to purchase third-party land. This agreement forms a "mining easement", which grants Alcoa access to the mining areas in exchange for compensation payments and as a result there are no other titles, claims, leases, or options applicable to the exploration or mining permit areas which may limit Alcoa's rights.

Table 3-1: Juruti Mineral Rights

Mining Permits	Ownership	Area (ha)[1]	Protocol Date	Expiration Date (if applicable)	Current Phase
808.954/1975	ALCOA World Alumina Brasil Ltda.	9,945	01/10/1975	N/A	Mining Concession
850.010/1991	ALCOA World Alumina Brasil Ltda.	10,000	18/01/1991	N/A	Mining Concession
850.011/1991	ALCOA World Alumina Brasil Ltda.	9,481	18/01/1991	N/A	Mining Concession
Total Mining Concessions (ha)		**29,426[3]**			
751.777/1996	ALCOA World Alumina Brasil Ltda.	2,792	29/10/1996	N/A	Economic Feasibility Submitted (Mining Requirement)
850.026/2001	ALCOA World Alumina Brasil Ltda.	10,000	16/02/2001	N/A	Economic Feasibility Submitted (Mining Requirement)
850.056/2003	ALCOA World Alumina Brasil Ltda.	2,232	17/02/2003	N/A	Economic Feasibility Submitted (Mining Requirement)
850.133/2006	ALCOA World Alumina Brasil Ltda.	884	17/03/2006	N/A	Economic Feasibility Submitted (Mining Requirement)
850.243/2002	ALCOA World Alumina Brasil Ltda.	8,122	29/10/2002	N/A	Economic Feasibility Submitted (Mining Requirement)
850.357/2001	ALCOA World Alumina Brasil Ltda.	9,102	21/09/2001	N/A	Economic Feasibility Submitted (Mining Requirement)
850.376/2003	ALCOA World Alumina Brasil Ltda.	5,583	18/08/2003	N/A	Economic Feasibility Submitted (Mining Requirement)
850.504/2000	ALCOA World Alumina Brasil Ltda.	9,597	17/10/2000	N/A	Economic Feasibility Submitted (Mining Requirement)
850.505/2000	ALCOA World Alumina Brasil Ltda.	8,175	17/10/2000	N/A	Economic Feasibility Submitted (Mining Requirement)
850.506/2000	ALCOA World Alumina Brasil Ltda.	10,000	17/10/2000	N/A	Economic Feasibility Submitted (Mining Requirement)
850.580/2003	ALCOA World Alumina Brasil Ltda.	3,996	10/11/2003	N/A	Economic Feasibility Submitted (Mining Requirement)
850.355/2001	Matapu Sociedade de Mineraçao Ltda.	9,739	21/09/2001	N/A	Economic Feasibility Submitted (Mining Requirement)
808.953/1975	ALCOA World Alumina Brasil Ltda.	3,824	01/10/1975	N/A	Economic Feasibility Submitted (Mining Requirement)
850.350/2010	ALCOA World Alumina Brasil Ltda.	8,750	07/05/2010	19/12/2022	Claim area (Drilling program for final report)
850.351/2010	ALCOA World Alumina Brasil Ltda.	211	07/05/2010	19/12/2022	Claim area (Drilling program for final report)

Mining Permits	Ownership	Area (ha)[1]	Protocol Date	Expiration Date (if applicable)	Current Phase
850.352/2010	ALCOA World Alumina Brasil Ltda.	382	07/05/2010	19/12/2022	Claim area (Drilling program for final report)
850.576/2017	ALCOA World Alumina Brasil Ltda.	8,661	13/07/2017	N/A	Claim area (Drilling program for final report)
850.577/2017	ALCOA World Alumina Brasil Ltda.	5,394	13/07/2017	N/A	Claim area (Drilling program for final report)
850.091/2020	ALCOA World Alumina Brasil Ltda.	8,997	31/01/2020	26/05/2023	Claim area (Drilling program for final report)
850.968/2010	ALCOA World Alumina Brasil Ltda.	612	14/12/2010	19/12/2022	Claim area (Drilling program for final report)
880.112/2002	ALCOA World Alumina Brasil Ltda.	6,070	30/10/2002	N/A	Claim area (Drilling program for final report)
880.113/2002	ALCOA World Alumina Brasil Ltda.	9,506	30/10/2002	N/A	Claim area (Drilling program for final report)
880.116/2002	ALCOA World Alumina Brasil Ltda.	9,700	30/10/2002	N/A	Claim area (Drilling program for final report)
850.335/2001	Matapu Sociedade de Mineraçao Ltda.	9,466	21/08/2001	19/12/2022	Claim area (Drilling program for final report)
850.336/2001	Matapu Sociedade de Mineraçao Ltda.	9,712	21/08/2001	19/12/2022	Claim area (Drilling program for final report)
850.337/2001	Matapu Sociedade de Mineraçao Ltda.	9,660	21/08/2001	19/12/2022	Claim area (Drilling program for final report)
850.338/2001	Matapu Sociedade de Mineraçao Ltda.	9,378	21/08/2001	19/12/2022	Claim area (Drilling program for final report)
880.114/2002	ALCOA World Alumina Brasil Ltda.	8,800	30/10/2002	N/A	Claim area not gazetted
880.115/2002	ALCOA World Alumina Brasil Ltda.	8,521	30/10/2002	N/A	Claim area not gazetted
	Total Other (ha)	**197,866**			
880.078/2003	Omnia Minérios S.A.	7,422	12/11/2003	N/A	Claim area dropped
880.017/2003	ALCOA World Alumina Brasil Ltda.	7,922	08/04/2003	N/A	Claim area dropped

Notes:

1. Numbers may not add due to rounding.
2. Matapu Sociedade de Mineraçao Ltda is a wholly owned subsidiary of Alcoa World Alumina Brasil Ltda
3. Overlapping Mining Concessions 808.954/1975 and 850.010/1991 result in a true total Mining Concession area of 29,410 ha

Figure 3-3 illustrates the various concessions held by Alcoa in association with the Juruti Bauxite Mine. Figure 3-4 also illustrates the Mining Concessions relative to the current boundaries of the Juruti Bauxite Mine.

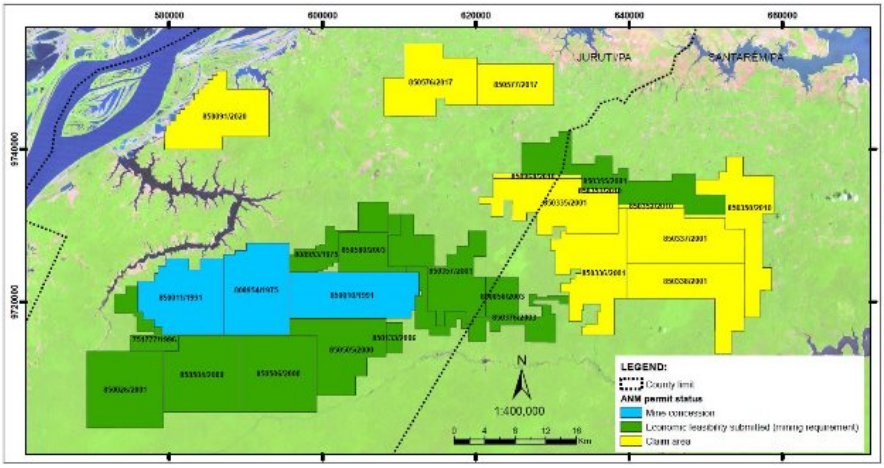


Figure 3-3: Juruti Block Permit Status (Alcoa, 2021)

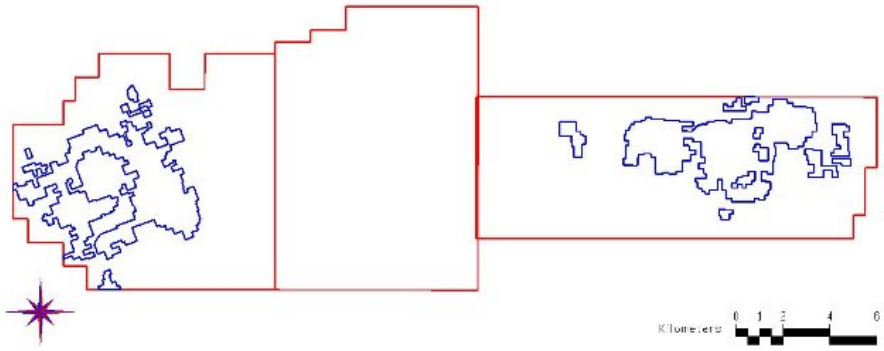


Figure 3-4: Juruti Bauxite Mine boundaries versus mining permits (Alcoa, 2022)

Figure 3-5 below similarly illustrates the permit status in relation to the Nhamundá Block which is north of the Juruti Block on the opposite side of the Amazon River and adjacent to the Nhamundá River.

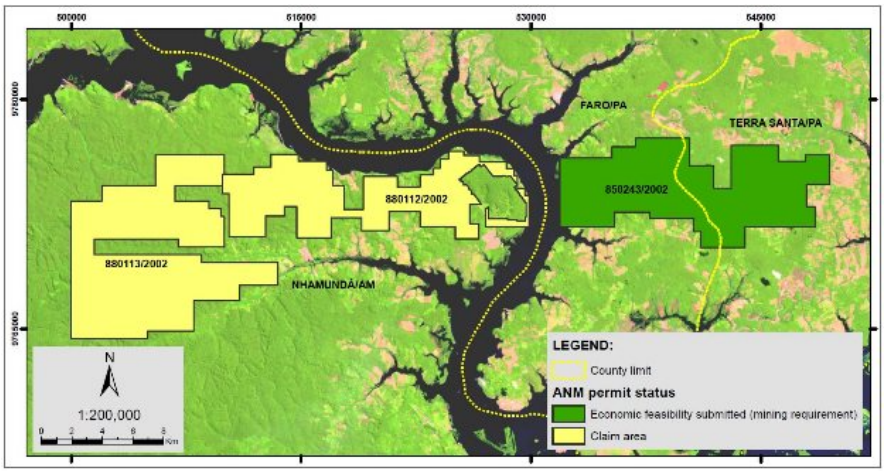


Figure 3-5: Nhamundá Block Permit Status (Alcoa, 2021)

4.3 Encumbrances

Pursuant to information obtained, Alcoa reports that there are no liens and encumbrances. Alcoa submits an Annual Environmental Report in compliance with the Juruti operating licenses and approvals. No significant compliance issues were identified in the 2019/2020 and 2020/2021 Annual Environmental Reports.

Despite previous issues reported with the local communities, these have since been resolved through Alcoa's engagement. SLR was made aware of two environmental incidents which led to siltation of downstream watercourses in December 2020 and March 2021. A full environmental assessment was conducted in each case and the incidents were reported to the regulators. Alcoa has therefore demonstrated that the mine reports and addresses any non-compliance issues and incidents. SLR is not aware of any other violations and any fines incurred by Alcoa with respect to the Juruti Mine.

4.4 Royalties

Royalties paid by Alcoa with respect to the Juruti bauxite mine total 4.5% and include the Brazilian Mining Royalty (CFEM) payments of 3%, and landowner royalty payment of 1.5%.

4.5 Other Significant Factors and Risks

SLR is not aware of any environmental liabilities on the property. Alcoa has indicated that they hold all required permits to conduct the proposed work on the property, having lodged permit renewals 120 days prior to expiry as required by law for all approvals. Lack of capacity at the regulator is a significant issue hampering the formal issuance of renewals in a timely manner. SLR is not aware of any other significant

factors and risks that may affect access, title, or the right or ability to perform the proposed work program on the property.

5.0 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

5.1 Accessibility

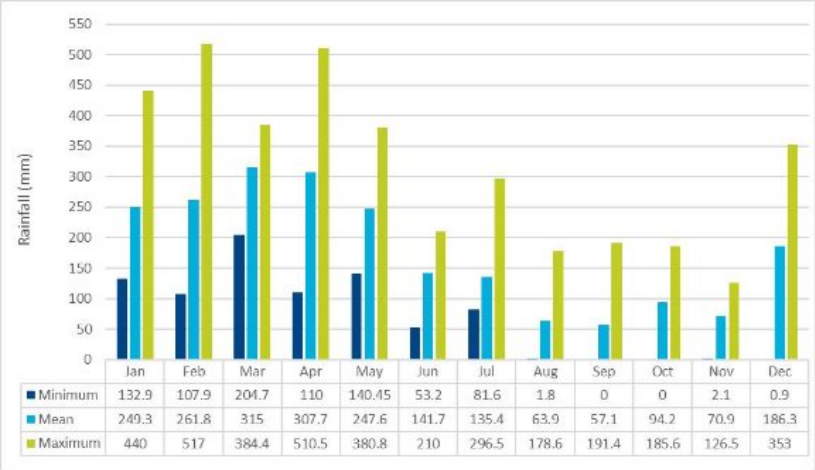
As described in previous sections, the Juruti Bauxite Mine is located the west of Pará State approximately 55 km from the town of Juruti on the southern shore of the Amazon River and near the border with Amazonas State to the west. The Juruti mining area is connected to Juruti town and port facilities by a dedicated site road that joins to the PA-257 road near Juruti town, and a dedicated, private railway between the mining area and port.

There are very few major roads across the region and Juruti itself is generally only accessible by road from nearby villages on the same section of Amazon River before its junction with the Tapajós River from the south. The only major road in this area is the PA-257.

The nearest major city to Juruti is Santarém, approximately 160 km to the east which is only accessible by either boat (approximately 6 hours) or by air (approximately 1 hour) from Juruti Airport (JRT) to Santarém-Maestro Wilson Fonseca Airport (STM). National roads connect Santarém to the rest of Pará State including the port city of Belém on Brazil's northern coast, approximately 1,400 km by road via the 230 and PA-151 roads.

5.2 Climate

The Juruti Bauxite Mine is located in the northern region of Brazil in the Amazon River catchment area which experiences one of the highest rainfall rates in the country. Rainfall and climate data is collected via a meteorological / weather station in Juruti (Figure 4-1). Annual rainfall is typically highest in the months of February to April, averaging around 300 mm per month but ranging from 100 – 500 mm. The lowest rainfall is generally observed in the months of August to October averaging 50 – 100 mm but can be up to 200 mm per month.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Minimum	132.9	107.9	204.7	110	140.45	53.2	81.6	1.8	0	0	2.1	0.9
Mean	249.3	261.8	315	307.7	247.6	141.7	135.4	63.9	57.1	94.2	70.9	186.3
Maximum	440	517	384.4	510.5	380.8	210	296.5	178.6	191.4	185.6	126.5	353

Figure 4-1: Historical rainfall recorded by the Juruti meteorological station (Alcoa, 2021)

In line with annual variations in temperatures, evaporation rates also vary throughout the year which can influence the behavior of tailings disposal facilities and the quantity of water than can typically be recovered. Evaporation rates are generally highest in September to November and lowest in April and May.

Mining at Juruti operates 24 hours per day and 7 days per week. Therefore, mine operations take place year round.

5.3 Local Resources

While the Juruti Bauxite Mine is in a relatively remote location and largely inaccessible by road, the mine itself is well established having been in commercial operation since 2009. During this time, the resources, services, and facilities available in the town of Juruti have expanded significantly. The town is a short flight from Santarém which offers a greater range of local resources as required and is located on the Amazon River providing transport and logistics route to the wider Pará State.

5.4 Infrastructure

Infrastructure required for bauxite mining operations is well-established and available, the majority of which is located within the area of the Juruti Bauxite Mine, around 55 km south of the town of Juruti. The required infrastructure includes the following, with additional information provided in Section 15.0:

- Rail siding and rail loading facilities for the transportation of ore and product
- Bauxite beneficiation plant comprising ore crushing (primary and secondary) and washing (scrubbing, screening, cyclone separation, filtering) plants
- Mine waste facilities including tailings thickening lagoons and tailings disposal ponds

- Stockpiles and material handling equipment including conveyors
- Ancillary buildings including administrative and mine site offices, warehouses, laboratory, and workshops
- Fuel station
- Water supply system comprising water collection pumps installed on a raft in the Juruti Grande stream north on the mining infrastructure and plant area, and a water pipeline corridor of approximately 9 km. A portion of the water is also reclaimed from the tailings ponds and re-used by the beneficiation plant.
- Power generation through Thermoelectric Units (UTE) under a power purchase agreement with Petrobras Distribuidora S.A. (Petrobras). Two units are located at the mine site and port, each supplying 13.8 kV into dedicated electrical substations. Power is distributed by overhead insulated transmission lines installed by Alcoa and downrated by secondary substations.
- Surface water management and pumping systems, including a wastewater (effluent) treatment plant.
- Off-site rail corridor connecting the mine to Juruti port and access road
- Port facilities including rail siding, materials handling equipment/conveyors, and ship loader with capacity for 75,000-ton vessels.
- There is a total of 485 Alcoa personnel employed at the Juruti Bauxite Mine. There is no on-site accommodation due to the proximity to Juruti town. The mine is also supported by additional Contractor personnel which are discussed in more detail in Section 13.9.

Juruti port and airport are considered critical for the transportation of materials, supplies, and personnel to the mine.

5.5 Physiography

The Juruti Bauxite Mine is located within the Amazon Sedimentary Basin and catchment area. The physiography of the project area is characterized by extensive plateaus which range from 70 to 190 m above sea level. Surface water within the mining area typically drains from these plateaus northwards towards the Juruti Grande stream.

Vegetation across the mining area is characterized as being within the Amazon rainforest, the world's largest area of tropical rainforest with high floral and faunal diversity.

6.0 HISTORY

6.1 Prior Ownership

Prior to acquisition by Alcoa in 2000, the Juruti mining area was previously under ownership of Pechiney S.A., a French exploration and development company, now known as Rio Tinto Alcan.

6.2 Exploration and Development History

Initial prospecting and exploration across the Juruti deposits were originally undertaken in 1972 and 1973 by previous owners. The first drilling of the deposit is known to have been completed by Reynolds Group Holdings.

Details of historical drilling procedures are limited to orientation (vertical) and drilling type (auger or well type).

The historical auger sampling method consisted of cutting through the lithologies with an auger-type shell, using a combination of rotational movements provided mechanically, and the downward vertical pressure/force exerted by the equipment. The overlying clays and the capping material were discarded next to the holes, after which sampling commenced. Sampling was typically undertaken in small increments with the rate of penetration dependent on the competence / hardness of the underlying horizons. Each sample taken from the hole was placed on a plastic tarp and its length measured. Sampling was undertaken within each lithological horizon, with effort made to avoid sampling across horizon boundaries. As a result, sample sizes were known to be variable.

There is no information available for wells.

The Juruti project was later acquired by Alcoa in 2000 and following further exploration and technical evaluation, production commenced in 2009.

6.3 Past Production

The following Table 5-1 provides a summary of the Run-of-Mine (RoM) production from the Juruti Bauxite Mine since 2014, in addition to a breakdown of the crushed, unwashed, and washed bauxite production. The washing plant mass recovery for each year is also included.

This past production data highlights the Juruti Bauxite Mine as a longstanding mining operation.

Table 5-1: Past Production from Juruti Bauxite Mine 2014 – 2021[1] (Alcoa, 2021)

Year	RoM (t)	Crushed Bauxite (t)	Unwashed Bauxite (t)	Washed Bauxite Product (t)	Washing Plant Mass Recovery (%)
2014	6,412,807	6,412,807	-	4,773,862	74.00
2015	6,453,910	6,453,910	314,438	5,362,360	75.90
2016	7,363,186	6,146,474	1,216,712	4,670,847	76.10
2017	8,043,325	6,709,616	1,333,619	5,052,595	75.60
2018	8,451,754	7,500,427	951,328	5,678,137	75.64

Year	RoM (t)	Crushed Bauxite (t)	Unwashed Bauxite (t)	Washed Bauxite Product (t)	Washing Plant Mass Recovery (%)
2019	8,726,203	7,557,043	1,078,118	5,850,453	75.28
2020	9,189,820	7,921,648	1,203,965	5,976,754	75.71
2021[1]	9,032,457	8,029,004	956,705	6,044,409	74.88

Note:

1. 2021 production represents Actual and September forecasts

7.0 GEOLOGICAL SETTING, MINERALIZATION, AND DEPOSIT

7.1 Regional Geology

The Juruti area is located in the lower part of the Amazonian basin, south of the Amazon River, between the Guyana and Brazilian Shields. Parent deposits which form the base of the bauxite sequence belong to the Alter-do-Chao Formation comprising continental sedimentary deposits that accumulated in a fluvial-lacustrine environment and consist of sandstones, siltstones, mudstones, and quartz breccias. Bauxites are known to have formed during intense lateritic alteration of the Cretaceous (145 to 66 Ma) siliciclastic parent deposits which is estimated to have occurred during the Eocene (56 to 34 Ma).

Cretaceous deposits were later covered by tropical soils as a product of root activity resulting in a kaolinitic and alumina-goethite deposited during flooding events in the Miocene (23 to 5 Ma). The regional geomorphology and geochemical composition of the bauxite deposits are also known to have been influenced by several secondary erosion and weathering events.

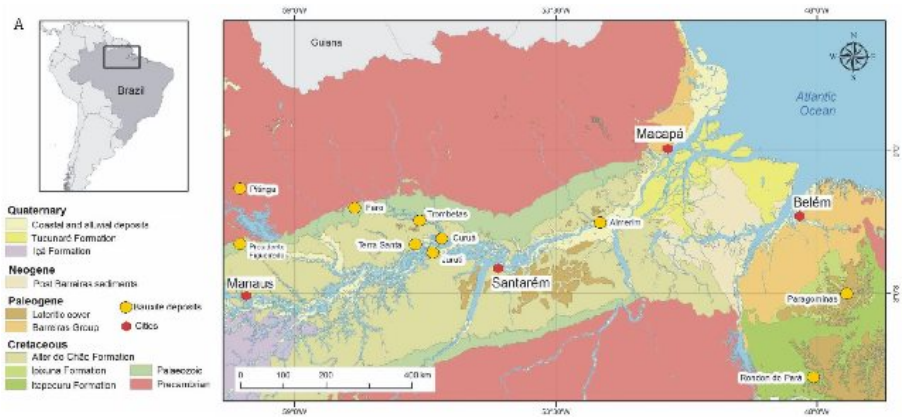


Figure 6-1: Simplified Regional Geology of Eastern Amazon (adapted from Negrao, 2018)

7.2 Local Geology

The evolution of bauxite in this region is generally accepted to have occurred through a combination of intense weathering and geochemical alteration, leaching by meteoric waters, and accumulation of alumina and iron-rich horizons, in addition to periodic erosion and redeposition of upper horizons.

The lowermost horizon of the bauxitic deposits is comprised of clayey, silty, and sandy layers of a weathered clastic sediment which is related to the Cretaceous Alter-do-Chao Formation. These horizons form gently undulating plateaus ranging from 100 m to 170 m above the level of the Amazon, surrounded by drainage erosion channels. While these plateaus cover extensive areas both north and south of the Amazon, not all are bauxitic, despite being within the same geomorphological and climatic area on top of the same sedimentary formation, and many are characterized by thick accumulations of kaolinitic layers.

The bauxitic plateaus can be characterized by five major horizons, often exhibiting gradational transitions through each, although sub-horizons are known to exist which have been historically classified through investigations of microfacies and microscopic textures.

- Kaolinitic loose yellow clay, also referred to as Belterra Clay, typically seen as being homogenous with some small gibbsite and goethite and characterized as petrogenic from geochemical processes
- Nodular horizon of gibbsitic and hematitic nodules, commonly embedded in yellow clay material, particularly near the base, with nodules gradually becoming smaller in size upwards in the horizon.
- Indurated iron-rich horizon overlain by an indurated bauxite, typically grading from white and pink, to yellowish-red as gibbsite crystals gradually disappear with increasing hematite and kaolinite content, trending to yellow and pink near the top with increasing gibbsite
- Kaolinitic mottled horizon, typically mottled white and pale red in color kaolinitic clays which commonly exhibits a gradational boundary with the underlying silty and sandy sediment horizon. The unit is generally between 5 m and 10 m thick, which towards the top has increasing gibbsite with common kaolinitic alternation and/or replacement.
- Quartz-kaolinitic weathered clastic sediment horizon, composed of sandstones, siltstones, and mudstones originating from the regional Alter-do-Chao Formation.

These major horizons are illustrated in Figure 6-2.

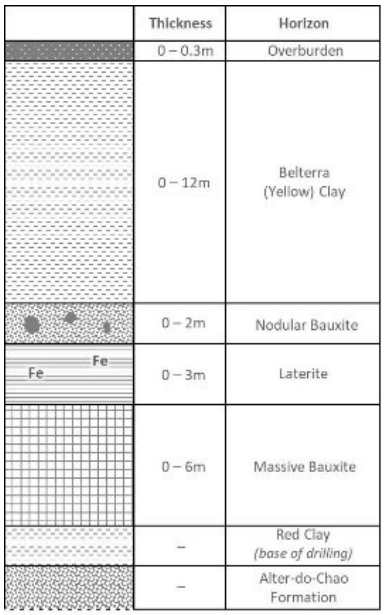


Figure 6-2: Simple stratigraphic column of the Juruti bauxite plateau (SLR, 2022)

The above horizons have been interpreted to have formed during three main episodes of weathering:

1. Initial ferruginization of sediments creating a ferricrete which has been observed in soils across the Amazon basin area and formed from intense weathering of basal parent sediments

2. Bauxitization by the formation of gibbsite crystals, forming massive bauxite horizons. The formation of bauxitic and non-bauxitic plateaus across the region has been attributed to the difference in kaolinite content of original parent material during this period of weathering.

3. Intense silicification and geochemical processes resulting in the formation of kaolinitic clays on top of the original bauxite horizon

7.3 Property Geology

The detailed stratigraphy of the Juruti deposit based on extensive exploration drilling and detailed geological logging is comprised of, with increasing depth, a mottled clay horizon at the base topped with a massive bauxite layer, overlain by a ferricrete crust with hematite and gibbsite nodules, and an overlying yellow clay at surface (Table 6-1). In comparison to their lateral extent over tens of kilometers, the overall thickness of the bauxite deposits is relatively thin.

Table 6-1: Juruti deposit stratigraphy

Stratigraphic Horizon	Thickness range (m)	Description
Belterra (yellow) Clay	0 – 12	Homogenous and permeable kaolinite clay layer formed from chemical alteration
Nodular Bauxite	0 – 2	Discontinuous across the deposit, occurring as nodules of fine gibbsite crystals in a kaolinite matrix with increasing iron (hematite) content with depth. Horizon can be split into an upper, non-economic and lower, economic sub-horizon
Laterite	0 – 3	Low silica with varying color, hardness, texture, and iron (hematite) content
Massive Bauxite	0 – 6	Mainly gibbsite, hematite, and kaolinite, averaging 2 m thick, showing replacement of silica with hematite towards the top. Represents the primary mineralized horizon of economic interest.
Red Clay	-	Silty clay, rich in gibbsite, kaolinite, and hematite. Total depth not commonly proven in drilling across the deposit.
Alter-do-Chao Formation	-	Arkose sandstones, siltstones, and mudstones

Figure 6-3 and Figure 6-4 below illustrate cross sections through the geological models of the Capiranga Central and Maurai plateaus showing the major stratigraphic horizons described above.

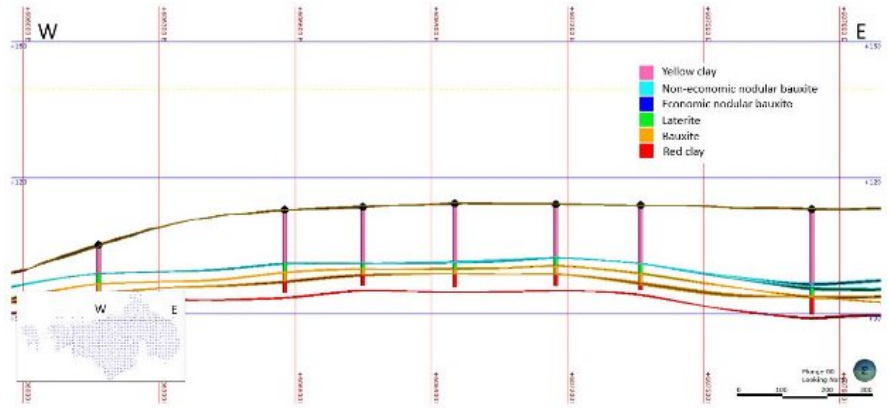


Figure 6-3: Capiranga Central geological section. Vertical exageration: 10x (SLR, 2022)

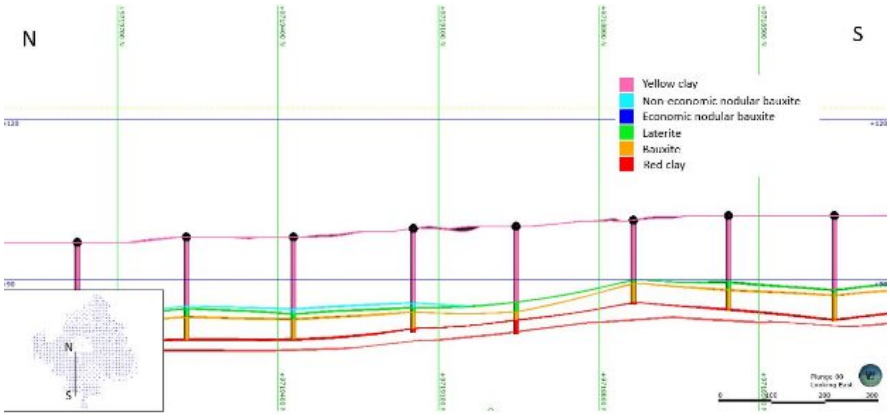


Figure 6-4: Mauari geological section. Vertical exageration: 10x (SLR, 2022).

7.4 Mineralization

Bauxite mineralization principally occurs as microcrystalline gibbsite ($Al(OH)_3$), along with accessory minerals of hematite (Fe_2O_3), goethite ($FeO(OH)$), kaolinite ($Al_2Si_2O_5(OH)_4$), and anatase (TiO_2). The mineralization of each of the stratigraphic horizons observed across the Juruti deposits are classified

based on a combination of visual inspection during drilling and sampling, and the results of chemical analysis. The chemical compositions used to define each of the major horizons are shown in Table 6-2.

Table 6-2: Chemical limits used to define each horizon

Lithological Domain	A.Al_2O_3	R.SiO_2	Fe_2O_3
Yellow clay	-	-	-
Non-economic nodular bauxite	<45%	>8%	<20%
Economic nodular bauxite	≥45%	≤8%	≤20%
Laterite	<35%	-	>34%
Bauxite	≥35%	≤8%	≤34%
Red clay	-	>8%	-

Table 6-3 below provides a summary of the stratigraphic horizons interpreted during exploration across each of the Juruti plateaus.

Table 6-3: Summary of stratigraphic horizons within bauxite plateaus

Plateau	Description	Yellow clay	Non-economic nodular bauxite	Economic nodular bauxite	Laterite	Bauxite	Red clay[1]
Capiranga Central	Avg. Thickness (m)	10.32	0.98	1.56	1.80	2.23	2.17
	Avg. Top Depth (m)	---	10.32	11.30	12.86	14.66	16.89
Mauari	Avg. Thickness (m)	11.61	0.96	0.95	1.48	2.39	1.27
	Avg. Top Depth (m)	---	11.61	12.57	13.52	15	17.39
Mutum	Avg. Thickness (m)	8.57	1.51	---	1.63	2.90	1.15
	Avg. Top Depth (m)	---	8.57	---	10.08	11.71	14.61
Nhamundá	Avg. Thickness (m)	5.53	1.55	---	1.50	3.98	0.84
	Avg. Top Depth (m)	---	5.53	---	7.08	8.58	12.56
Santarém	Avg. Thickness (m)	11.84	1.04	---	1.81	2.53	1.43
	Avg. Top Depth (m)	---	11.84	---	12.88	14.69	17.22
São Francisco	Avg. Thickness (m)	12.10	1.70	---	1.55	3.80	1.21
	Avg. Top Depth (m)	---	12.1	---	13.8	15.35	19.15

Notes:

1. The red clay thickness values are the length drilled in this lithotype, although given this unit it an indicator of the total depth of mineralization, drilling does not commonly define the total thickness of this lithotype.

7.5 Deposit Types

Bauxite deposits, sedimentary deposits with economic concentrations of aluminum oxide, represent the world's major source of aluminum and consist primarily as the minerals gibbsite ($Al(OH_3)$), boehmite, and diaspore, and commonly found alongside iron oxide minerals including goethite and hematite, kaolinite clay minerals, and minor concentrations of titanium oxide minerals such as anatase and ilmenite.

Bauxite formation is widely known to occur through two main depositional mechanisms:

- **Lateritic bauxite**: formed through intense chemical weathering and accumulation of residual and transported material on top of aluminosilicate-rich parent rocks. The Juruti deposit is classified as a lateritic bauxite deposit.
- **Karstic bauxite**: formed on top of carbonate / paeleokarstic surfaces and karst depressions by the accumulation of aluminosilicate-rich clays at the time of chemical weathering and dissolution of carbonate rocks.

Lateritic bauxite deposits are generally associated with a tropical (hot and humid) environment which is a principal driver in the chemical weathering processes required. As a result, lateritic bauxite deposits are globally known to exist across Central and South America, West Africa, Central Asia, and Australia. Conversely, karstic bauxites more commonly occur at higher latitudes including Jamaica, Southern and Eastern Europe, Russia, and China.

8.0 EXPLORATION

8.1 Exploration

Limited details on regional and exploration drilling procedures conducted by previous operators are available. SLR understands that the Nhamundá plateau is characterized by a combination of historical well and auger type drill holes and some recent AC holes completed by Alcoa. The Mutum, Santarém, and São Francisco plateaus are characterized using historical auger type drill holes.

Alcoa exploration is focussed on initial mapping to define the extents of each plateau and follow up drilling at wide spacing to confirm mineralization. Prospective areas defined from this drilling are infilled in line with company objectives.

8.1.1 Alcoa Exploration

The primary means of exploration by Alcoa has been through AC drilling, in which drill cuttings are recovered as a sample through the injection of compressed air into the drill hole. This method is a common technique in unconsolidated ground, and the SLR QP is of the opinion that it is appropriate for use in the exploration of bauxite. Drilling is undertaken across several plateaus, the relative location of which are illustrated in Figure 7-1. Since acquisition in 2000, exploration drilling by Alcoa has focused on Capiranga, Capiranga Central, Mauari, and Guaraná, and results have superseded the historical data.

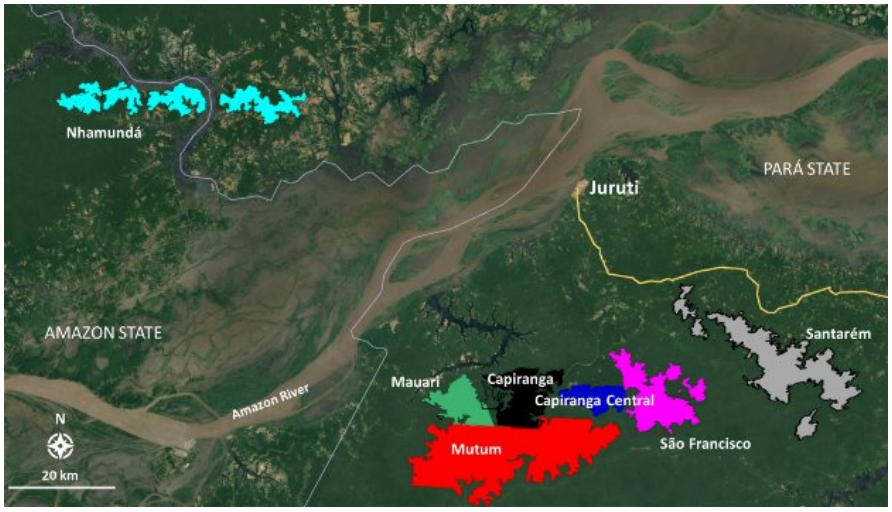


Figure 7-1: Plateaus limits of the Juruti operation (Alcoa, 2022).

8.2 Drilling

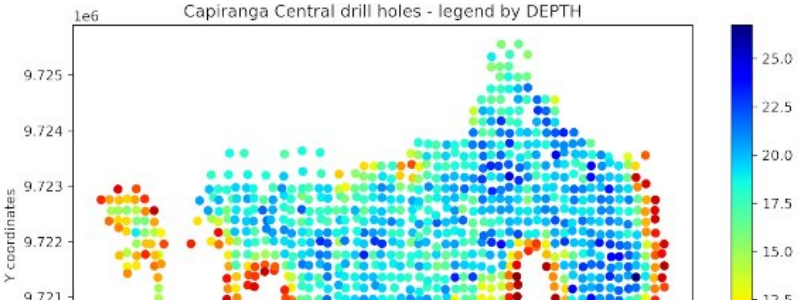
8.2.1 Drilling Summary

Drilling across the numerous plateaus that comprise the Juruti mining area was predominantly undertaken from 2007 to 2019; there has been no drilling in 2020 or 2021. A total of 3,146 drill holes for 50,628 m of drilling has been completed as shown in Table 7-1.

Table 7-1: Juruti drilling programs

Plateau	Year	No. of holes	Total Length (m)
Capiranga Central	2017	232	3,871.83
	2018	509	8,429.91
	2019	191	3,292.30
	Total	**932**	**15,594.04**
Mauari	2014	114	1,826.15
	2015	568	9,541.46
	2016	174	2,656.13
	Total	**856**	**14,023.74**
Mutum	2001	15	195.50
	2002	165	1,934.90
	2003	37	502.50
	2007	77	1,202.50
	2008	179	2,751.10
	Total	**473**	**6,586.50**
Nhamundá	2004	4	64.40
	2005	31	461.70
	2006	16	234.80
	2008	14	235.90
	2009	161	1,522.10
	2010	58	845.70
	Total	**284**	**3,364.60**
Santarém	2004	4	64.40
	2003	34	567.40
	2005	30	521.80
	2006	18	326.40
	2007	86	1,535.10
	Total	**214**	**3,689.10**
São Francisco	2002	9	173.10
	2003	39	733.70
	2004	192	3,850.30
	2006	126	2,281.60
	2007	21	331.00
	Total	**387**	**7,369.70**
Total		**3,146**	**50,627.68**

Figure 7-2 to Figure 7-7 illustrate the distribution of drilling that has been undertaken across each of the Juruti bauxite plateaus included within the Mineral Resource estimate.



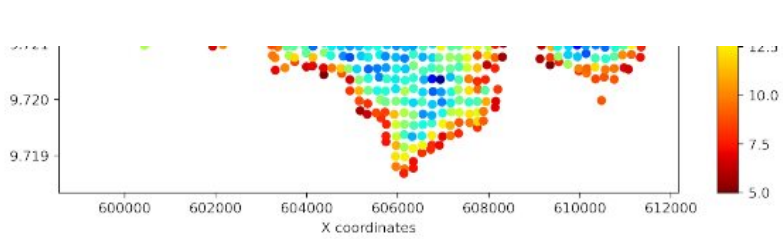


Figure 7-2: Capiranga Central plateau drill hole distribution (SLR, 2022)

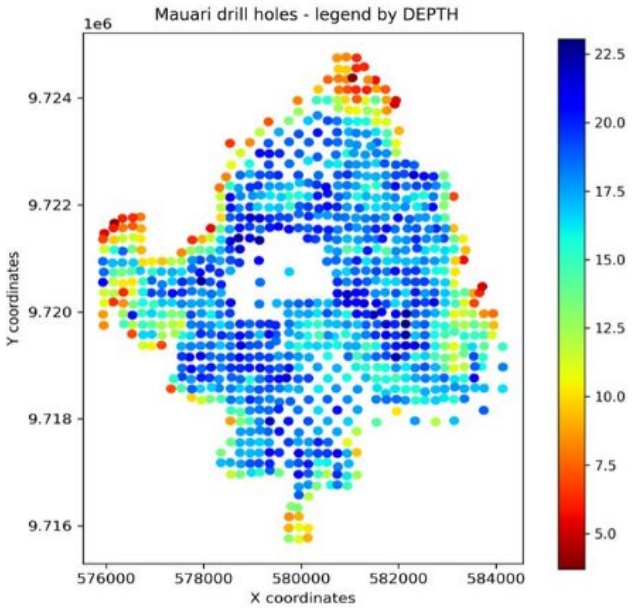


Figure 7-3: Mauari plateau drill hole distribution (SLR, 2022)

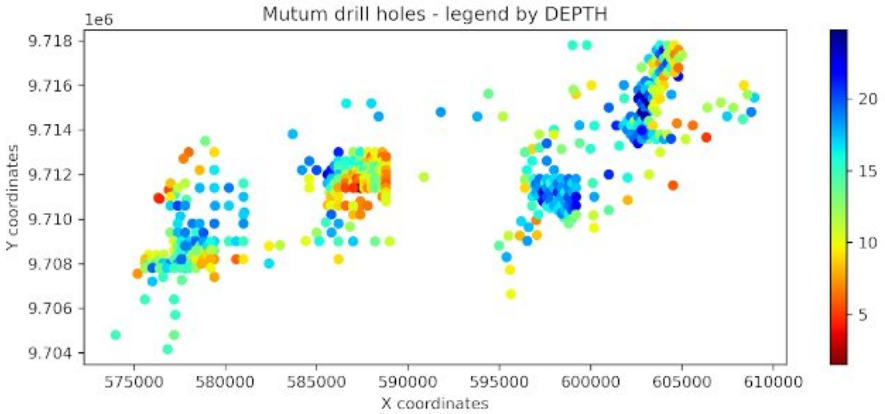


Figure 7-4: Mutum plateau drill hole distribution (SLR, 2022)

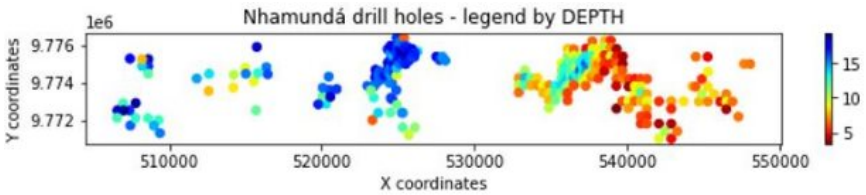


Figure 7-5: Nhamundá plateau drill hole distribution (SLR, 2022)

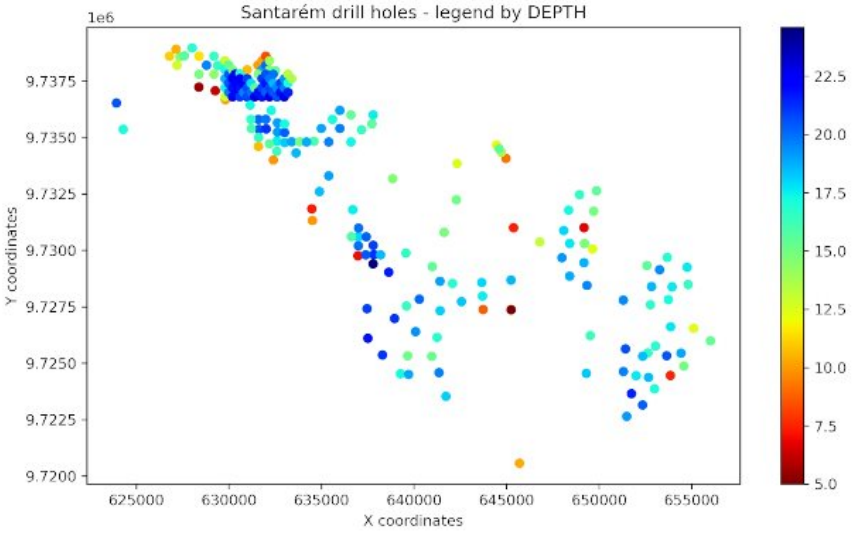


Figure 7-6: Santarém plateau drill hole distribution (SLR, 2022)

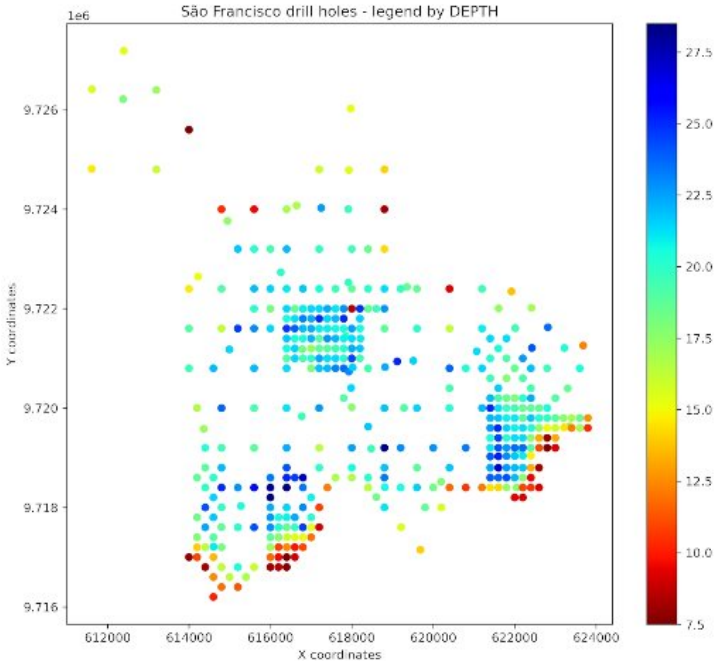


Figure 7-7: São Francisco plateau drill hole distribution (SLR, 2022)

The data from the Capiranga Central and Mauari plateaus are from AC drilling. For Mutum, Santarém and São Francisco plateaus, the information used for the Mineral Resources are from auger drill holes. The Nhamundá plateau is supported by well, AC and auger information (Figure 7-8).

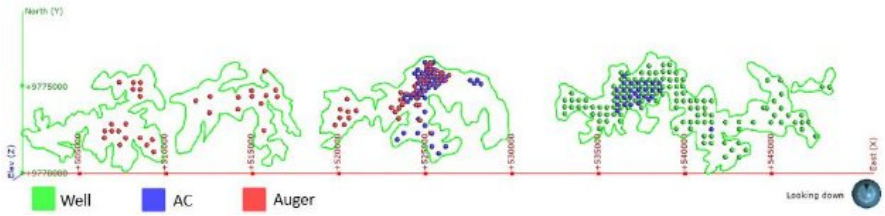


Figure 7-8: Drilling by type - Nhamundá plateau

8.2.2 Drill Spacing

Initial exploration drilling campaigns are performed on an 800 m grid over the plateaus. Prospective results are followed up with infill drilling campaigns of 400 m and finally 200 m grid spacing. Plateaus are drilled to within 50 m of the plateau limits to be able to confirm mapped mineralization extents using drilling. Alcoa plans to confirm mineralization in all plateaus using AC drilling over the next decade. SLR supports this initiative.

In the months ahead of scheduled mining, Alcoa consolidates the drilling results on a 50 m by 100 m grid. This drilling, called short-term drilling, is used to create a short-term model for mine planning and is not integrated into the long-term model.

For the Capiranga Central and Mauari plateaus, drill spacing has been mainly carried out on a regular grid pattern of 200 m by 200 m. In some specific locations, such as at the plateau limits or in the north part of the Capiranga Central plateau, the drill spacing increases to approximately 400 m by 400 m. The exploration plan is to have these plateaus completely drilled on 200 m by 200 m spacings during 2022.

For the Mutum, Nhamundá, Santarém, and São Francisco plateaus, drill holes were completed by previous operators using auger type drilling and the drill hole spacing is variable. On the Mutum and São Francisco plateaus, which are the closest plateaus to the Capiranga Central and Mauari plateaus, areas may be characterized by drill hole spacings of 200 m by 200 m, 400 m by 400 m or 800 m by 800 m. Alcoa plans to have these plateaus defined using AC drilling at a spacing of 200 m by 200 m by 2027.

Most drilling in the Santarém plateau is defined by an irregular drill hole grid ranging from closely spaced to 700 m up to 1,500 m. In the northwest region there is a small area with regular drill spacing of 400 m by 400 m. Alcoa plans to have this plateau defined using AC drilling at a spacing of 200 m by 200 m by 2029.

The Nhamundá plateau is located on the north side of Amazon River, 70 km in the northwest direction in a straight line from Juruti site, and is the furthest plateau from the Juruti site. The drilling in this plateau was carried out using a combination of wells, auger and AC holes, and the exploration plan is to have the entire plateau drilled using AC. The drill spacing is irregular however on average the drill hole spacing is 400 m by 400 m. In areas drilled by AC, the spacing is approximately 100 m by 100 m. The exploration plan is to have this area drilled to 200 m by 200 m spacing between 2030 and 2032.

8.2.3 Drilling Procedures

The following summary includes details of drilling procedures executed by Alcoa. Details of historical drilling procedures is limited to orientation (vertical) and drilling type (auger or well type).

All holes completed by Alcoa across the plateaus have been drilled vertically and given the shallow nature of the deposit, no downhole surveys have been undertaken on any of the holes. Drilling is undertaken by external contractors and the drilling procedures are typically dictated by the material types being drilled; either unmineralized, superficial deposits or mineralized laterite deposits.

- **Unmineralized**: overlying superficial clay deposits are commonly found to cap the underlying bauxite deposits. Drilling of this unconsolidated material is generally done using a large 8-inch diameter, high-pressure AC drill which can sufficiently recover material to the surface. No samples are taken from this horizon. The lower boundary of the horizon is typically identified by the presence of lateritic gravels comprising small rock fragments.

- **Mineralized**: following the removal of overlying clays and gravels, the drilling method is changed to coring with the use of an 8-inch outer and 6-inch inner diameter core barrel. Samples of the mineralized horizon are collected from the inner core barrel into PVC tubes. Each drill run is typically 1.15 m in length, with the material recovery recorded after each run. On completion of each run, individual sample intervals in PVC tubes are labelled with the drill hole number, sampled interval, top and bottom depth, and sealed with plastic caps to prevent the loss of sample material.

Figure 7-9 shows an active exploration drill rig in the Juruti area during the SLR site visit.



Figure 7-9: Photo of exploration drilling (SLR, 2021)

Samples are collected from the core barrel into plastic PVC tubes, sealed and labelled at both ends. Geological logging is undertaken by Alcoa's on-site geologists and samples are prepared with the assistance of contracted technicians (Figure 7-10). Samples are logged, weighed, and stored in sealed plastic bags each of which is clearly labelled and barcoded before being sent for assaying. All drill cores are photographed on completion.



Figure 7-10: Photo of sample logging and preparation facilities (SLR, 2021)

8.2.4 Drill Recovery

Each drill hole is evaluated for core / sample recovery after each run through the mineralized horizon. Sample recovery rates in excess of 95% through mineralized horizons are deemed to be acceptable, however, drill holes failing to meet this criterion are rejected. In these instances sample material is discarded, and the hole is re-drilled.

Drill runs typically range from 0.3 m to 1.15 m and are ultimately dictated by the core barrel capacity. After each run, the core barrel is checked to ensure no material / sample loss at the end of the run.

The SLR QP reviewed drill recovery data provided by Alcoa for 932 drill holes across the Capiranga Central plateau and 856 drill holes across the Mauri plateau and noted that recoveries were consistently above 95%. The SLR QP is of the opinion that this satisfies the acceptable limits required to demonstrate sample representativeness.

8.2.5 Lithological Logging

Sealed PVC tubes containing the unconsolidated material recovered during drilling are transported to the core logging facility where Alcoa geologists, engineers, technicians, and skilled assistants process the core. The PVC tubes are arranged sequentially on purpose-built tables, and metal plates are placed between each tube to prevent physical contact of the samples upon tube opening. In sequence, the PVC tubes are opened using two cuts of a circular saw with a dust collector, or a special knife, and the enclosed core lengths are measured, and any changes to the composition or volume of the clay material are noted.

Once exposed, the samples are inspected by geologists, and a description is entered directly into a “Toughbook” within the acQuire™ workspace connected to the server. Samples are logged with reference to a core library and secondary litho-types and relevant peculiarities are noted. Color, structure, texture, interstices, and hardness are all recorded alongside the principal lithology.

All holes used for long term planning are photographed digitally and the hole name and interval recorded.

Core is broken along lithological boundaries using an electric hammer or chisel, and further separated into samples from 0.25 m to 0.50 m in length. These samples are then bagged in plastic bags labelled with drill

hole ID and interval and affixed with a barcode. Sample batches are driven to the onsite Juruti Mine laboratory for sample preparation and analysis and a requisition form is produced in acQuire™.

It is the QP's opinion that there are no known drilling, sampling or recovery factors that could materially affect the accuracy and reliability of the results and that the results are suitable for use in the Mineral Resource estimation.

8.3 Topography

A Digital Terrain Model (DTM) for the Juruti mining area is based on survey / remote sensing data collected using LiDAR (Light Detection and Ranging) by TecTerra Geotecnologias. This topography data is available in UTM coordinate system using the SIRGAS 2000 datum.

Drill hole collars have been surveyed by total station (within active mining areas) and Global Positioning System (GPS) (within exploration areas). For geological modelling, the LiDAR information was used in conjunction with the drill hole coordinates and elevations as follows:

- LiDAR data (Capiranga Central and Mauari)
- Total station, GPS, and SRTM (Shuttle Radar Topography Mission) elevation post processing (São Francisco, Mutum, and Santarém)
- GPS and SRTM elevation post processing (Nhamundá)

8.4 Hydrogeology Data

No site-specific hydrogeological data is available; however, hydrogeological conditions do not influence the mining operations at Juruti.

8.5 Geotechnical Data

No site-specific geotechnical data is available however, as these deposits are shallow, the impact of geotechnical conditions on the mining operations at Juruti is considered minimal.

8.6 Planned Exploration

Alcoa has a robust exploration plan for the next ten years, aimed at improving the data quality and to support the mine operation, for the plateaus that have not yet been drilled by AC (Figure 7-11 and Figure 7-12). The plan covers the all the plateaus where Alcoa has mining permits and will replace the historical drilling information (auger and well) with more accurate drilling and sampling methodologies, including Mutum, Santarém, São Francisco and Nhamundá plateaus.

Table 7-2 provides a summary of the number of holes, total meters and costs associated with the exploration plan between 2022 and 2032..

The SLR QP is of the opinion that the exploration plan is necessary and adequate to support the future mine operation, in addition to developing the mineral potential of the targets and increasing the predictability of the grades and tonnage.

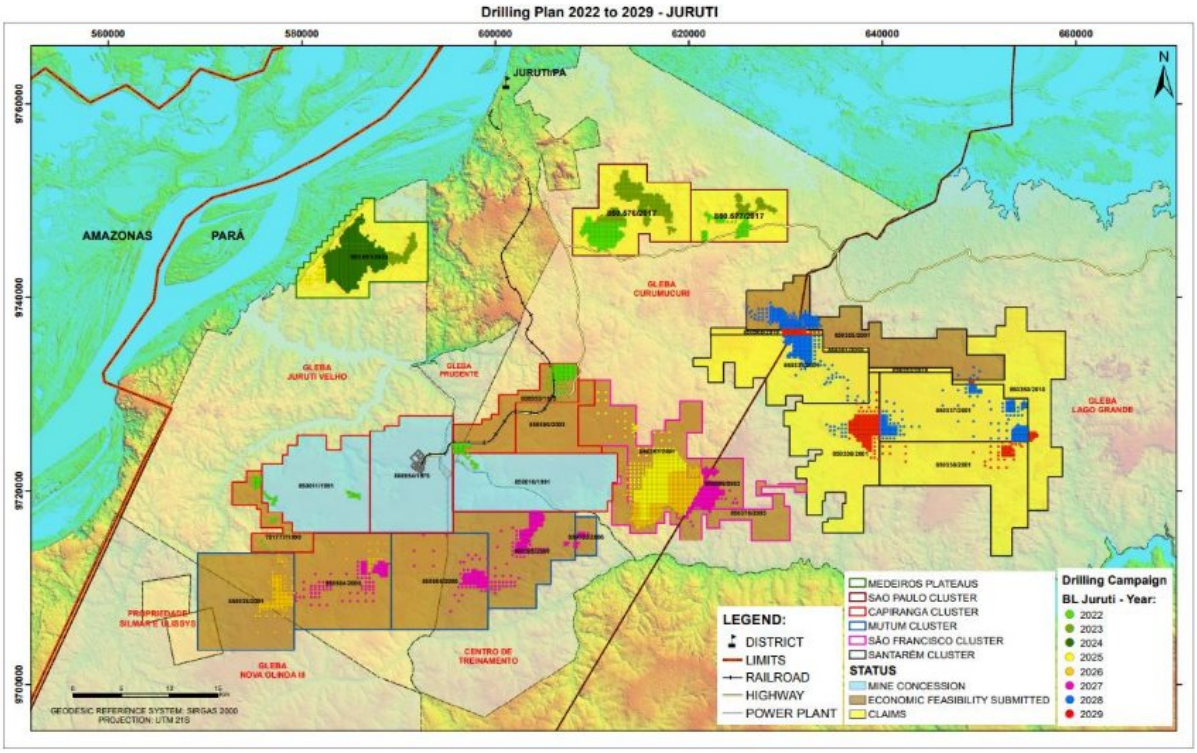


Figure 7-11: Alcoa exploration plan from 2022 until 2029 (Alcoa, 2021).

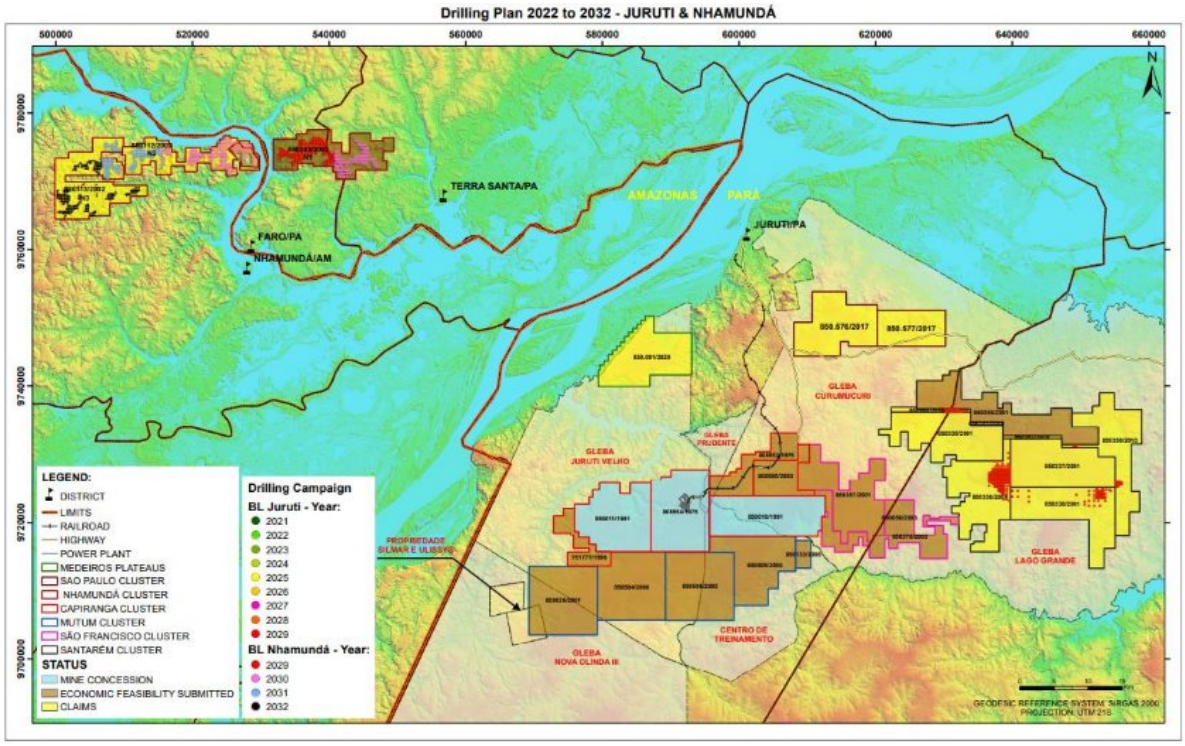


Figure 7-12: Alcoa exploration plan from 2029 to 2032 (Alcoa, 2021).

Table 7-2: Number of holes, total meters and costs associated with the exploration plan (Alcoa, 2021).

	Exploration plan - from 2022 to 2032											
	2022	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**Total**
No. holes	586	559	669	584	625	691	697	731	674	390	349	**6,555**
Meters	11,098	11,244	11,300	11,382	10,897	10,657	11,914	9,867	8,491	5,972	5,235	**108,05**
	Costs (US$000)[1]											
All costs	**2,191**	**2,586**	**2,955**	**2,878**	**2,633**	**2,671**	**3,336**	**2,337**	**2,367**	**1,806**	**2,008**	**27,76**

Notes:

1. The values are in US$ considering the R$:US$ exchange rate of R$5.34:US$1.00
2. The costs are approximate and include drilling, roads, fuel, and others.

9.0 SAMPLE PREPARATION, ANALYSES, AND SECURITY

9.1 Sample Preparation and Analysis

The following summary includes details of sample preparation and analytical procedures executed by Alcoa for the AC samples. For auger samples, a similar methodology was used, however the technologies were simpler. Details of historical procedures are unknown.

All sample preparation and chemical analysis are undertaken at Alcoa's onsite laboratory, the "Juruti Mine Lab". The Juruti Mine Lab is not independent of Alcoa and is not accredited with or certified by a national or international organization for quality management or relevant analytical procedures.

The acQuire™ system in place for drill hole database management is integrated with the Juruti Mine laboratories' Laboratory Information Management System (LIMS). While the system integration allows for seamless nomenclature and recording of analytical results, the identification of inserted quality management samples is blind to laboratory personnel.

9.1.1 Sample Preparation

Samples are initially crushed then homogenized then split into two equal samples. Each duplicate sample is sealed in a plastic bag and labelled before being transported to the on-site laboratory. At this stage, each sample is weighed to allow for future determination of density.

Samples are initially divided into three:

- Used for a wet sieving process where it is separated into +20 and +400 mesh (#) particle sizes before being sent for chemical analysis. The mass recovery of each size fraction is calculated through comparison to the initial sample mass.
- Chemical analysis of the raw / crude sample material.
- Used for moisture calculation then stored.

The remaining duplicate sample, and the recovered material from wet sieving are retained on site and stored in sealed plastic bags for future use as required.

Figure 8-1 below illustrates the complete sample preparation flowsheet including the several stages of sample weighing, crushing, homogenizing, and splitting.

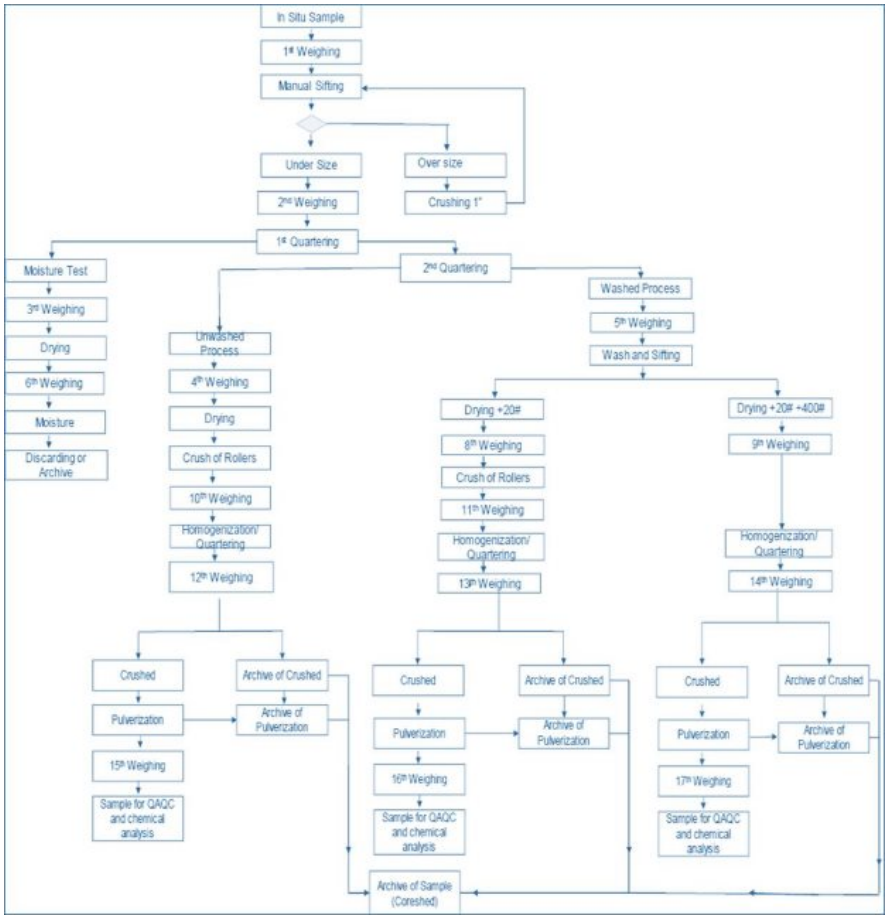


Figure 8-1: AC sample preparation flowsheet (SRK, 2019).

Although a 20 mesh screen is being used for the sample preparation, the plant process uses a 14 mesh screen. The SLR QP is of the opinion that for the new plateaus to be drilled with AC, the internal laboratory should use a 14 mesh screen to align the process with the plant, and that the bias generated due the different screens is not material to the Mineral Resources, given that the smallest screen used is the same for both, and the A.Al_2O_3 and R.SiO_2 is reported with all the material with a granulometry greater than 200 mesh.

9.1.2 Chemical Analysis

The principal chemical analysis is made by Fourier Transform Infrared Spectroscopy (FTIR) and approximately 10% of the samples are re-analyzed, as reference samples, by titration for available alumina and atomic absorption for reactive silica.

The chemical analysis undertaken on each sample are:

- Aluminum oxide Al_2O_3 (total and available)
- Silica SiO_2 (total and reactive)
- Titanium dioxide TiO_2 (total)
- Iron oxide (hematite) Fe_2O_3 (total)
- Loss on Ignition (LOI)

The analytical methods are summarized in Table 8-1.

Table 8-1: Analytical methods used

Analytical Method	Analysis
Fourier Transform Infrared Spectroscopy (FTIR)	Total Alumina: RMSEV = 0.891.37; RMSEC = 1.19; DL = 0.07 A.Al_2O_3: RMSEV = 0.901.63; RMSEC = 1.36; DL = 0.1 Total Silica: RMSEV = 0.690.81; RMSEC = 0.66; DL = 0.1 R.SiO_2: RMSEV = 0.460.77; RMSEC = 0.54, DL = 0.04 Iron: RMSEV = 1.331.96; RMSEC = 1.75, DL = 0.13 Titania: RMSEV = 0.210.32, RMSEC = 0.15; DL = 0.01 LOI: RMSEV = 0.590.89; RMSEC = 0.64; DL = 0.05
Zinc Titration	A.Al_2O_3 (%error = 0.70; S = 0.45)
X-Ray Fluorescence Spectroscopy	Total Alumina (%error = 1.14; S = 0.81) Total Silica (%error = 2.35; S = 0.13) Iron (%error = 0.94; S = 0.14) Titania (%error = 3.05; S = 0.05)
Inductively Coupled Plasma (ICP)	R.SiO_2 (%error = 0.35; S = 0.04)
Atomic Absorption	R.SiO_2 (%error = 0.29; S = 0.12)
Thermogravimetric Analysis (TGA)	Loss Ignition (%error = 0.05; S = 0.05)

Notes:

1. RMSEV: Root Mean Square Error of Validation
2. RMSEC: Root Mean Square Error of Calibration
3. DL: Detection Limit

9.1.3 Density Determinations

Density is determined for each drill core sample and for each material type recovered, including Nodular Bauxite, Laterite, Bauxite, and Red Clay. The method for determining sample density is based on calculating the volume of each individually sealed PVC tube of known diameter (5.6-inch).

Samples are initially weighed prior to being sent to the laboratory, after which the moisture content of each sample is also calculated. The percentage recovery of each sample is measured in the field after each drilling run, that corresponds to approximately 1.15 m, through a visual inspection. The volume of the samples are measured according to the run length and the PVC tube diameter, which is 5.6 inches.

Dry density is then calculated, expressed in g/cm^3, using the following equation which is run as an internal script within the exploration acQuire™ database software:

$$Density = \frac{\frac{sample\ weight - (sample\ weight \times moisture)}{1000}}{(\frac{5.6 \times 0.0254}{2})^2 \times \pi \times sample\ length \times sample\ recovery}$$

The calculation is done through an automated process and stored in an acQuire™ database.

The density values are approximately 1.30 g/cm^3 for all the layers, except for the laterite layer that shows higher values due the higher iron content. Table 8-2 below provides summary statistics of the density data from the Capiranga Central and Mauari plateaus. A default / blanket density value of 1.30 g/cm^3 is used for the other plateaus.

Table 8-2: Summary of density data statistics by plateau

Plateau	Lithology[1]	No. Samples	Min	Max	Mean	Std. Dev.	CV.
Capiranga Central	Nodular Bauxite (waste)	656	0.800	1.860	1.297	0.162	0.125
	Nodular Bauxite (ore)	591	0.870	1.690	1.303	0.133	0.102
	Laterite	4,121	0.280	2.400	1.544	0.194	0.125
	Bauxite	4,475	0.550	2.390	1.298	0.199	0.153
	Red Clay	4,918	0.600	2.500	1.332	0.170	0.127
Mauari	Nodular Bauxite (waste)	326	0.770	2.020	1.241	0.149	0.120
	Nodular Bauxite (ore)	25	1.090	1.610	1.271	0.130	0.102
	Laterite	2,802	0.800	2.180	1.492	0.198	0.133
	Bauxite	4,098	0.650	2.140	1.290	0.172	0.133
	Red Clay	1,752	0.710	2.110	1.330	0.174	0.131

Notes:

1. Nodular Bauxite (waste) = high clay content and Nodular Bauxite (ore) = low clay content

9.1.4 Sample Storage and Archiving

Following chemical analysis, all pulverized, and selected coarse fraction samples are stored onsite in sheds and their locations are recorded within the LIMS systems. The disposal of long-term drilling samples

representing exhausted, non-prospective, or non-Mineral Resource areas is performed following strict criteria and digital archive protocol. Short-term drilling samples are discarded once the area they delineated is fully exhausted.

9.2 Quality Assurance and Quality Control

Quality Assurance (QA) consists of evidence that the assay data has been prepared to a degree of precision and accuracy within generally accepted limits for the sampling and analytical method(s) to support its use in a resource estimate. Quality Control (QC) consists of procedures used to ensure that an adequate level of quality is maintained in the process of collecting, preparing, and assaying the exploration drilling samples. In general, QA/QC programs are designed to prevent or detect contamination and allow assaying (analytical), precision (repeatability), and accuracy to be quantified. In addition, a QA/QC program can disclose the overall sampling-assaying variability of the sampling method itself.

9.2.1 QA/QC Protocols

The following QA/QC protocols were initially implemented by Alcoa in 2013, and further developed and refined in subsequent years. Drilling campaigns supported by QA/QC results include those conducted on the Capiranga, Capiranga Central, Guaraná, and Mauari plateaus. Currently, the inclusion of QA/QC samples are limited to exploration drilling campaigns.

Current procedures are documented in *QAQC System Management - Rev 001.005* (Alcoa, 2018). The QA/QC program is managed by the Alcoa geology department, is blind to the Juruti Mine Lab and for each batch of approximately 26 samples submitted to the laboratory currently includes:

- Two duplicate samples (representing either coarse or pulp duplicates at the discretion of the geologist), with at least one sample of bauxite, and,
- Three of a possible six custom reference material samples prepared using Juruti bauxite material, representing low, medium, and high-grade bauxite.

Sample batches of less than thirteen samples are to include one duplicate and two reference samples. In 2019, acceptance criteria for individual batches were developed by Alcoa and dictate that a batch will be rejected if two or more of the included QA/QC samples report outside acceptable limits for available alumina and reactive silica:

- More than 10% difference when compared to the reference material expected value, or
- More than 10% difference to the original sample value.

If a batch does not pass this acceptance criteria, it is repeated in full. These criteria and protocol continue to be reviewed by Alcoa. Prior to 2019, results were monitored without specific short-term actions associated with performance.

In addition to samples submitted to the primary laboratory, selected pulp duplicate samples from the Central plateau are submitted to a secondary laboratory, SGS Geosol Laboratorios Ltda (SGS), to monitor bias at the Juruti Mine Lab at a rate of 1 in 20 samples (5%), with the reference material samples. SGS Geosol is an independent laboratory based in Brazil as a joint venture between SGS Brazil and Geosol Geologia e Sondagens. SGS Geosol is certified according to the Brazilian Association of Technical Standards (ABNT) Brazilian National Standard (NBR) ISO 9001:2015 for chemical and geochemical analyses and by

ABS Quality Evaluation INC (United States) which is accredited by the National Institute of Metrology, Standardization, and Industrial Quality (INMETRO) in Brazil.

The most recent analysis of laboratory performance was completed in partnership with VCE Consultoria Mineral (VCE), a Brazilian based mining consulting firm (VCE, 2019), and with focus on available alumina and reactive silica results from the Capiranga, Capiranga Central, Mauari, and Guaraná plateaus.

SLR reviewed the QA/QC analysis completed by VCE and has summarized the results in the succeeding sections. SLR focused their review on Capiranga Central (2017, 2018) and Mauari (2014 to 2016) sample results, as the almost exhausted plateaus Capiranga and Guaraná are not currently included as Mineral Resources or Mineral Reserves at the Juruti Mine.

9.2.2 Duplicate Samples

QA/QC protocols at the Juruti Mine stipulate the inclusion of pulp and coarse duplicate sample monitoring. These duplicates help to monitor preparation, assay precision, and grade variability as a function of sample homogenization and laboratory error at different stages of the preparation process (crushing and pulverizing). Coarse and pulp duplicate samples were collated by plateau and graphed by VCE (2019) in the following ways:

- Half Average Relative Difference (HARD) versus cumulative frequency. This chart provides a good visual assessment of how many sample pairs have a HARD value above 10% (paired samples with HARD values above 10% may indicate lower precision of those pairs).
- ABS (HARD) by batch. This is the absolute HARD value related to batches and is reviewed with a tolerance limit of 10%.
- Mean versus ABS (HARD). This chart may indicate grade ranges in which there are more discrepant sample pairs.
- Scatter plot of the original and duplicate samples.

SLR reviewed the graphs prepared by VCE and has replicated a selection of the graphs below to support SLR's analysis of the results.

Figure 8-2 compares HARD values for crushed and pulp duplicate pairs of available alumina and reactive silica results against cumulative frequency at the Capiranga Central plateau. A total of approximately 80% and 90% of crushed and pulp duplicate pairs of available alumina results, respectively, report HARD values of 10% or less, representing good and very good repeatability for the crushed and pulp duplicate sample pairs. Poorer repeatability is observed for reactive silica duplicate pair results where approximately 30% and 75% of crushed and pulp duplicate pairs, respectively, report HARD values of 10% or less.

Similar findings are observed in scatter plots of the results (not shown) where pulp sample pairs have better precision than coarse sample pairs for both analytes, and available alumina results show better precision than reactive silica results. Precision was sometimes observed to have worse performance at low reactive silica (below 5%) and available alumina (below 40%) grade ranges, did not appear to follow temporal trends, and no bias was observed.

Similar findings (not shown) were observed in the graphs prepared by VCE for the other plateaus, including Mauari.

The results point towards low precision in the reactive silica and SLR recommends the geology team works with the Juruti Mine laboratory to investigate and improve performance. SLR notes that many of the

QA/QC results are outside of the current accepted tolerance limits and recommends Alcoa first work towards improved precision at the laboratory, through a combination of umpire laboratory tests, and collaboration with the Juruti Mine laboratory team to review and improve the preparation and analytical procedures in place, and to then modify tolerance limits to reference achievable precision.

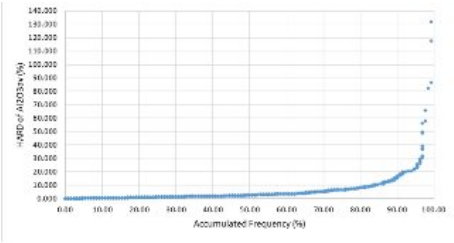
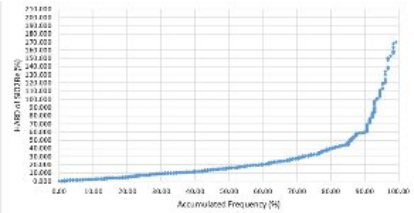
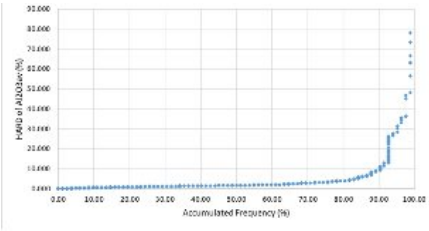
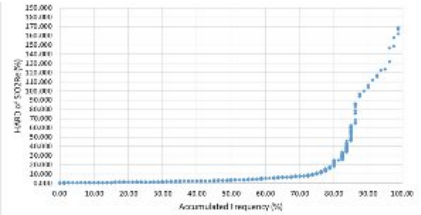
A.Al_2O_3Crushed Duplicate Pairs	R.SiO_2 Crushed Duplicate Pairs
	
A.Al_2O_3Pulp Duplicate Pairs	**R.SiO_2 Pulp Duplicate Pairs**
	

Figure 8-2: Capiranga Central Duplicate Pairs Plots of HARD vs Accumulated Frequency (modified from VCE, 2019)

9.2.3 Standard Samples

Results of the regular submission of reference material (standards) are used to identify issues with specific sample batches, and biases associated with the primary assay laboratory (Juruti Mine Laboratory). Results of the standards were plotted in control charts, and failure rates, defined as a value reporting more than 10% from the expected value, were reviewed.

Expected values and accepted value ranges for reference material in place at Juruti Mine are listed in Table 8-3 for available alumina (A.Al_2O_3) and reactive silica (R.SiO_2).

Table 8-3: Expected Values and Ranges of Reference Material (Standards)

Standard	Parameter	Value	Std. Deviation	Minimum acceptable	Maximum acceptable
ITAK-1015	A.Al_2O_3	42.210	0.370	41.100	43.320
ITAK-1015	R.SiO_2	5.400	0.150	4.950	5.850
ITAK-1016	A.Al_2O_3	43.270	0.580	41.530	45.010
ITAK-1016	R.SiO_2	4.574	0.112	4.238	4.910
ITAK-1017	A.Al_2O_3	49.960	0.960	47.080	52.840
ITAK-1017	R.SiO_2	2.370	0.100	2.070	2.670
ITAK-1018	A.Al_2O_3	39.270	0.440	37.950	40.590
ITAK-1018	R.SiO_2	5.080	0.130	4.690	5.470
ITAK-1019	A.Al_2O_3	45.650	0.410	44.420	46.880
ITAK-1019	R.SiO_2	6.180	0.220	5.520	6.840
ITAK-1020	A.Al_2O_3	50.200	0.320	49.240	51.160
ITAK-1020	R.SiO_2	4.390	0.110	4.060	4.720

Control charts of A.Al_2O_3 and R.SiO_2 standards at Capiranga Central, representing drilling campaigns in 2017 and 2018 were prepared by VCE and are reproduced in Figure 8-3. Each chart has a small number of isolated values far outside of the accepted range and show a slight to strong positive bias for both available alumina and reactive silica. SLR agrees with VCE's assessment that out-of-range values most likely represent sample mix-ups.

Reactive silica in standards ITAK (Brazilian chemical laboratory) 1016 and ITAK 1017 shows lower precision (more scatter) and a very high and consistent bias, more often than not above the accepted value range. Similar results were observed in control charts of Capiranga (2013-2017, 2019), and Mauari (2014-2016), which used standards ITAK-1018, ITAK-1019, and ITAK-1020 (results not shown). In all cases, reactive silica results were more erratic and likely to be outside acceptable value ranges.

VCE did not plot the results of reference material sent to SGS, and SLR recommends reviewing these results in the context of SGS performance. If a similar bias were to be present at SGS, SLR recommends testing samples at a tertiary laboratory and explore adjusting the expected value and acceptable range based on those findings. If no bias was observed in reference material at SGS or the tertiary laboratory, SLR recommends working with the primary laboratory to resolve the bias. SLR also recommends following up possible sample mix-ups in a timely manner and working with the laboratory to identity and resolve the lower precision observed in the low reactive silica standard results.

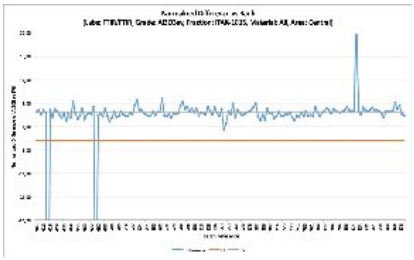
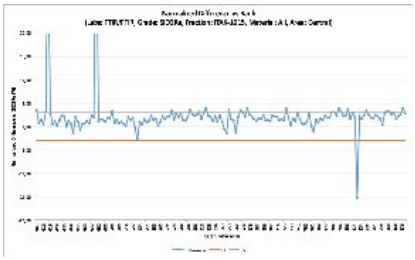
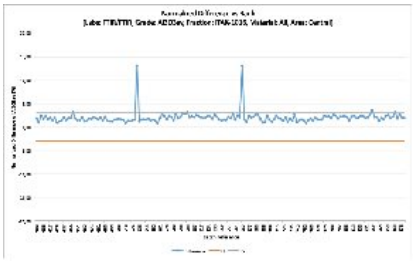
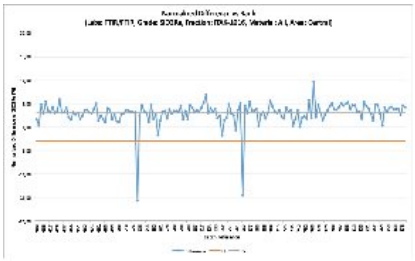
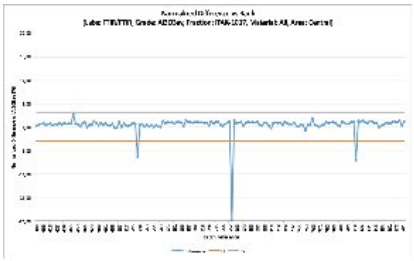
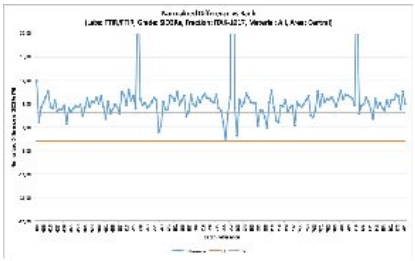
ITAK 1015 A.Al_2O_3 (low)	ITAK 1015 R.SiO_2 (high)
	
ITAK 1016 A.Al_2O_3 (moderate)	**ITAK 1016 R.SiO_2 (moderate)**
	
ITAK 1017 A.Al_2O_3 (high)	**ITAK 1017 R.SiO_2 (low)**
	

Figure 8-3: Control charts of available alumina and reactive silica standards at Capiranga Central (2017 and 2018) (modified from VCE, 2019)

9.2.4 External Lab Check Assays

Submitting assays to a secondary laboratory helps to monitor bias at the primary laboratory. The primary laboratory is the internal Juruti Mine Laboratory, owned and operated by Alcoa, while the secondary laboratory is SGS Geosol Laboratório Ltda, located in Minas Gerais state in Brazil, which is a certified

laboratory for quality management and analytical techniques (ISO 14001-2015, ISO 9001-2015, ISO 17025 and ISO17025), independent of Alcoa.

Plots of HARD vs cumulative frequency (CF) and scatter plots of original and duplicate samples for both available alumina and reactive silica from the Capiranga Central plateau are shown in Figure 8-4.

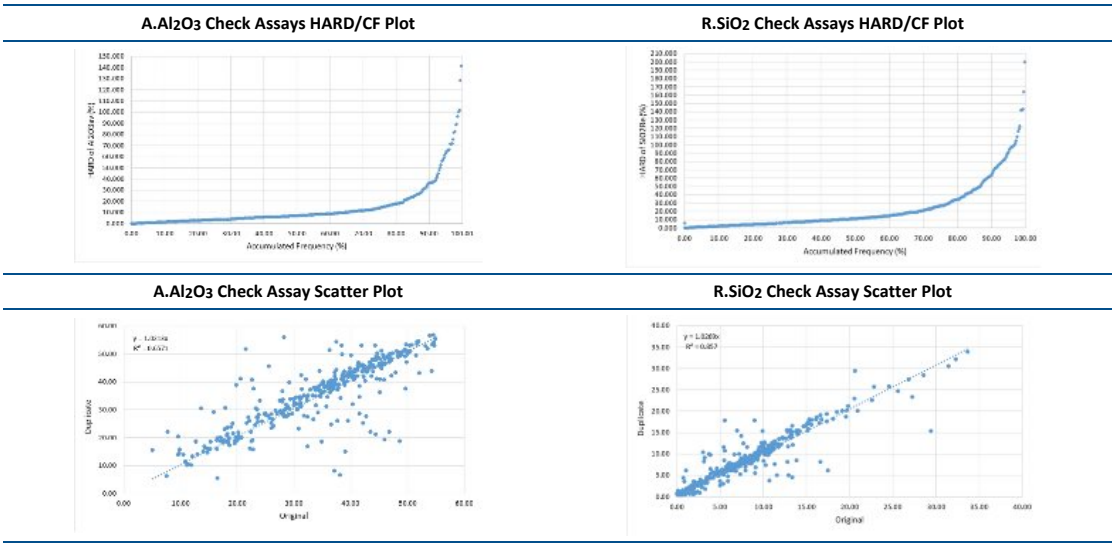


Figure 8-4: Comparison of original and check assay results available alumina and reactive silica at Capiranga Central (modified from VCE, 2019).

In conflict with observations from the standard sample results, which show a high bias of available alumina and reactive silica, the check assay results point towards a slight low bias at the primary laboratory. Results of submitted reference samples were not available to review, but SLR recommends reviewing reference sample performance of SGS submitted samples in this context. Results also show poor sample precision: approximately 30% of available alumina and 50% of reactive silica check assay pairs plot outside the acceptable tolerance limit of 10% HARD.

9.3 Sample Security

Alcoa uses acQuire™ software to manage all aspects of the drill hole database and acQuire™ is fully integrated between the Alcoa geology and laboratory departments. The information is entered into acQuire™ using direct entry by logging geologists and technical support team, through a combination of tables, bar codes, and digital scales. These procedures limit the potential for manual interference or data entry errors. Figure 8-5 shows the bar codes and digital scales in the core logging facility.





Figure 8-5:Bar codes and digital scale used in the sampling procedure.

9.4 Conclusions

The SLR QP makes the following conclusions with respect to the sample collection, preparation, analysis, and security, as well as the QA/QC measures in place at Juruti and supporting Alcoa's drilling and sampling programs covering the Capiranga Central and Mauari plateaus:

- Exploration sampling, preparation, and analyses are appropriate for the style of mineralization and are sufficient to support the estimation of Mineral Resources.
- The analytical procedures used for the Alcoa Mineral Resource comprise part of conventional industry practice. FTIR is not widely used yet in the bauxite industry but is becoming more widely accepted and applied to more operations. At Alcoa the method has been consistently applied successfully for a decade.
- Sample and data security are consistent with industry best practice.
- There is potentially a long-standing high bias in both reactive silica and available alumina analytical sample results at the primary laboratory, supported by the results of the reference sample analysis. This observation is not consistent with observed results of the check assay program and additional analysis is required to confirm the bias.
- Coarse and pulp duplicate pairs of reactive silica are currently not meeting the acceptance criteria designed by Alcoa.
- Both available alumina and reactive silica check assay samples show poor precision between the Juruti Mine laboratory and secondary laboratory, SGS.
- The QA/QC program as implemented by Alcoa has been helpful to identify problems with the primary analytical laboratory. It is unclear whether the results of the QA/QC program are being used by Alcoa to support investigations and to improve procedures and results.

The SLR QP is not aware of what QA/QC work was completed by Alcoa to confirm the historical drilling results supporting the Mutum, Nhamundá, Santarém, and São Francisco plateaus. A comparison between auger and AC drill holes was however completed by Alcoa, as discussed in Section 9.1.

9.5 Recommendations

The QP makes the following recommendations with respect to the sample collection, preparation, analysis, and security, as well as the QA/QC measures in place at Juruti Mine:

- Develop a robust monthly QA/QC report, which includes a summary of performance and related actions to improve results as needed. Plot results in temporal context and cross compare results across different plateaus and QA/QC sample types to confirm findings. Create and implement an action plan to improve laboratory performance.
- Develop and implement a robust QA/QC program for short term drill holes.
- Develop a check assay protocol in which identical analytical procedures are used across laboratories.
- Re-evaluate the observed high bias of all standards in the context of reference material analyzed at secondary laboratory SGS. If a similar bias is present in reference material samples submitted to SGS, test samples at a tertiary laboratory and explore adjusting the expected value and acceptable range based on all findings. If no bias is observed in reference material at SGS or the tertiary laboratory, work with the primary laboratory to resolve the bias.
- Follow up possible sample mix-ups in a timely manner and monitor QA/QC results on a monthly basis.
- Investigate and resolve the reason for the lower precision observed in the low reactive silica standard results.
- Work with Juruti Mine laboratory and SGS to improve precision of coarse and pulp duplicate sample pairs.
- Work towards Brazilian and/or international accreditation for quality management (such as ISO 9001) and analytical techniques (such as ISO 17025 or ISO 14000) at the onsite Juruti Mine laboratory.
- Adopt in the physical laboratory the #14 mesh screen, for the new plateaus chemical analysis, to reproduce the plant process.

In the opinion of the QP, the sample preparation, security, and analytical procedures are adequate for the purposes of Mineral Resource estimation.

10.0 DATA VERIFICATION

10.1 Alcoa Verification Work

10.1.1 Verification of Historical Data

The acQuire system management was initially implemented as the official database at Juruti in 2011, however the data began to be migrated in 2014 and 2015. Before the acQuire implementation the database was managed through MS Excel and MS Access and the drill log information was typed. The historical data from Mutum, Nhamundá, Santarém and São Francisco plateaus are currently in the migration process, and the actual drilling data is being managed in acQuire system.

For the data that was already migrated to acQuire some check and validations were taken, such as a visual validation comparing logs and the database information, the sum of the oxides (ATG, STG, FEG, TIG and PPG) was calculated and validated, and other Excel tools were used for validation procedures.

Regarding with the accuracy and precision of the assays, the historical data do not have QA/QC, and the Alcoa staff conducted a study comparing AC and auger samples to identify and quantify the differences.

SLR received the chemical analysis certificates of the historical data for Mutum, Nhamundá, Santarém and São Francisco plateaus, signed by the technical responsible person from the laboratory, and reviewed the comparison made by Alcoa staff. The results are summarized below.

10.1.2 Comparison of Auger and Air Core Drilling Results

To quantify the difference between AC and auger samples, Alcoa staff developed a study in the Mauari plateau and generate two scenarios, one using only AC samples and another one using only auger samples. As the Mauari plateau does not have twin holes (Figure 9-1: Mauari plateau with AC drill holes and historical data - well and auger (SLR, 2022).), the study was based on ordinary kriging (OK) results.

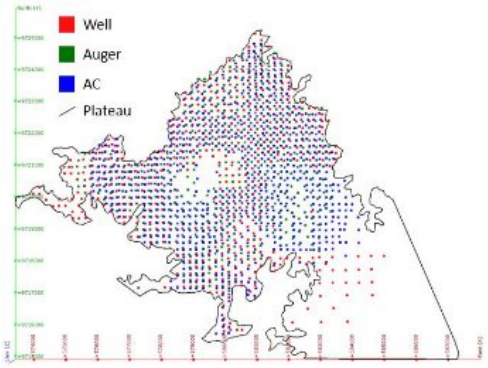


Figure 9-1: Mauari plateau with AC drill holes and historical data - well and auger (SLR, 2022).

In the most part of the plateau the AC and auger distribution are almost in the same regions, with a few exceptions in the southeast. The results obtained by Alcoa are shown in Table 9-1 and demonstrates that there is a material difference for R.SiO_2 and Global Mass Recovery (RCG) of 17 and 21% respectively.

Table 9-1: Results from ordinary kriging for AC and auger samples (SLR, 2021).

	A.Al_2O_3 (%)	R.SiO_2 (%)	RCG (%)
AC	46.88	4.11	72.73
Auger	46.37	3.51	59.97
Difference	**1%**	**17%**	**21%**

Alcoa staff state that there is a tendency to generate fines in auger drilling, as the RCG is much smaller (59.97%) against AC drill holes (72.73%). Furthermore, the R.SiO_2 grade is underestimated using auger samples, again due to the fines generation when compared with AC.

No more information was sent regarding this study.

The SLR QP is of the opinion that Alcoa must develop a statistic and geostatistical study with twin holes (not more than one meter from the original auger or well), to calculate the real bias between methodologies for all the plateaus where the samples are from auger or wells. After that the QP can define correction factors or penalties for the biased variables.

10.2 SLR Site Verification Procedures

The SLR QP visited the Juruti Bauxite Mine from October 18 to October 21, 2021. While on site, SLR held discussions with site personnel, visited an active mining area on the Capiranga Central plateau, an active exploration drill site at Mutum, and the drill core handling and storage facilities. The SLR QP reviewed previously selected drill hole intercepts within several drill holes at each deposit and compared them against recorded lithology logging and assay results. In addition, the SLR QP reviewed data collection, handling, storage, security, and QA/QC procedures. The SLR QP also visited the Juruti Mine Laboratory, including both the preparation and analysis locations, and reviewed sample processing and analytical procedures.

The SLR QP regards the geological and mineralization interpretations used to support Mineral Resource estimation consistent with the observed rock exposure and drill core, and the Alcoa geologists to have a good understanding of the geology and mineralization.

10.3 SLR Audit of the Drill Hole Database

Historical and Alcoa collected drill hole data was reviewed by SLR through several software-based validation routines to identify gaps, overlaps, anomalous or impossible values, duplicated information, and typos. The database showed good consistency and only eight missing intervals in Capiranga Central database and eleven missing intervals in Mauari were identified. These missing intervals have no material impact in the Mineral Resources estimate.

The SLR QP is of the opinion that database verification procedures for the Juruti site comply with industry standards and are adequate for the purposes of Mineral Resource estimation and for inclusion in the Technical Report Summary.

11.0 MINERAL PROCESSING AND METALLURGICAL TESTING

The Juruti Bauxite Mine's processing plant has been in operation since 2009 and uses a simple comminution and washing circuit to produce washed bauxite for shipping along with the unwashed bauxite (direct shipping or ore). The primary processing involved in this plant is removal of silt and clay (fine particles) from the ore and includes crushing, washing and wet screening.

11.1 Metallurgical test work

- Metallurgical test work was completed on the samples collected from the Juruti project in two independent commercial laboratories in two separate programs:
- 2002 – JKTech, Australia
- 2007 - HDA Servicos S/C Ltda, Brazil

SLR understands that these laboratories have no association with Alcoa other than the commercial contract to complete the test work. SLR notes that these laboratories have good reputations in the mineral process industry and operate according to best practices, however, it is not known if they were certified by any standards association at the time of the test work.

The objective of the test work programs was to establish the comminution design parameters for use in the process plant design. Both test work programs have included the determination of the Bond ball mill work index (BWI) and Bond rod mill work index (RWI).

11.2 Test work samples

JKTech received nine samples representing three zones from three sample pits identified as Capiranga (Pit A), Guaraná (Pit B) and Mauari (Pit C). The three zones were identified as Massive bauxite, Transition bauxite and Ferruginous laterite. The samples were washed and screened in the lab to remove the -38µm fraction.

HDA Serviocs has received a single sample composed of three different size fractions (trommel oversize, +8 mm and +1.5 mm) in five separate bags. The contents of all five bags were homogenized in a single pile and then sub samples were obtained for test work.

SLR is unable to verify the source of these samples but is of the opinion that those samples were representative of the Juruti project mineralization at that time.

11.3 Comminution test work

JKTech completed the BWI and RWI determinations on washed +38 material. The closing screen sizes were 1.18 mm for the RWI and 300 µm for the BWI. The JKTech results are summarized in Table 10-1.

HDA Serviocs completed the BWI determinations with three different closing screen sizes with the aim of generating a final product at P_{80}=0.15 mm. The RWI determinations were conducted in two different closing screen sizes with the aim of generating a final product at P_{80}= 0.70 mm. The HDA Servicos results are summarized in Table 10-2 below.

Table 10-1: JKTech comminution results (JKTech, 2002)

Sample Pit	Sample zone	Bond work index (kWh/t)	
		RWI	BWI
Capiranga (Pit A)	Massive Bauxite	9.26	11
	Transition Bauxite	10.2	10.5
	Ferruginous Bauxite	10.2	10.6
Guaraná (Pit B)	Massive Bauxite	10.5	11
	Transition Bauxite	10.1	10.1
	Ferruginous Bauxite	10.1	10.1
Mauari (Pit C)	Massive Bauxite	10.3	8.69
	Transition Bauxite	9.22	9.07
	Ferruginous Bauxite	10.1	10.3

Table 10-2: HDA Servicos comminution results (HDA Servicos, 2007)

Closing screen size (mm)	Bond work index (kWh/t)	
	RWI	BWI
1.190	9.78	-
1.190	9.68	-
0.840	9.12	-
0.425	-	9.5
0.300	-	10.1
0.212	-	9.1

The test work results shown in Table 10-1 and

Table 10-2 indicate that the ore is moderately hard and can be ground to the required product sizes without any challenges.

The SLR QP is of the opinion that the data derived from testing activities described above is adequate for the purpose of this TRS because the mine has operated since 2009. Further, the process flowsheet is straightforward and includes comminution and washing circuits alone. It is important to note that such a simple flowsheet design does not need significant test work inputs other than the comminution results. The comminution results can be used for the initial mill sizing and ongoing benchmarking exercises.

The SLR QP notes that the test work included only the comminution test work and was not related to recovery predictions. However, the plant has been operating for more than 10 years and consistent

operating data is available to support the plant recoveries and product grades. The operating data demonstrates that the recovery of 75% with a final product specification having 47.5% of available alumina content ($A.Al_2O_3$) and 4.1% of reactive silica ($R.SiO_2$) content is achieved consistently in the plant. This means the product has consistently met refinery specifications without any deleterious elements. Based on this, and the additional information about the mine plan provided by Alcoa, it is reasonable to assume that the ore from Juruti operations can be economically processed for the next 10 years.

12.0 MINERAL RESOURCE ESTIMATES

12.1 Summary

The Mineral Resource estimate for the Juruti Bauxite Mine, as of December 31, 2021, was completed by the Alcoa's Brazil staff and audited and adopted by SLR. Mineral Resources estimated are based on the following drill hole information for each plateau:

- 932 AC drill holes totalling 15,594 m at Capiranga Central,
- 856 AC drill holes totalling 14,023 m at Mauari,
- 473, 214, and 387 auger drill holes at Mutum, Santarém, and São Francisco, respectively, for a total of 13,964 m, and
- 284 auger, well, and AC drill holes at Nhamundá for a total of 3,966 m.

Mineralization domains representing plateau stratigraphy are defined using interval lithology classifications based on chemical ranges were created using GeoLogic™ software. Block model estimates for six discrete areas were completed within Isatis™ software, using 0.5 m top and bottom cut composites and ordinary kriging (OK) in a four-pass approach which used increasingly larger search ellipses and relaxed composite criteria within regular block models of 50 m x 50 m x 0.5 m.

Mineral Resources were classified in accordance with the definitions for Mineral Resources in S-K 1300. Class assignment was based on Risk Index (RI) criteria, which involved assigning blocks a RI based on uncertainty related to ore zone volume, grades, and metal content and estimated using indicator kriging and conditional simulation techniques. Some post processing of classification assignment was performed to remove isolated and fringe blocks. The Mutum, Santarém, and São Francisco plateaus were restricted to a classification of Indicated Resources and Inferred Resources to account for both the wider spacing of drill holes and lower quality sample information captured from well and auger drill holes. The Nhamundá plateau is limited to a classification of Inferred to account for both the wider spacing of drill holes and lower quality sample information captured from auger and well drill holes.

Wireframe and block model validation procedures including wireframe to block volume confirmation, statistical comparisons with composite and nearest neighbor (NN) estimates, swath plots, visual reviews in 3D, cross section, and plan views, as well as cross software reporting confirmation in Python were completed for all deposits by SLR. SLR's main validation work focused on the Capiranga Central and Mauari plateaus, which are the only plateaus at the Juruti Bauxite Mine with estimated Mineral Reserves in addition to Mineral Resources.

Mineral Resources are constrained to a 50 m offset distance from each plateau limit and to blocks meeting a pit discard cut-off value of the mining related costs. A benefit calculation is applied to determine whether a block is economically viable whereby benefit is the revenue less mining related costs.

The criteria for the benefit calculation were developed using a long-term bauxite price of US$35.33/t (wet base), a R$:US$ exchange rate of R$5.34:US$1.00, mining related costs, and considering 100% metal recovery for the washed and unwashed material. The Mineral Resources bauxite price is defined as 30% higher than the Mineral Reserves bauxite price. The Mineral Reserves bauxite price is based on contracts between Juruti Mine and Alumar Refinery (Alcoa), since 90% of the bauxite production is shipped to this

refinery. The contract is reviewed annually and is based on factors relating to internal and external demand for bauxite, as well as bonus and penalties depending on the product quality.

The transfer price mechanism from Juruti to Alumar is determined by a weighted-average price of the previous year's third-party sales. For example, the 2021 internal transfer price from Juruti to Alumar will be the weighted-average price of 2020 third-party sales.

A summary of the Mineral Resources exclusive of Mineral Reserves for the Juruti Bauxite Mine is shown in Table 11-1. The estimate is presented on a 100% ownership basis to AWAC for consolidated report purposes although Alcoa's share is 60%.

Table 11-1: Summary of Juruti Bauxite Mine Mineral Resources – December 31, 2021

Bauxite Product	Washed Bauxite			Unwashed Bauxite			Washed + Unwashed Bauxite		
Classification	**Tonnage (M dmt)**	**A.Al_2O_3 (%)**	**R.SiO_2 (%)**	**Tonnage (M dmt)**	**A.Al_2O_3 (%)**	**R.SiO_2 (%)**	**Tonnage (M dmt)**	**A.Al_2O_3 (%)**	**R.SiO_2 (%)**
Measured	5.27	44.66	5.45	0.38	42.83	3.02	5.66	44.53	5.28
Indicated	56.97	45.39	4.47	1.62	43.53	2.82	58.59	45.34	4.42
Measured + Indicated	**62.24**	**45.33**	**4.55**	**2.00**	**43.40**	**2.86**	**64.24**	**45.27**	**4.50**
Inferred	562.75	45.70	4.72	1.04	43.42	2.71	563.79	45.69	4.72

Notes:

2. The definitions for Mineral Resources in S-K 13000 were followed.
1. Mineral Resources are estimated using a long-term bauxite price of US$35.33 per tonnes (wet base), and a R$:US$ exchange rate of R$5.34:US$1.00, considering 100% of metal recovery for the washed and unwashed material.
2. Mineral Resources are estimated at a pit discard cut-off value based on a benefit calculation that determines whether a block is economically viable.
3. There is no minimum mining width for Mineral Resources.
4. Bulk density is interpolated or assigned and averages 1.30 t/m^3.
5. Mineral Resources are exclusive of Mineral Reserves.
6. Mineral Resources that are not Mineral Reserves and do not have demonstrated economic viability.
7. Mineral Resources are stated on a 100% ownership basis for AWAC for consolidated reporting purposes although Alcoa's share is 60%.
8. Numbers may not add due to rounding.

The SLR QP reviewed the Mineral Resources assumptions, geological modelling and estimation workflows, data consistency and reporting procedures, and is of the opinion that the Mineral Resource estimate is appropriate for the style of the mineralization, and that the block model is reasonable and acceptable to support the December 31, 2021 Mineral Resource estimate.

The SLR QP is of the opinion that with consideration of the recommendations summarized in Sections 1.0 and 23.0 of this report, any issues relating to all relevant technical and economic factors likely to influence the prospect of economic extraction can be resolved with further work.

12.2 Resource Database

The Juruti Bauxite Mine database includes collar, lithology, stratigraphy, and assay information for exploration AC drill holes within the Mauari and Capiranga Central plateaus, historical auger drilling within the Mutum, Santarém, and São Francisco plateaus and AC drill holes, auger drill holes and wells for Nhamundá plateau (Figure 11-1). All drill holes are vertical and short, as is appropriate to capture the flat lying and relatively shallow mineralization defining the plateaus, and downhole surveys are not taken or needed.

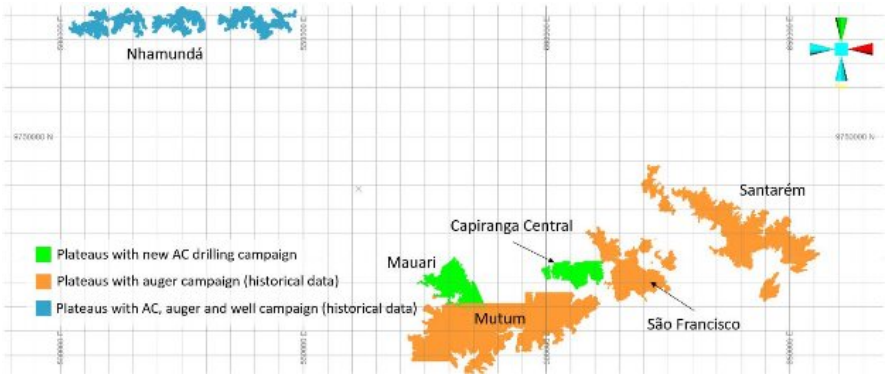


Figure 11-1: Drill hole Type by Plateau at Juruti mine (SLR, 2021)

The Table 11-2 summarizes the database information related to the Juruti plateaus.

Table 11-2: Summary of the database for Juruti plateaus

Plateau	Drill holes	Total depth (m)	Total number of samples
Capiranga Central	932	15,594.04	15,708
Mauari	856	14,023.74	9,859
Mutum	473	6,586.41	5,604
Nhamundá	284	3,364.33	3,966

Plateau	Drill holes	Total depth (m)	Total number of samples
Santarém	214	3,681.10	2,555
São Francisco	387	7,369.65	5,805
Total	**3,146**	**50,619.27**	**43,497**

Grade control drill holes at Capiranga Central and Mauari are not included in the Mineral Resource database or workflow due to differing sampling and quality management protocols. SLR recommends investigating whether and how these drill holes can be incorporated into future estimations at the Mine. SLR supports Alcoa's exploration plan to replace auger drill holes at Mutum, Nhamundá, Santarém, and São Francisco with AC drill holes.

Table 11-3 summarizes the columns in the assay file.

Table 11-3: Summary of the columns in the assay file

Variable	Description	Variable	Description
HOLEID	Drill hole name	FE3	Total Iron - washed - mesh +400# (%)
SAMPFROM	DH from (m)	TI3	Total Titanium - washed - mesh +400# (%)
SAMPTO	DH to (m)	PP3	LOI - washed - mesh +400# (%)
LITO	Described lithotype (log)	ATB	Total Alumina - unwashed (%)
LITOQ	Chemical lithotype (calculated)	AAB	A.Al_2O_3 - unwashed (%)
LITOM	Interpreted lithotype (final)	STB	Total Silica - unwashed (%)
DENS	Dry density	SRB	R.SiO_2 - unwashed (%)
UMID	Humidity (%)	FEB	Total Iron - unwashed (%)
RC1	Mass recovery - washed - mesh +20# (%)	TIB	Total Titanium - unwashed (%)
AT1	Total Alumina - washed - mesh +20# (%)	PPB	LOI - unwashed (%)
AA1	A.Al_2O_3 - washed - mesh +20# (%)	CFP	Channel = 10; DH = 20; Pit = 30
ST1	Total Silica - washed - mesh +20# (%)	LPCP	Long Term = 1; Short Term = 2
SR1	R.SiO_2 - washed - mesh +20# (%)	DATER	Analysis Date
FE1	Total Iron - washed - mesh +20# (%)	SEAM	Interpreted lithotype (final)
TI1	Total Titanium - washed - mesh +20# (%)	ESTEQG-1	Sum of total oxides washed + 20#
PP1	LOI - washed - mesh +20# (%)	ESTEQG-3	Sum of total oxides washed -20# + 400#
RC3	Mass recovery - washed - mesh - 20# +400# (%)	ATG	Global Total Alumina - washed (%)
AT3	Total Alumina - washed - mesh - 20# +400# (%)	STG	Global Total Silica - washed (%)
AA3	A.Al_2O_3a- washed - mesh - 20# +400# (%)	FEG	Global Total Iron - washed (%)
ST3	Total Silica - washed - mesh - 20# +400# (%)	TIG	Global Total Titanium - washed (%)
SR3	R.SiO_2 - washed - mesh - 20# +400# (%)	PPG	Global LOI - washed (%)

For the estimation of Mineral Resources and Mineral Reserves, three calculated variables were created to represent the total washed material:

- Global Available Alumina ($A.Al_2O_3$): AAG (%) = ((RC1*AA1) + (RC3*AA3)) / (RC1 + RC3)
- Global Reactive Silica ($R.SiO_2$): SRG (%) = ((RC1*SR1) + (RC3*SR3)) / (RC1 + RC3)
- Global Mass Recovery: RCG (%) = RC1 + RC3

These calculated variables are referred to as Key Economic Variables (KEVs) throughout the report and represent the variables of focus during SLR's audit work.

The location of the drill holes for Capiranga Central and Mauari deposits are shown in Figure 11-2 and Figure 11-3.

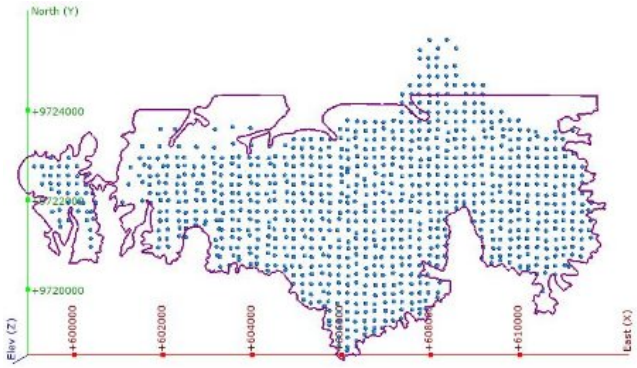


Figure 11-2: Capiranga Central drill hole collar locations (SLR, 2021)

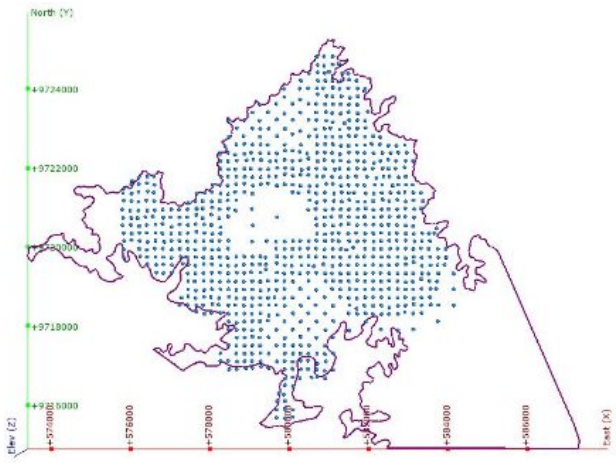


Figure 11-3: Mauari drill hole collar locations (SLR, 2021)

12.3 Geological Interpretation

The geological wireframes were generated using GeoLogic™ software. The methodology consists of creating contiguous contact surfaces for each lithology, using the variable LITOM, post-processed to consider the chemical ranges as defined in the LITOQ column and shown in Table 11-4 below. This is subsequently visually re-classified to create a single interval of each geological layer in each drill hole, expressed in the LITOM column. Figure 11-4 shows the LITOQ classification according to AAG, SRG and RCG.

Table 11-4: Chemical limits used to define LITOQ for the Capiranga Central and Mauari plateaus

Lithological Domain	Code	A.Al_2O_3	R.SiO_2	Fe_2O_3
Yellow clay	20	-	-	-
Non-economic nodular bauxite	30	<45%	>8%	<20%
Economic nodular bauxite	35	≥45%	≤8%	≤20%
Laterite	40	<35%	-	>34%
Bauxite	50	≥35%	≤8%	≤34%
Red clay	60	-	>8%	-

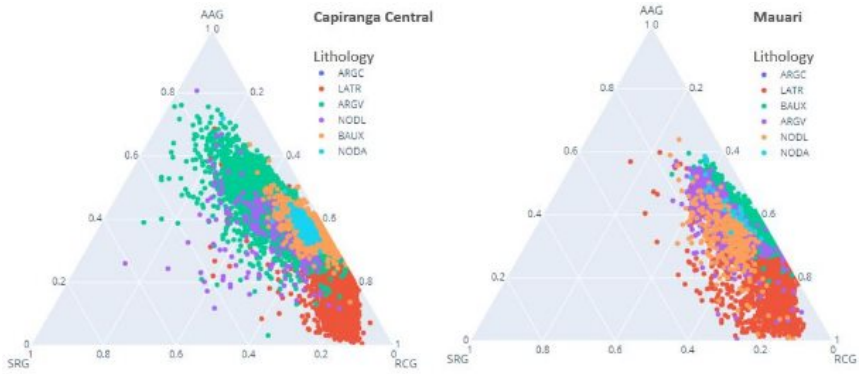


Figure 11-4: Ternary charts of lithologies for Capiranga Central and Mauari plateaus (SLR, 2021).

Table 11-5 shows the differences between the number of LITO, LITOQ and LITOM sample classification in the bauxite layer for the Capiranga Central and Mauari plateaus.

Table 11-5: Bauxite sample classifications according to LITO, LITOQ and LITOM.

Plateau	LITO	LITOQ	LITOM
Capiranga Central	6,646	4,551	4,479
Mauari	4,363	3,462	4,098

To generate the geological surfaces, the interval's contact between lithologies is used, stacked from the bottom-up. This way the stratigraphy is honored and if a lithology does not occur in the drill hole, curvature points are created, preferably along the pre-existent drill holes, to suppress this interval.

The top surface of the yellow clay and bottom surface of red clay have some differences in the interpolation. The top surface of yellow clay coincides with the topography, that was acquired from LiDAR campaigns, and to get a better detail, the LiDAR information was used in conjunction with the drill hole coordinates and elevations. The red clay layer is typically used as an indicator to inform the base of drilling and sampling, and the majority of drill holes do not cross this layer. To create the bottom surface of red clay, points are generated one meter below the end of the drill holes. The surface is interpolated using these points, which also represents the bottom limit of the block models. The lateral extent of the layers are the limits of the plateaus, as a 90° vertical limit, that are established in agreement with the Certification of Plateau Border (Figure 11-5).

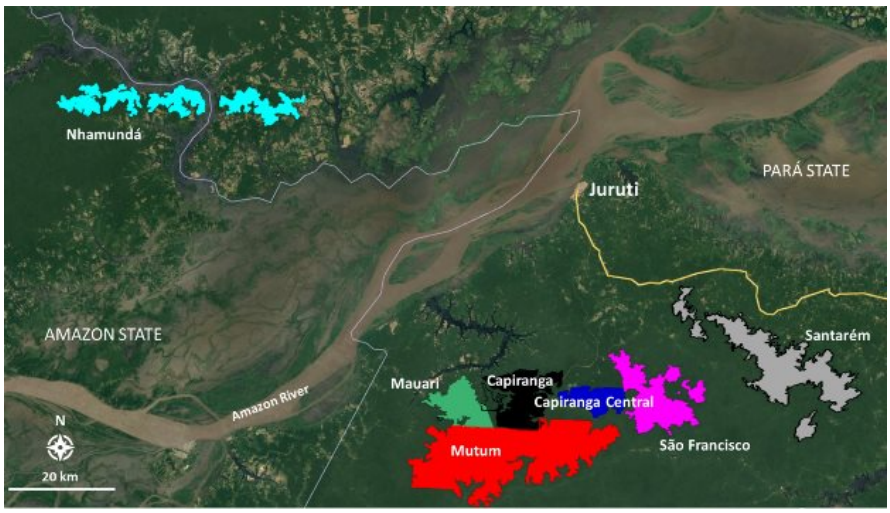


Figure 11-5: Plateaus limits of the Juruti operation (Alcoa, 2022).

Figure 11-6 and Figure 11-7 shows example geological sections of the Capiranga Central and Mauari plateau models.

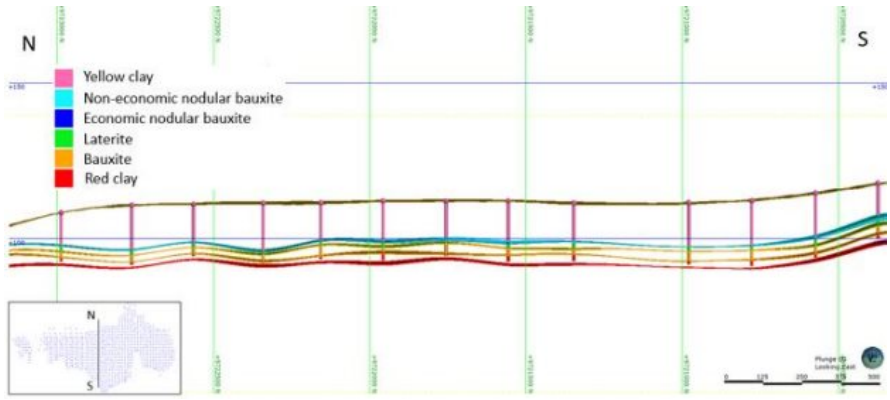


Figure 11-6: Capiranga Central geological section. Vertical exaggeration: 10x (SLR, 2021)

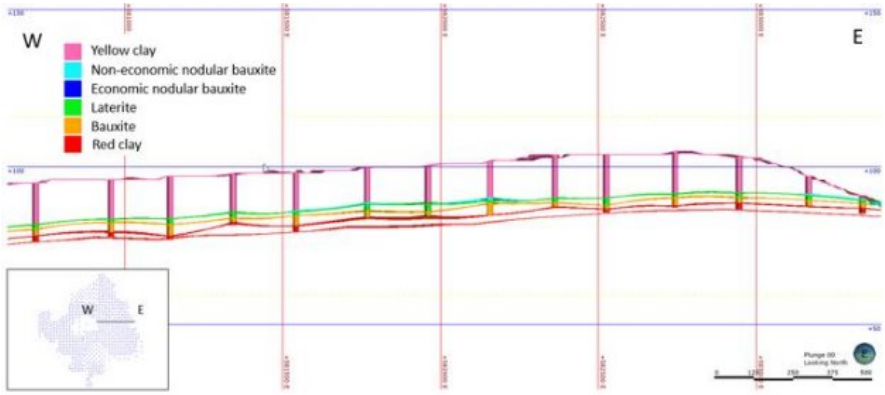


Figure 11-7: Mauari geological section. Vertical exaggeration: 10x (SLR, 2021)

The SLR QP reviewed the top and bottom bauxite wireframes and is of the opinion that the continuity of the mineralization wireframes could be improved in some areas. In localised areas of the deposit where the drill hole spacings is wider, apparent pinch-outs (thinning) of the bauxite layer are observed without support. The bauxite layer may in fact be laterally continuous across these areas, although in the SLR QPs' opinion, without drilling in these areas, this approach to geological modelling is conservative. There are isolated instances across the deposit of individual drillholes indicating a lack of bauxite mineralization, which supports the conservative approach taken at this stage.

12.4 Resource Assays and Compositing

All statistical data analysis procedures, including compositing, were performed in Isatis™ software. Regular length composites of 0.5 m were created, broken by LITOM lithology, with the last sample discarded if less than 0.25 m.

Histograms of sample lengths for the Capiranga Central and Mauari plateaus are shown in Figure 11-8 and Table 11-6 shows basic statistics for non-composited and composited intervals of KEVs within the bauxite layer of each plateau.

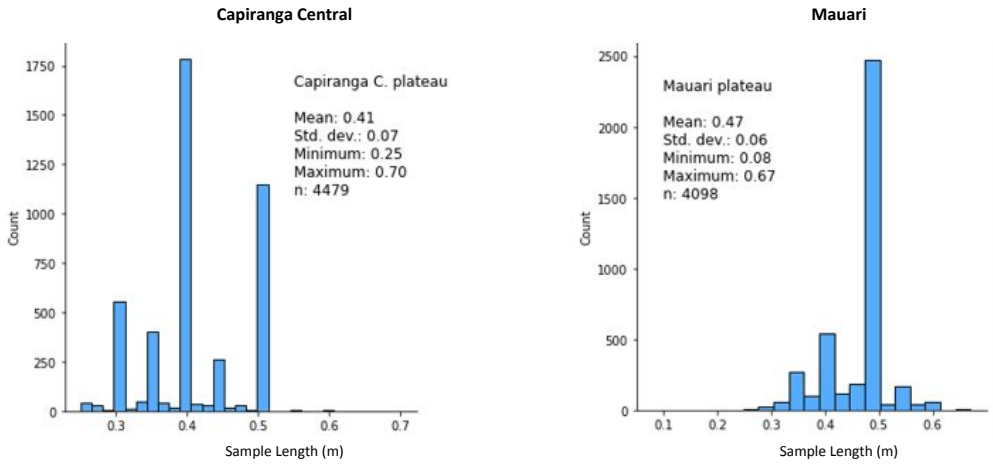


Figure 11-8: Histogram of raw sample lengths for the Capiranga Central and Mauari plateaus (SLR, 2021).

Table 11-6: Statistics for non-composited and composited samples of the bauxite layer (all plateaus).

		Bauxite layer - Non-Composited[1]								Bauxite layer – Composited[1]							
	Variable	Count	Mean	STD	Min	25%	50%	75%	Max	Count	Mean	STD	Min	25%	50%	75%	Max
	AAG (%)	4479	47.41	5.02	15.39	44.23	47.87	51.03	58.48	3675	47.49	4.62	23.21	44.59	47.80	50.89	58.01
	SRG (%)	4479	4.05	2.40	0.10	1.97	3.64	5.79	13.39	3675	4.01	2.32	0.20	2.01	3.65	5.72	13.16
Cap. Central	RCG (%)	4479	77.14	11.36	20.65	69.00	79.47	86.56	99.97	3675	77.30	10.65	28.49	69.42	79.22	86.17	97.23
	Length (m)	4479	0.41	0.07	0.25	0.37	0.40	0.50	0.70	3983	0.46	0.10	0.01	0.50	0.50	0.50	0.50
	DENS (g/t)	4475	1.30	0.20	0.55	1.16	1.30	1.43	2.39	3671	1.30	0.18	0.71	1.17	1.30	1.42	2.11
	AAG (%)	4097	46.76	4.99	19.42	43.70	47.20	50.22	60.57	3851	46.78	4.83	19.42	43.72	47.16	50.15	60.57
	SRG (%)	4097	4.39	2.19	0.03	2.44	4.49	6.23	14.30	3851	4.37	2.15	0.03	2.48	4.47	6.15	13.29
Mauari	RCG (%)	4098	72.72	14.90	21.61	62.87	76.06	84.83	95.91	3851	73.10	14.33	21.61	63.52	76.19	84.77	95.91
	Length (m)	4098	0.47	0.06	0.08	0.42	0.50	0.50	0.67	4173	0.46	0.10	0.01	0.50	0.50	0.50	0.50
	DENS (g/t)	4098	1.29	0.17	0.65	1.18	1.29	1.40	2.14	3852	1.29	0.16	0.71	1.18	1.29	1.40	1.99
	AAG (%)	2303	42.73	6.93	15.30	38.59	43.79	47.72	57.50	2294	42.77	6.75	20.94	38.58	43.78	47.65	57.49
	SRG (%)	2303	5.60	2.63	0.10	3.67	5.60	7.43	14.90	2294	5.63	2.60	0.10	3.72	5.61	7.42	14.90
Mutum	RCG (%)	2305	52.89	12.61	21.09	43.44	53.93	61.83	97.56	2294	52.81	12.39	21.09	43.74	53.76	61.64	97.56
	Length (m)	2305	0.49	0.04	0.20	0.50	0.50	0.50	0.80	2338	0.49	0.06	0.10	0.50	0.50	0.50	0.50
	DENS (g/t)	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	AAG (%)	1521	45.31	6.40	16.73	42.35	46.52	49.70	57.15	1513	45.34	6.15	16.73	42.35	46.46	49.66	57.15
	SRG (%)	1521	5.80	2.71	0.49	3.70	5.62	7.75	13.35	1513	5.80	2.66	0.65	3.72	5.64	7.72	13.18
Nhamundá	RCG (%)	1521	64.22	16.11	11.05	54.23	67.11	77.28	94.76	1513	64.25	15.71	11.72	54.03	66.83	77.18	94.76
	Length (m)	1521	0.50	0.05	0.30	0.50	0.50	0.50	0.75	1571	0.48	0.07	0.05	0.50	0.50	0.50	0.50
	DENS (g/t)	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	AAG (%)	845	42.62	6.96	20.21	38.26	43.53	48.12	57.32	845	42.66	6.87	20.21	38.38	43.54	48.02	56.29
	SRG (%)	845	5.96	2.39	0.41	4.33	5.92	7.60	13.95	845	5.96	2.37	0.41	4.38	5.92	7.58	13.95
Santarém	RCG (%)	845	50.78	12.50	9.93	41.07	51.58	59.99	80.31	845	50.71	12.26	14.34	41.48	51.23	59.87	80.31
	Length (m)	845	0.50	0.05	0.20	0.50	0.50	0.50	0.80	872	0.48	0.07	0.10	0.50	0.50	0.50	0.50
	DENS (g/t)	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

		Bauxite layer - Non-Composited[1]								Bauxite layer – Composited[1]							
	Variable	Count	Mean	STD	Min	25%	50%	75%	Max	Count	Mean	STD	Min	25%	50%	75%	Max
São Francisco	AAG (%)	2832	45.55	6.94	20.37	42.18	46.82	50.54	59.00	2818	45.57	6.63	20.37	42.32	46.77	50.33	58.97
	SRG (%)	2832	4.32	2.54	0.10	1.99	4.34	6.18	16.61	2818	4.33	2.49	0.10	2.08	4.35	6.15	16.61
	RCG (%)	2839	54.94	14.48	15.08	43.24	56.25	66.82	87.93	2818	54.82	14.07	15.08	43.16	56.40	66.21	87.04
	Length (m)	2839	0.49	0.05	0.30	0.50	0.50	0.50	0.70	2914	0.48	0.07	0.10	0.50	0.50	0.50	0.50
	DENS (g/t)	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Notes:

1. For Capiranga Central and Mauari the statistics correspond to the AC drill holes. For Mutum, Santarém and São Francisco plateaus, the statistics correspond to auger samples. Statistics for the Nhamundá plateau included data from AC, wells, and auger holes to enable a comparison between non-composited and composited data for the entire plateau.

The compositing routine executed by Alcoa resulted in a 2% or 2.7% decrease in sample length at Capiranga Central and Mauari, respectfully. SLR is of the opinion that this information loss does not affect the integrity of the Mineral Resource estimate.

Histograms of composited KEV at Capiranga Central and Mauari are shown in Figure 11-9.

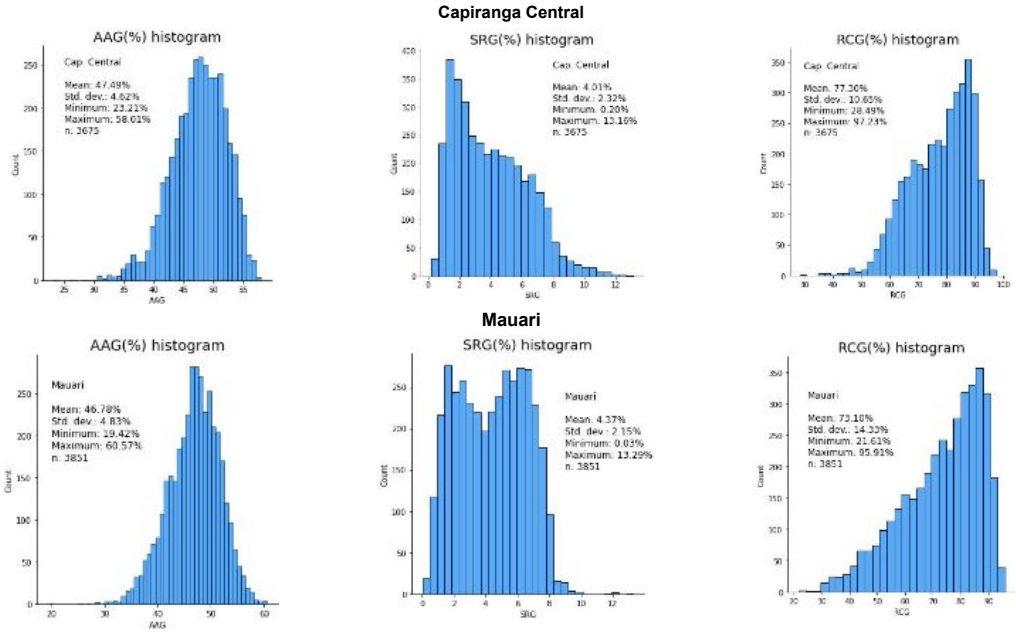


Figure 11-9: Histograms of composited KEVs for Capiranga Central and Mauari plateaus (SLR, 2021)

12.5 Treatment of High-Grade Assays

12.5.1 Capping Levels

Alcoa performs a treatment for high and low grades based on the first and 99th percentile (P1-P99), (Figure 11-10), or the fifth and 95th percentile (P5-P95), referred to a low cuts and top cuts. In most cases, P1-P99 is used but depending on the situation, P5-P95 is used. The values are defined for each variable directly in the neighborhood definition parameters in Isatis™ software.

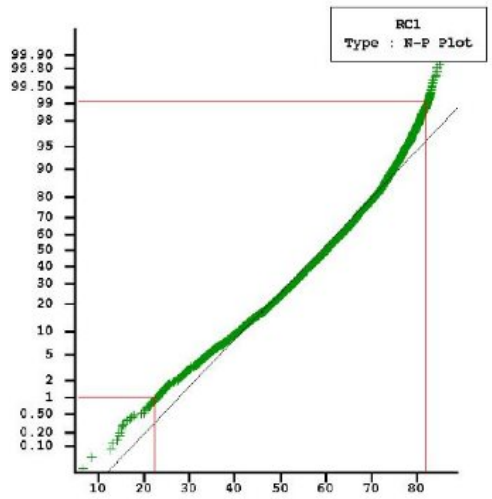


Figure 11-10: Probability plot with the delimitation of P1 and P99, (Alcoa, 2021)

The top cuts and low cuts are calculated for all the main variables for the Capiranga Central and Mauari plateaus, and limited to AA1, AA3, SR1, SR3, RC1, and RC3 variables for the other plateaus, as demonstrated in the Table 11-7. Top cut values are further restrained during interpolation through restricted search ellipse dimensions.

Table 11-7: Top and low cuts used for the Juruti plateaus.

	Variable	Top cut	Low cut	Distance			Top cut	Low cut	Distance
Capiranga Central	AA1 (%)	56.44	35.56	40	Nhamundá	AA1 (%)	54.32	26.37	100
	AA3 (%)	56.02	32.95	40		AA3 (%)	53.25	22.01	100
	AAG (%)	56.18	36.56	40		AAG (%)	---	---	---
	SR1 (%)	8.88	0.58	40		SR1 (%)	12.45	0.89	100
	SR3 (%)	10.29	0.54	40		SR3 (%)	10.83	0.58	100
	SRG (%)	8.14	0.62	40		SRG (%)	---	---	---
	RC1 (%)	82.66	24.49	40		RC1 (%)	82.61	13.8	100
	RC3 (%)	37.67	6.13	40		RC3 (%)	21.51	0.54	100
	RCG (%)	93.45	55.02	40		RCG (%)	---	---	---
	DENS (g/t)	1.73	0.89	40		DENS (g/t)	---	---	---
Mauari	AA1 (%)	57.41	27.31	100	Santarém	AA1 (%)	54.4	23.15	100
	AA3 (%)	55.86	31.95	100		AA3 (%)	55.79	24.1	100
	AAG (%)	56.74	34.5	100		AAG (%)	---	---	---
	SR1 (%)	9.82	0.625	100		SR1 (%)	14.3	1.1	100
	SR3 (%)	9.94	0.53	100		SR3 (%)	10.7	0.8	100
	SRG (%)	8.31	0.6	100		SRG (%)	---	---	---
	RC1 (%)	79.5	7.05	100		RC1 (%)	54.9	6	100
	RC3 (%)	41.33	8.07	100		RC3 (%)	37.06	7.3	100
	RCG (%)	99.33	34.72	100		RCG (%)	---	---	---
	DENS (g/t)	1.7	0.93	100		DENS (g/t)	---	---	---
Mutum	AA1 (%)	55.4	23.5	100	São Francisco	AA1 (%)	56.32	23.5	50
	AA3 (%)	55.3	22	100		AA3 (%)	56.78	26.1	50
	AAG (%)	---	---	---		AAG (%)	---	---	---
	SR1 (%)	13.9	0.46	100		SR1 (%)	12.7	0.2	50
	SR3 (%)	9.6	0.3	100		SR3 (%)	10.3	0.22	50
	SRG (%)	---	---	---		SRG (%)	---	---	---
	RC1 (%)	56.34	6.27	100		RC1 (%)	54.93	2.6	50
	RC3 (%)	39.68	5.92	100		RC3 (%)	41.8	8.03	50
	RCG (%)	---	---	---		RCG (%)	---	---	---
	DENS (g/t)	---	---	---		DENS (g/t)	---	---	---

The data present in table above correspond to the drilling methodology used in each plateau, that is AC drill holes in Capiranga Central and Mauari plateaus, auger in Mutum, São Francisco and Santarém plateaus and AC, auger and well for Nhamundá plateau.

Figure 11-11 shows probability plots comparing capped and uncapped KEV composites at Capiranga Central and Mauari and illustrates that the values defined for top and low cuts are not in a natural break within the distributions. In some cases, e.g., RCG for Mauari plateau (lower-right) and SRG for Capiranga Central plateau (upper-middle), more than 5% or 10% of the distribution is being re-classified to a small range. This is an important change in the distribution that directly impacts the variability and estimate.

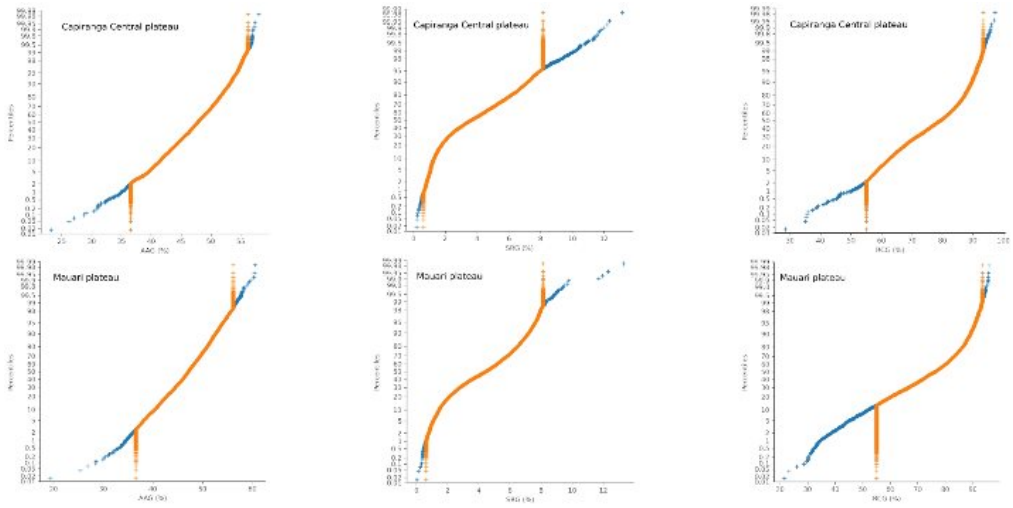


Figure 11-11: KEV probability plots of original (orange) and capped (blue) composited values for Capiranga Central (top) and Mauari (bottom) plateaus, (SLR, 2021)

SLR recommends reviewing whether grade restriction through low and top cutting is warranted, and refining the methodology to ensure that the delimiting values represent true outlier data. The impact of the current approach may be that areas reflecting either low or high values of economic and deleterious elements, as well as wash recovery values are underrepresented in the block model.

12.6 Trend Analysis

12.6.1 Variography

Variograms are calculated for all estimated variables. The variograms developed usually have two structures and are calculated using the composited samples. Figure 11-12 shows KEV variograms for the Capiranga Central and Mauari plateaus.

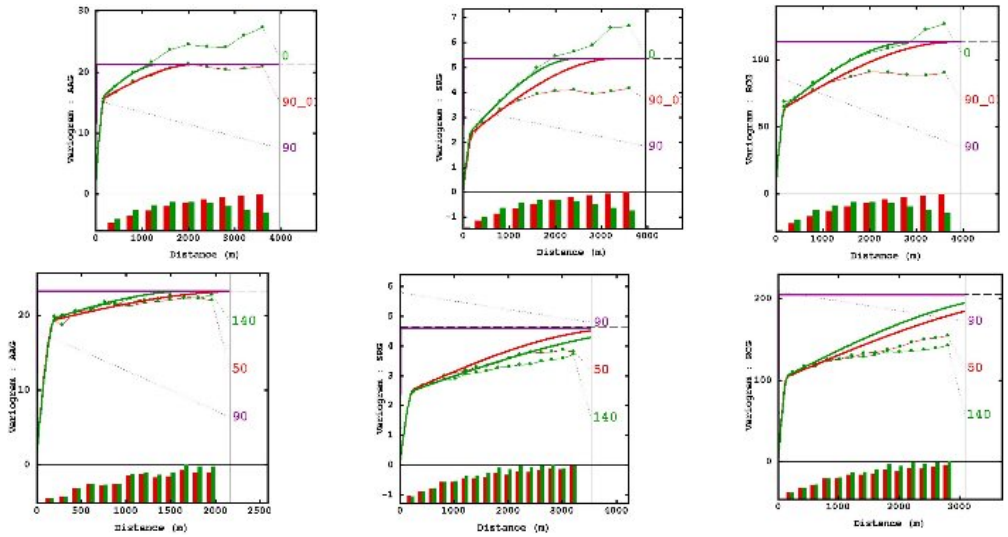


Figure 11-12: AAG, SRG and RCG variograms for Capiranga Central (top) and Mauari (bottom), (Alcoa, 2021)

Table 11-8 and Table 11-9 show the variogram fitting parameters for all the variables for the Capiranga central and Mauari plateaus.

Table 11-8: Variogram parameters for the Capiranga Central Plateau.

Variable	Azimuth	Nugget	Sill 1	Sill 2	Structure 1 (m)			Structure 2 (m)		
					Horizontal		Vertical	Horizontal		Vertical
AA1	90	2	15.9	6.8	190	190	1.3	2400	1450	2.3
AA3	90	1.1	17.1	12.2	250	250	1.4	3600	2300	2.6
AAB	90	4.5	32.5	22.2	250	210	1.7	2700	1550	3.4
AAG	90	1.8	13.2	6.3	200	200	1.3	2200	1400	2
ATB	90	1.2	15.4	3.25	190	190	1.2	1300	900	2.8
ATG	90	1.3	12.1	3.2	240	260	1.6	2600	2000	2.1
DENS	90	0.005	0.014	0.014	220	200	2	3100	2100	2.9
FEB	90	5	29.5	13.2	190	180	2.5	2800	2300	2.2
FEG	90	3.09	28.79	7.61	240	260	1.6	2600	2000	2.1
PPB	90	0.6	4.6	1.9	160	160	1.4	1800	1200	3.2
PPG	90	0.32	2.95	0.78	240	260	1.6	2600	2000	2.1
RC1	90	1	96.5	77	230	210	2	8200	7200	0

Variable	Azimuth	Nugget	Sill 1	Sill 2	Structure 1 (m)			Structure 2 (m)		
					Horizontal		Vertical	Horizontal		Vertical
RC3	90	0.01	28	22	250	250	3.5	6000	3900	2.9
RCG	90	5	54.4	38	210	210	2.3	3800	2900	2.6
SR1	90	0.01	2.5	3.55	200	200	3	3400	2600	3
SR3	90	0.01	2.4	3.5	230	210	4.5	3300	2200	5
SRB	90	0.01	11.4	15.4	220	220	3.2	3600	2300	3
SRG	90	0.01	2.1	3.25	230	200	3.5	3300	2450	3
STB	90	0.10	14.5	19.6	200	190	3.5	3800	2300	3
STG	90	0.49	4.53	1.20	240	260	1.6	2600	2000	2.1
TIB	90	0.005	0.017	0.006	150	150	1.1	2900	1900	4.3
TIG	90	0.002	0.017	0.005	240	260	1.6	2600	2000	2.1
UMID	90	0.8	5.2	2.45	200	200	2.2	2500	2200	2.4

Table 11-9: Variogram parameters for the Mauari Plateau.

Variable	Azimuth	Nugget	Sill 1	Sill 2	Structure 1 (m)			Structure 2 (m)		
					Horizontal		Vertical	Horizontal		Vertical
AA1	50	1.5	26.3	7.3	350	350	1.45	5000	2500	3.5
AA3	50	1.5	18.9	6.7	250	200	1.2	2600	2300	2.7
AAB	50	1.5	47.5	22	300	150	2.3	4000	2900	4.5
AAG	50	1.5	17.4	4.4	200	210	1.4	2300	1700	2.15
ATB	50	1.5	17.4	4.2	220	220	1.2	1500	1000	2.1
ATG	50	1.5	14.6	3.8	220	220	1.4	5000	2900	2.8
DENS	50	0.007	0.014	0.006	250	230	0.9	4800	3000	2.7
FEB	50	5	30.6	12	400	220	1.3	6000	3000	4.2
FEG	50	5	27	14	300	280	1.7	5000	3800	2.5
PPB	50	0.6	5.35	2	270	250	1.8	1900	1250	2
PPG	50	0.3	3.29	0.72	280	250	1.5	2800	2100	3.8
RC1	50	0.01	145	195	270	270	2.8	8500	6400	2
RC3	50	0.01	29.2	30	350	330	3	4000	3500	0
RCG	50	0.01	100	105	152	165	2	5000	4200	2
SR1	50	0.1	2.8	2.8	270	280	1.9	4400	5700	2
SR3	50	0.1	2.7	2.05	280	310	4.85	4900	6500	0
SRB	50	0.1	15.5	14.5	300	250	2	5200	6200	2
SRG	50	0.1	2.25	2.25	250	250	2.1	4200	5200	2
STB	50	0.1	20.18	18	300	300	2	5500	7000	0
STG	50	0.1	3.45	3.85	280	300	2.2	5000	8000	0
TIB	50	0.03	0.225	0.035	140	190	0.5	1200	1800	1.6
TIG	50	0.02	0.1	0.11	250	250	2.5	3500	3200	3.2
UMID	50	0.1	6.8	4.05	280	280	2.1	6000	4800	0

12.7 Search Strategy and Grade Interpolation Parameters

To define the search strategy for the plateaus, Alcoa performed an extensive study to define the best parameters related to the search ellipse size, octant search restriction, and the number of composites to be used in each interpolation pass in order to minimize smoothing and to improve validation results.

Table 11-10 lists the estimated variables at Capiranga Central and Mauari plateaus and details of the resultant four-pass interpolation approach, which used increasingly larger search ellipses and relaxed composite criteria in the fourth pass is shown in Table 11-.

Table 11-10: Summary of estimated variables at Capiranga Central and Mauari

Variable	Description	Variable	Description
AA1	A.Al_2O_3- washed - mesh +20# (%)	RC1	Mass recovery - washed - mesh +20# (%)
AA3	A.Al_2O_3a- washed - mesh - 20# +400# (%)	RC3	Mass recovery - washed - mesh - 20# +400# (%)
AAB	A.Al_2O_3- unwashed (%)	RCG	Global Mass Recovery (%) (calculated)
AAG	A.Al_2O_3- washed (%) (calculated)	SR1	R.SiO_2 - washed - mesh +20# (%)
ATB	Total Alumina - unwashed (%)	SR3	R.SiO_2 - washed - mesh - 20# +400# (%)
ATG	Global Total Alumina - washed (%)	SRB	R.SiO_2 - unwashed (%)
DENS	Dry density	SRG	Global Reactive Silica (%) (calculated)
FEB	Total Iron - unwashed (%)	STB	Total Silica - unwashed (%)
FEG	Global Total Iron - washed (%)	STG	Global Total Silica - washed (%)
PPB	LOI - unwashed (%)	TIB	Total Titanium - unwashed (%)
PPG	Global LOI - washed (%)	TIG	Global Total Titanium - washed (%)
		UMID	Humidity (%)

All other plateaus were estimated using a similar approach, with flat, increasingly larger search ellipses and relaxed composite criteria in a multi-pass OK interpolation workflow. Density was assigned at 1.3 t/m^3.

Table 11-11: Estimation parameters for the Capiranga Central and Mauari Plateaus

	Pass 1		Pass 2		Pass 3		Passes 1, 2 and 3				Pass 4					
Plateau	Major	Semi-major	Major	Semi-major	Major	Semi-major	Vertical[1]	Min Samples	No. Sectors	Opt per sector[2][3]	Major	Semi-major	Vertical	Min samples	No. sectors	Opt per sector
Capiranga Central	300	230	600	450	900	675	1 / 1.5	3	4	3 / 6	1500	1500	2	1	4	3 / 6
Mauari	585	450	1200	900	2500	1900	1 / 1.5	3	4	2 / 6	5200	5200	2	1	4	2 / 6

Notes:

1. Vertical search is 1 m for pass 1 and 2, and 1.5 m for pass 3
2. Opt per sector is 6 for all variables except ATG, FEG, PPG, STG, and TIG, which is 3.
3. Opt per sector is 6 for all variables except ATG, FEG, PPG, STG, and TIG, which is 2.

12.8 Block Models

Block model specifications by plateau is shown in Table 11-12. Individual block model dimensions cover each plateau without overlap. The Nhamundá block model represents a combination of several models designed to best reflect available data locally.

Table 11-12: Block model specifications.

Plateau	Axis	Origin	No. Blocks	Block Size	Rotation
Capiranga Central	X	599000	263	50	0
	Y	9718300	150	50	0
	Z	77	110	0.5	0
Mauari	X	573400	234	50	0
	Y	9723900	206	50	0
	Z	65	105	0.5	70°
Mutum	X	573050	727	50	0
	Y	9703850	284	50	0
	Z	75	150	0.5	0
Nhamundá[1]	X	506400	837	50	0
	Y	9770800	116	50	0
	Z	60	240	0.5	0
Santarém	X	623300	659	50	0
	Y	9720350	373	50	0
	Z	90	204	0.5	0
São Francisco	X	608000	410	50	0
	Y	9714000	310	50	0
	Z	70	190	0.5	0

Notes:

1. This is the information of the combined block models

12.9 Cut-off Grade

Mineral Resources are constrained to a 50 m offset distance from each plateau limit and are estimated at a pit discard cut-off value. A benefit calculation is applied to determine whether a block is economically viable.

The criteria for the Mineral Resources were developed using:

- A long-term bauxite price of US$35.33/t (wet base), representing a 30% increase over the Mineral Reserve bauxite price
- A R$:US$ exchange rate of R$5.34:US$1.00
- 100% metal recovery for the washed and unwashed material
- Maximum mining selectivity, without consideration of minimum thickness.

The Mineral Resources bauxite price is defined as 30% higher than the Mineral Reserves bauxite price, which is defined as weighted-average price of the previous year's third-party sales (more details can be found in the Section 16.2.3 Pricing). The Mineral Reserves bauxite price is based on contracts between Juruti Mine and Alumar Refinery (Alcoa), once 90% of the bauxite production is shipped to this refinery. The contract is reviewed annually and is based on factor relating to internal and external demand for bauxite, as well as bonus and penalties depending on the product quality. The transfer price mechanism from Juruti to Alumar is determined by a weighted-average price of the previous year's third-party sales. For example, the 2021 internal transfer price from Juruti to Alumar will be the weighted-average price of 2020 third-party sales.

The SLR QP is of the opinion that the Mineral Resource estimation approach is acceptable and the Mineral Resources represent a reasonable estimate of the economic potential of the mineral deposit.

12.10 Classification

The Mineral Resource classification uses indicator kriging and Turning Bands conditional simulation in the unfolded block model made by unfold tool in Isatis™. Indicator kriging is used to measure the uncertainty related to the ore zone volume and the conditional simulation is used to access the uncertainty related to the grades and metal content.

In this methodology, indicator kriging of lithology type (bauxite/non-bauxite) is performed to assign a probability to each block referencing accurate determination of bauxite. With the results of the indicator kriging Alcoa's team uses the risk index (RI), that is based on the sample distribution and in the geometrical characteristics of the deposit, to make a first classification of the mineral resources, according to the ranges defined by Amorim and Ribeiro (1996), shown below.

- Measured: RI ≤ 0.6
- Indicated: 0.6 < RI ≤ 0.9
- Inferred: RI > 0.9

The kriging variance is another variable generated from indicator kriging and it indicates the degree of confidence of this assumption. For the final Mineral Resource classification, both methodologies are used, RI and kriging variance.

Conditional simulation (turning bands algorithm) is performed on A.Al_2O_3, R.SiO_2, wash recovery, and density accumulated on two-dimensional (2D) panels of 50 m x 50 m, and three dimensional (3D) panels representing quarterly (800 m x 800 m) and annual (1,600 m x 1,600 m) production periods. Uncertainty limits are defined as shown below:

- Measured: +/- 15% uncertainty in the quarterly panel
- Indicated: +/- 15% uncertainty in the annual panel

The remaining unclassified blocks are classified as inferred.

The limits for the conditional simulation classification are defined through the maximum estimated error (MEE), according to the equation below.

$$MEE_{(i)} = \frac{[(Q95_{(i)} - Q5_{(i)})/2]}{E_{type(i)}}$$

Where $Q95_{(i)}$ and $Q5_{(i)}$ are the 95th and 5th quantiles of the simulated block *i* and $E_{type(i)}$ is the mean of the values simulated in each block.

For the final MEE value an average MEE was used, according to the expression below.

$$MEE_{(average)} = \frac{(MEE_{acc\ Al2O3} + MEE_{acc\ SiO2} + MEE_{acc\ Rec} + MEE_{acc\ thickness} + MEE_{acc\ Dens})}{5}$$

Where $MEE_{acc\ Al2O3}$, $MEE_{acc\ SiO2}$, $MEE_{acc\ Rec}$, $MEE_{acc\ Thickness}$ and $MEE_{acc\ Dens}$, are the MEE of each variable simulated.

The MEE and RI limits for classification are presented in the table below.

Table 11-13: MEE and RI Classification Limits

Deposit	RI Intervals			MEE Intervals		
	Measured	Indicated	Inferred	Measured	Indicated	Inferred
Capiranga Central	RI < 0.6	0.6 ≤ RI ≤ 0.9	> 0.9	< 0.54	0.54 ≤ MEE ≤ 0.82	> 0.82
Mauari	RI < 0.6	0.6 ≤ RI ≤ 0.9	> 0.9	< 0.30	0.30 ≤ MEE ≤ 0.51	> 0.51
São Francisco	RI < 0.6	0.6 ≤ RI ≤ 0.9	> 0.9	< 0.30	0.30 ≤ MEE ≤ 0.45	> 0.45
Nhamundá 1 (AC)	RI < 0.6	0.6 ≤ RI ≤ 0.9	> 0.9	< 0.25	0.25 ≤ MEE ≤ 0.35	> 0.35
Nhamundá 2 (AC)	RI < 0.6	0.6 ≤ RI ≤ 0.9	> 0.9	< 0.25	0.25 ≤ MEE ≤ 0.35	> 0.35
Nhamundá 3 (auger)	RI < 0.6	0.6 ≤ RI ≤ 0.9	> 0.9	< 0.10	0.10 ≤ MEE ≤ 0.30	> 0.30
Nhamundá 4 (wells/pits)	RI < 0.6	0.6 ≤ RI ≤ 0.9	> 0.9	< 0.30	0.30 ≤ MEE ≤ 0.41	> 0.41
Nhamundá 5 (wells/pits)	RI < 0.6	0.6 ≤ RI ≤ 0.9	> 0.9	< 0.15	0.15 ≤ MEE ≤ 0.35	> 0.35
Mutum	RI < 0.6	0.6 ≤ RI ≤ 0.9	> 0.9	< 0.40	0.40 ≤ MEE ≤ 0.58	> 0.58
Santarém	RI < 0.6	0.6 ≤ RI ≤ 0.9	> 0.9	< 0.30	0.30 ≤ MEE ≤ 0.45	> 0.45

The final classification represents the most conservative result between RI and that based on the MEE. As both are a 3D classification, the final result also has a 3D pattern.

Post-processing of the classification is performed to avoid artefacts such as “spotted-dogs”, and to improve the continuity of the results. The post-processing is based on a grid smoothing procedure which assigns the class of a block according to the local majority. Further post processing is performed to limit a classification of Indicated to areas supported by auger drill hole results, and to Inferred where supported by well type samples.

Figure 11-13 shows a plan view of the Capiranga Central (top) and Mauari (bottom) model classifications.

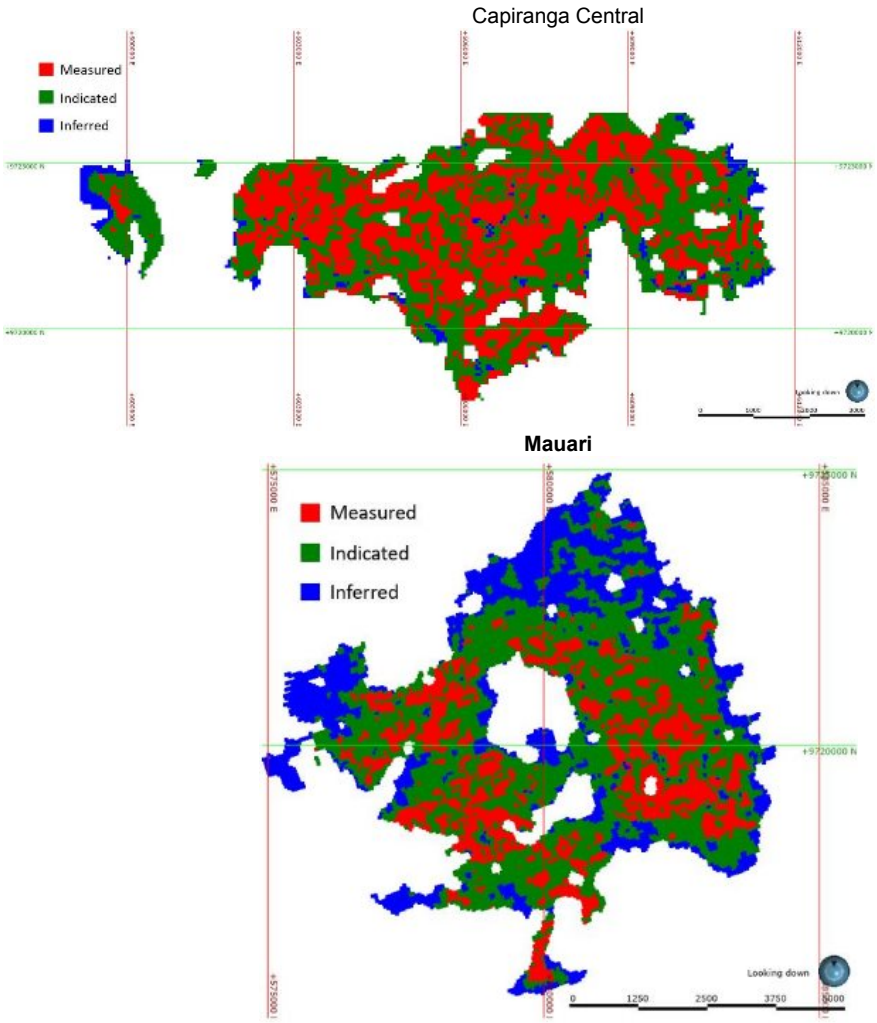


Figure 11-13: Mineral Resources classification for the Capiranga Central (top) and Mauari (bottom) plateaus (SLR, 2021)

The Mineral Resource classification methodology described above is based on the geostatistical approach, and the uncertainties are quantified based on the quality of sampling, drill hole spacing, assays, top and low-cuts, variogram, and the expertise and experience of the Alcoa's staff in the steps related with Mineral Resources. The source of uncertainties, depending on each Resource category mentioned here, are not all subject to quantification individually. Instead, a global perspective of all the categories together is given by the conditional simulation methodology, which stipulates the limits of ±15% of the production uncertainty on a quarterly basis for Measured Resources, ±15% of the production uncertainty on an annual basis for Indicated Resources, and Inferred Resources have the production uncertainty that are higher than ±15% on an annual basis.

The SLR QP is of the opinion that the procedures adopted to generate the final Mineral Resources classification are in accordance with the industry best practices and are reasonable and acceptable.

12.11 Block Model Validation

SLR validated the block models through the following methods:

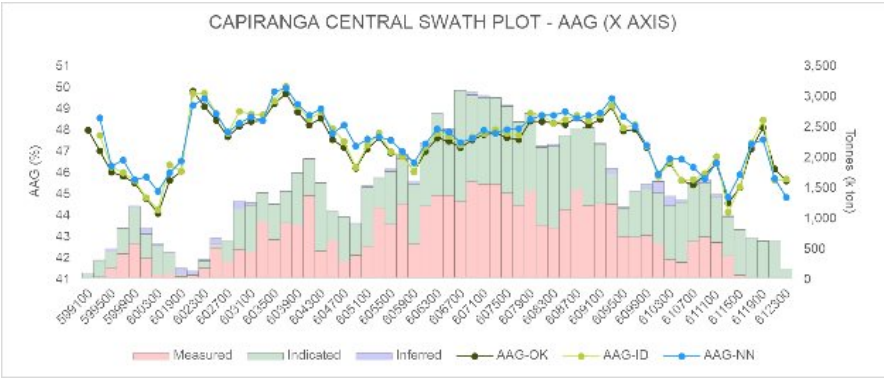
- Swath plots of the ordinary kriging (OK), inverse distance cubed (ID3) and nearest neighbor (NN) estimations. The inverse distance and nearest neighbor estimates were parallel estimate made by SLR using the neighborhood parameters provided by Alcoa.
- Statistical validation comparing samples composited with the top and low-cut values and the OK estimate.
- Visual validation of the block models and samples through vertical and longitudinal sections.
- Statistic of parallel estimation comparison between composites with top and low-cut values and interpolated values

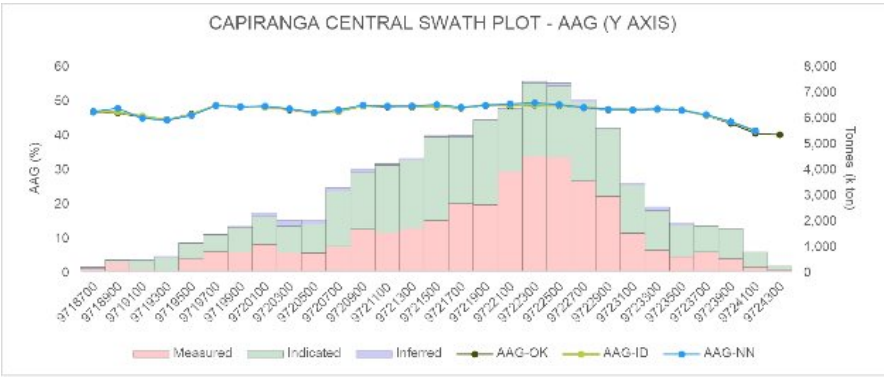
Alcoa similarly employs its own internal validation workflow that includes cross validation, QQ-plots, swath plots and visual inspection of sections showing the composites versus the block estimates. This validation workflow is an automatic routine in Isatis™ and is generated for all the variables for each plateau.

12.11.1 Swath Plots

Figure 11-14 and Figure 11-15 show the swath plots for the Capiranga Central and Mauari plateaus.

In general, the results in the swath plots are consistent, mainly for AAG in Capiranga Central. SRG does not show a homogeneous behavior compared to AAG but has a good consistency between the OK, ID3 and NN estimates. At the limit of the model extents, some plots show a more erratic behavior, but SLR considers this a normal effect in the regions with lower density of information and consequently no blocks classified as Measured Resources.


CAPIRANGA CENTRAL SWATH PLOT - AAG (X AXIS)
AAG (%)
Tonnes (k ton)
Measured
Indicated
Inferred
AAG-OK
AAG-ID
AAG-NN


CAPIRANGA CENTRAL SWATH PLOT - AAG (Y AXIS)
AAG (%)
Tonnes (k ton)
Measured
Indicated
Inferred
AAG-OK
AAG-ID
AAG-NN

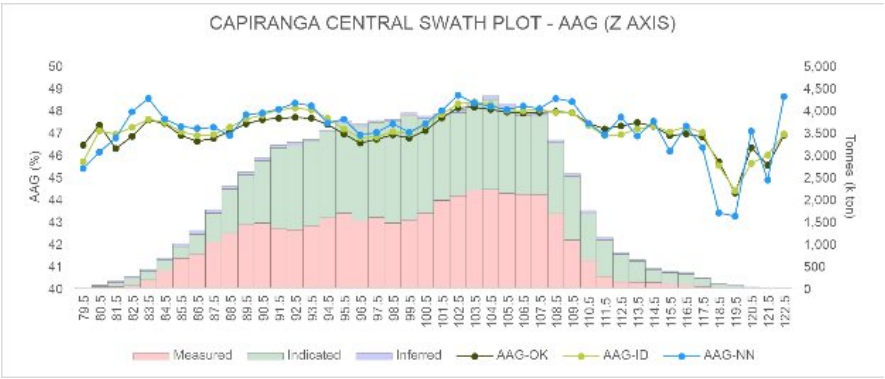
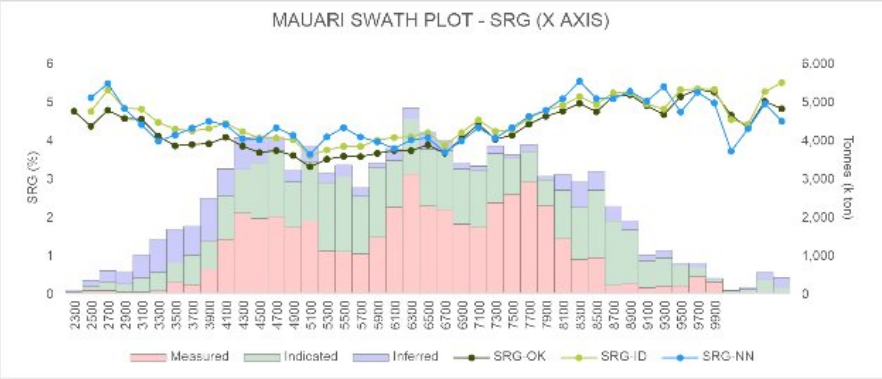
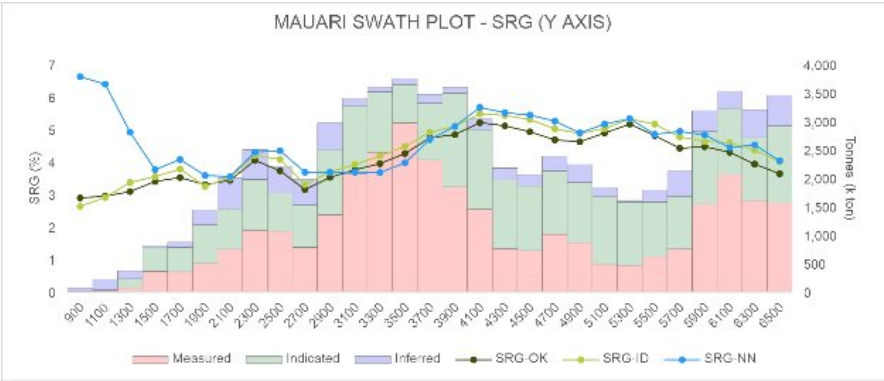

CAPIRANGA CENTRAL SWATH PLOT - AAG (Z AXIS)
AAG (%)
Tonnes (k ton)
Measured
Indicated
Inferred
AAG-OK
AAG-ID
AAG-NN

Figure 11-14: Swath plots in X, Y and Z for AAG - Capiranga Central plateau.





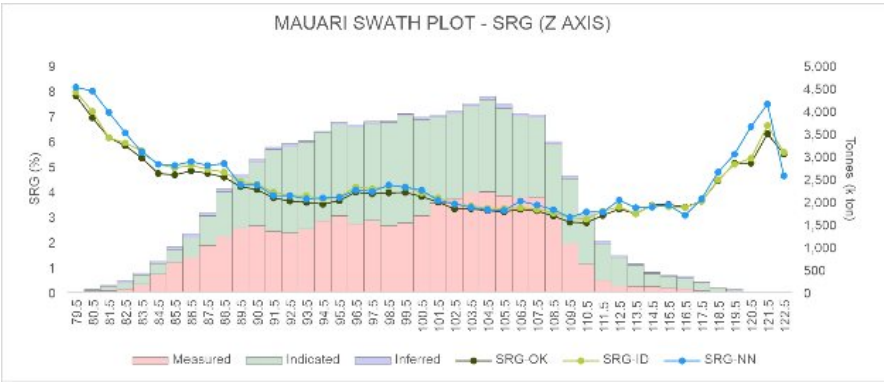


Figure 11-15: Swath plots in X, Y and Z for SRG - Mauari plateau.

12.11.2 Statistical Validation

Statistics of the block models and the samples composited and with top and low cuts were calculated by SLR and compared for this validation. Table 11-14 shows the results.

Table 11-14: Composites and block model statistics.

	Variable	Capped Composites					Ordinary Kriging					Difference
		Min (%)	Max (%)	Mean (%)	Std. Dev. (%)	CV	Min (%)	Max (%)	Mean (%)	Std. Dev. (%)	CV	
Capiranga Central	AA1 (%)	35.56	56.44	47.71	4.74	0.10	29.95	56.94	47.85	3.22	0.07	0.29%
	AA3 (%)	32.95	56.02	46.08	5.37	0.12	18.7	56.73	46.15	4.17	0.09	0.16%
	AAG (%)	36.56	56.18	47.53	4.46	0.09	30.88	56.69	47.57	3.18	0.07	0.09%
	SR1 (%)	0.58	8.88	4.06	2.33	0.57	0.15	11.73	3.67	1.91	0.52	-9.70%
	SR3 (%)	0.54	10.29	3.90	2.35	0.60	0.35	13.18	3.54	1.91	0.54	-9.10%
	SRG (%)	0.62	8.14	3.95	2.18	0.55	0.21	11.75	3.61	1.85	0.51	-8.65%
	RC1 (%)	24.49	82.66	58.79	13.01	0.22	19.88	82.71	60.72	8.86	0.15	3.29%
	RC3 (%)	6.13	37.67	18.52	6.83	0.37	4.75	52.46	18.07	5.35	0.30	-2.44%
	RCG (%)	55.02	93.45	77.43	10.25	0.13	45.77	105.76	78.79	7.29	0.09	1.76%
	DENS (g/t)	0.89	1.73	1.30	0.18	0.14	0.86	1.78	1.30	0.14	0.10	0.51%
Mauari	AA1 (%)	27.31	57.41	46.65	5.19	0.11	12.92	59.79	46.79	4.05	0.09	0.30%
	AA3 (%)	31.95	55.86	45.70	5.03	0.11	24.07	58.77	45.59	3.37	0.07	-0.24%
	AAG (%)	34.50	56.74	46.80	4.63	0.10	32.28	58.98	46.70	3.35	0.07	-0.20%
	SR1 (%)	0.63	9.82	4.56	2.33	0.51	0.09	11.11	4.19	1.97	0.47	-8.10%
	SR3 (%)	0.53	9.94	4.17	2.17	0.52	0.49	11.84	3.89	1.52	0.39	-6.72%
	SRG (%)	0.60	8.31	4.36	2.12	0.49	0.32	9.73	4.04	1.72	0.43	-7.27%
	RC1 (%)	7.05	87.03	51.25	16.48	0.32	2.76	86.21	54.35	14.51	0.27	6.04%
	RC3 (%)	8.07	41.33	21.84	7.44	0.34	6.36	43.46	21.26	5.52	0.26	-2.67%
	RCG (%)	34.72	95.91	73.13	12.12	0.17	32.19	100.69	75.60	11.25	0.15	3.39%
	DENS (g/t)	0.93	1.70	1.29	0.16	0.13	0.92	1.78	1.29	0.09	0.07	-0.03%
Mutum	AA1 (%)	23.50	55.40	42.02	7.32	0.17	0	55.4	37.63	10.66	0.28	-10.45%
	AA3 (%)	22.00	55.30	42.98	7.09	0.17	0	55.3	38.43	10.85	0.28	-10.58%
	AAG (%)	20.94	57.49	42.77	6.75	0.16	0	55.36	38.12	10.60	0.28	-10.88%
	SR1 (%)	0.46	13.90	6.41	3.23	0.50	0	15.08	6.65	2.93	0.44	3.79%
	SR3 (%)	0.30	9.60	4.61	1.97	0.43	0	13.21	4.81	1.91	0.40	4.47%
	SRG (%)	0.10	14.90	5.63	2.60	0.46	0	12.95	5.97	2.50	0.42	5.99%
	RC1 (%)	0.96	67.35	33.29	12.08	0.36	0	60.41	31.86	11.12	0.35	-4.30%
	RC3 (%)	2.86	52.93	19.51	7.25	0.37	0	41.85	16.76	6.88	0.41	-14.12%
	RCG (%)	21.09	97.56	52.81	12.39	0.23	0	79.97	48.62	14.67	0.30	-7.92%
	DENS (g/t)	-	-	-	-	-	1.3	1.3	1.30	-	-	-

Nhamundá	AA1 (%)	26.37	54.32	45.39	6.11	0.13	0	56.27	45.05	6.26	0.14	-0.75%
	AA3 (%)	22.01	53.25	43.60	6.98	0.16	0	57.86	42.88	6.81	0.16	-1.65%
	AAG (%)	16.73	57.15	45.34	6.15	0.14	0	56.82	44.84	6.26	0.14	-1.11%
	SR1 (%)	0.89	12.45	5.98	2.86	0.48	0	13.75	5.81	2.18	0.38	-2.89%
	SR3 (%)	0.58	10.83	5.17	2.25	0.43	0	13.95	5.11	1.62	0.32	-1.25%
	SRG (%)	0.65	13.18	5.80	2.66	0.46	0	12.92	5.67	2.01	0.35	-2.21%
	RC1 (%)	2.34	86.78	54.85	17.44	0.32	0	85.18	51.55	13.65	0.26	-6.01%
	RC3 (%)	0.46	34.11	9.41	6.36	0.68	0	32.3	9.15	2.86	0.31	-2.70%
	RCG (%)	11.72	94.76	64.25	15.71	0.24	0	92.25	60.70	12.88	0.21	-5.53%
	DENS (g/t)	-	-	-	-	-	1.3	1.3	1.30	-	-	-

	Variable	Capped Composites					Ordinary Kriging					Difference
		Min (%)	Max (%)	Mean (%)	Std. Dev. (%)	CV	Min (%)	Max (%)	Mean (%)	Std. Dev. (%)	CV	
Santarém	AA1 (%)	23.15	54.40	41.44	7.24	0.17	0	55	40.10	5.21	0.13	-3.23%
	AA3 (%)	24.10	55.79	43.79	7.29	0.17	0	55.55	42.17	5.52	0.13	-3.71%
	AAG (%)	20.21	56.29	42.66	6.87	0.16	0	55.01	41.04	5.07	0.12	-3.79%
	SR1 (%)	1.10	14.30	6.81	2.92	0.43	0	14.57	6.77	2.15	0.32	-0.57%
	SR3 (%)	0.80	10.70	4.76	1.93	0.41	0	12.27	5.16	1.74	0.34	8.42%
	SRG (%)	0.41	13.95	5.96	2.37	0.40	0	12.51	6.13	1.83	0.30	2.83%
	RC1 (%)	3.16	63.95	32.64	11.85	0.36	0	55.91	32.19	8.00	0.25	-1.38%
	RC3 (%)	2.32	44.68	18.07	6.31	0.35	0	43.27	18.01	4.30	0.24	-0.31%
	RCG (%)	14.34	80.31	50.71	12.26	0.24	0	77.32	50.20	8.85	0.18	-1.00%
	DENS (g/t)	-	-	-	-	-	1.3	1.3	1.30	-	-	-
São Francisco	AA1 (%)	23.50	56.32	43.48	7.60	0.17	16.09	57.94	43.34	5.31	0.12	-0.32%
	AA3 (%)	26.10	56.78	46.79	6.62	0.14	24.69	57.76	45.95	5.01	0.11	-1.80%
	AAG (%)	20.37	58.97	45.57	6.63	0.15	25.15	57.76	44.82	4.78	0.11	-1.64%
	SR1 (%)	0.20	12.70	5.11	3.16	0.62	0.01	14.26	4.80	2.37	0.49	-6.02%
	SR3 (%)	0.22	10.30	3.66	2.11	0.58	0.13	12.4	3.55	1.52	0.43	-2.89%
	SRG (%)	0.10	16.61	4.33	2.49	0.58	0.12	11.76	4.18	1.86	0.44	-3.51%
	RC1 (%)	0.90	60.77	30.22	13.47	0.45	3.37	55.34	31.85	9.45	0.30	5.40%
	RC3 (%)	3.22	60.08	24.60	7.17	0.29	4.87	51.17	23.74	5.19	0.22	-3.49%
	RCG (%)	15.08	87.04	54.82	14.07	0.26	24.25	83.23	55.59	9.69	0.17	1.41%
	DENS (g/t)	-	-	-	-	-	1.3	1.3	1.30	-	-	-

Table 11-14 shows that the maximum and minimum values of the block model grades are usually out of the range of the top and low cuts, including values of recovery above 100%. Alcoa provided information related to these occurrences and one of the reasons are kriging negative weights, which is a limitation of the estimation methodology already well known and described in public literature. As shown in the Table 11-15, the blocks out of the top and low cuts are predominantly less than 1% of the estimated blocks.

Table 11-15: Summary of the blocks out of the low and top cuts – Capiranga Central plateau.

Variable	Estimated blocks	Grade lower than low cut	Grade higher than top cut	Total	%
AA1	55083	64	3	67	0.12%
AA3	55083	77	5	82	0.15%
AAG	55083	185	2	187	0.34%
SR1	55083	42	663	705	1.28%
SR3	55083	35	129	164	0.30%
SRG	55083	181	42	223	0.40%
RC1	55083	26	1	27	0.05%

Variable	Estimated blocks	Grade lower than low cut	Grade higher than top cut	Total	%
RC3	55083	61	61	122	0.22%
RCG	55083	392	79	471	0.86%
DENS	55083	6	7	13	0.02%

The SLR QP is of the opinion is that it does not have a significant impact on the global Mineral Resources results, and SLR QP recommends that the estimation workflow is refined to treat and avoid the values above and below the top and low-cuts.

12.11.3 Visual Validation

For the visual validation, several horizontal and vertical sections in multiple orientations were created to observe if the grades in the samples were consistent with the grades in the block model. No anomalies were found, and Figure 11-16 and Figure 11-17 show a schematic vertical section comparing the blocks and samples in the Capiranga Central and Mauari plateaus.

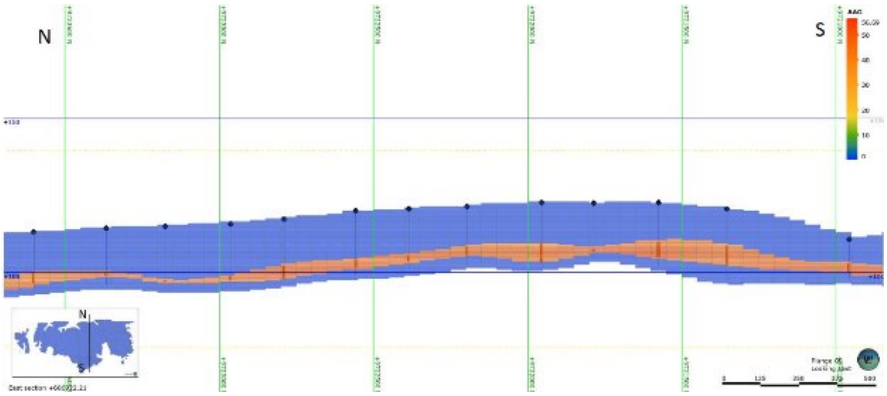


Figure 11-16: Vertical N-S section in the Capiranga Central plateau showing the blocks estimated in the bauxite layer (SLR, 2021)

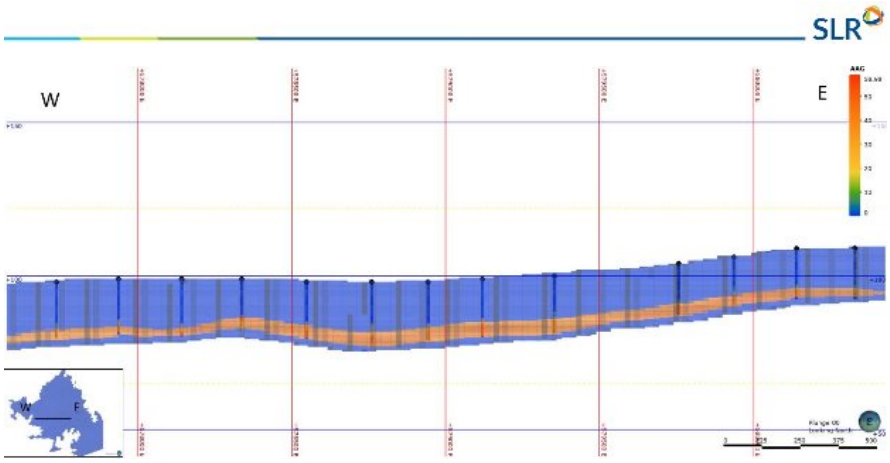


Figure 11-17: Vertical W-E section in the Mauari plateau showing the blocks estimated in the bauxite layer (SLR, 2021)

12.11.4 Parallel Estimation Statistics

Table 11-16 shows the comparison of the capped composites with the average grades of the block model using OK, and the ID3 and NN estimates. ID3 and NN were calculated by SLR using the same estimation strategy.

Table 11-16: Parallel statistics for the main variables for the Capiranga Central and Mauari plateaus.

Capiranga Central						
Variable	Capped Composites		Block Model			
	Samples	Mean	n Blocks	OK	ID3	NN
AAG (%)	3675	47.53	55083	47.57	47.74	47.88
SRG (%)	3675	3.95	55083	3.61	3.77	3.78
RCG (%)	3675	77.43	55083	78.79	78.08	78.09
Mauari						
Variable	Capped Composites		Block Model			
	Samples	Mean	n Blocks	OK	ID3	NN
AAG (%)	3851	46.80	62716	46.70	47.02	46.93
SRG (%)	3851	4.36	62716	4.04	4.30	4.30
RCG (%)	3851	73.13	62716	75.60	73.69	73.40

12.11.5 Comparison to Short Term Model

None of the six plateaus for which Mineral Resources are estimated, have been mined.

To evaluate the discrepancy between the long term and short-term block models, SLR analyzed and reviewed the reconciliation practiced elsewhere at the Juruti site, and noticed that the most important deviation is related to R.SiO2 (+5.94% for washed ore and +15.57% for unwashed ore in 2021). The highest differences in the drill holes and block model comparison were also with the reactive silica. QA/QC standard results are showing a high dispersion in this element as well. All of this indicates that the estimate of R.SiO2 is very sensitive and needs to be more detailed, given it has a high impact in the acid consumption in the process.

12.11.6 Mineral Resource Estimation Workflow Conclusions and Recommendations

Regarding the Mineral Resource estimation workflow and results, the SLR QP makes the following conclusions:

- the Mineral Resource estimation approach is acceptable and the Mineral Resources represent a reasonable estimate of the economic potential of the mineral deposit. The impact of the current grade restriction approach may be that areas reflecting either low or high values of economic and deleterious elements, as well as wash recovery values are underrepresented in the block model.
- Reconciliation prepared by Alcoa on actively mined plateaus indicates high dispersion and sensitivity of R.SiO2.

In consideration of the above conclusions, and to improve the estimation workflow and estimation results, the SLR QP makes the following recommendations:

1. Reduce dependance on well and auger drill hole results supporting Mineral Resource estimation at Nhamundá, Mutum, Santarém and São Francisco.

2. Improve the modelled bauxite layer continuity. There are some gaps in the mineralization layer locally where there are missing drill holes.
3. Review whether grade restriction through low and top cutting is warranted, and refine the methodology to ensure that the delimiting values represent true outlier data. As mining commences at Capiranga Central and Maurari, work to improve the accuracy and precision of the R.SiO2 results in both the analytical results and in the short term model, and carefully monitor performance.
4. Investigate modifications to the interpolation workflow to eliminate the small number of block values that are above and below the top and low cut values.

12.12 Mineral Resource Reporting

Table 11-17 below provides a full breakdown of the Mineral Resource estimate, arranged by plateau, product type, and classification. The effective date of this estimate is December 31, 2021. The estimate is presented on a 100% ownership basis to AWAC although Alcoa's share is 60%.

The Mineral Resources bauxite price is defined as 30% higher than the Mineral Reserves bauxite price. The Mineral Reserves bauxite price is based on contracts between Juruti Mine and Alumar Refinery (Alcoa), since 90% of the bauxite production is shipped to this refinery. The contract is reviewed annually and is based on factors relating to internal and external demand for bauxite, as well as bonus and penalties depending on the product quality.

The transfer price mechanism from Juruti to Alumar is determined by a weighted-average price of the previous year's third-party sales. For example, the 2021 internal transfer price from Juruti to Alumar will be the weighted-average price of 2020 third-party sales.

Table 11-17: Summary of Mineral Resources by plateau and bauxite type – December 31, 2021

Plateau	Measured			Indicated			Measured + Indicated			Inferred		
	Tonnage (Dry kt)	A.Al_2O_3 (%)	R.SiO_2 (%)	Tonnage (Dry kt)	A.Al_2O_3 (%)	R.SiO_2 (%)	Tonnage (Dry kt)	A.Al_2O_3 (%)	R.SiO_2 (%)	Tonnage (Dry kt)	A.Al_2O_3 (%)	R.SiO_2 (%)
Washed Bauxite												
Capiranga Central	1,883	44.87	5.61	9,006	45.38	4.51	10,889	45.29	4.70	852	45.33	4.51
Mauari	3,390	44.54	5.35	9,509	45.24	4.65	12,899	45.06	4.84	7,299	45.98	3.96
Mutum	0	0.00	0.00	26,509	45.07	4.52	26,509	45.07	4.52	77,438	44.05	4.67
Nhamundá	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	284,017	46.27	5.26
Santarém	0	0.00	0.00	4,521	45.20	4.42	4,521	45.20	4.42	73,300	44.66	4.64
São Francisco	0	0.00	0.00	7,424	46.88	4.00	7,424	46.88	4.00	119,848	46.01	3.59
Total	**5,273**	**44.66**	**5.45**	**56,969**	**45.39**	**4.47**	**62,242**	**45.33**	**4.55**	**562,752**	**45.70**	**4.72**
Not Washed Bauxite												
Capiranga Central	57	46.01	3.06	474	44.45	2.82	531	44.62	2.85	13	44.19	2.29
Mauari	327	42.28	3.01	1,144	43.15	2.82	1,471	42.96	2.86	1,026	43.41	2.72
Mutum	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
Nhamundá	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
Santarém	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
São Francisco	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
Total	**384**	**42.83**	**3.02**	**1,618**	**43.53**	**2.82**	**2,002**	**43.40**	**2.86**	**1,038**	**43.42**	**2.71**
Washed + Not washed Bauxite												
Capiranga Central	1,940	44.90	5.54	9,480	45.33	4.43	11,420	45.26	4.61	864	45.31	4.48
Mauari	3,717	44.34	5.15	10,653	45.02	4.45	14,370	44.84	4.63	8,324	45.66	3.81
Mutum	0	0.00	0.00	26,509	45.07	4.52	26,509	45.07	4.52	77,438	44.05	4.67
Nhamundá	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	284,017	46.27	5.26
Santarém	0	0.00	0.00	4,521	45.20	4.42	4,521	45.20	4.42	73,300	44.66	4.64
São Francisco	0	0.00	0.00	7,424	46.88	4.00	7,424	46.88	4.00	119,848	46.01	3.59
Total	**5,657**	**44.53**	**5.28**	**58,587**	**45.34**	**4.42**	**64,244**	**45.27**	**4.50**	**563,791**	**45.69**	**4.72**

Notes:

1. The definitions for Mineral Resources in S-K 13000 were followed.
2. Mineral Resources are estimated using a long-term bauxite price of US$35.33 per tonne (wet base), and a R$:US$ exchange rate of R$5.34:US$1.00, considering 100% of metal recovery for the washed and unwashed material.
3. Mineral Resources are estimated at a pit discard cut-off value based on a benefit calculation whether a block is economically viable.
4. There is no minimum mining width for Mineral Resources.
5. Bulk density average is 1.30 t/m^3.
6. Mineral Resources are exclusive of Mineral Reserves.
7. Mineral Resources that are not Mineral Reserves and do not have demonstrated economic viability.
8. Mineral Resources are stated on a 100% ownership basis for AWAC for consolidated reporting purposes. Alcoa's share is 60%
9. Numbers may not add due to rounding.

The SLR QP reviewed the Mineral Resources assumptions, geological modelling and estimation workflows, data consistency and reporting procedures, and is of the opinion that the Mineral Resource estimate is appropriate for the style of the mineralization, and that the block model is reasonable and acceptable to support the December 31, 2021 Mineral Resource estimate.

The SLR QP is of the opinion that with consideration of the recommendations summarized in Sections 1.0 and 23.0 of this report, any issues relating to all relevant technical and economic factors likely to influence the prospect of economic extraction can be resolved with further work.

The Mineral Resources for the Juruti Bauxite Mine as of December 31, 2021, are summarized in the Table 11-1. The Mineral Resource estimate was reported using all the blocks that have bauxite as lithology, satisfying quality and technical parameters. The Juruti Bauxite Mineral Resources are in compliance with the S-K 1300 resource definition requirement of “reasonable prospects for economic extraction”.

Compared to the 2020 fiscal year end, Juruti has a positive total balance in the Mineral Resources of +48.17 Mt, being a 323.85 Mt reduction in Measured and Indicated Mineral Resources, and a 372.02 Mt increase in Inferred Mineral Resources. The main changes for this are the total exhaustion and depletion of the Capiranga, Guaraná, and Juruti Sul, the update of the actual geological models, the 2021 production, and the Mineral Resource classification downgrade in the Mutum, Nhamundá, São Francisco and Santarém related to the lower confidence level in the auger drilling data.

13.0 MINERAL RESERVE ESTIMATES

13.1 Summary

Table 12-1 summarizes the Mineral Reserve estimate effective as of December 31, 2021. The estimate is reported on a 100% ownership basis to AWAC for consolidated reporting purposes, although Alcoa only owns 60% of AWAC.

Table 12-1: Summary of Mineral Reserves – December 31, 2021

Category (Washed + Unwashed Bauxite)	Tonnage (Mt)	Al_2O_3 (%)	Reactive SiO_2 (%)	Mass Recovery (%)
Proven	50.9	47.68	3.52	80.24
Probable	37.7	46.32	3.39	81.76
Total Proven + Probable	88.5	47.10	3.47	80.89

Notes:

1. The definitions for Mineral Reserves in S-K 1300 were followed for Mineral Reserves which are consistent with CIM (2014) definitions.
2. There is no specific cut-off grade used for Mineral Reserves. Instead, Mineral Reserves are estimated at a pit discard cut-off value of the ore related costs. A Benefit calculation is applied to determine whether a block is economically viable whereby Benefit is the revenue less the ore related costs.
3. Mineral Reserves are estimated using an average long-term bauxite price of US$27.18 per tonne and a US$/R$ exchange rate of R$5.34:US$1.00.
4. Bulk density is 1.30 t/m^3.
5. Numbers may not add due to rounding.
6. Mineral Reserves are stated on a 100% ownership basis for AWAC for consolidated reporting purposes although Alcoa's share is 60%

The Mineral Reserves were estimated by Alcoa and audited by the SLR QP. SLR takes responsibility for the Mineral Reserve estimate presented in this report.

Measured and Indicated Mineral Resources, estimated as of December 31, 2021, were used as inputs for conversion into Proven and Probable Mineral Reserves respectively.

Reserve Modifying Factors were first added to the block model. No commercial optimizer software is used to generate a pit shell at Juruti, but instead a Python script. The sub-blocked resource model, with no block regularization for the best Selective Mining Unit (SMU) was used to estimate Mineral Reserves. The total revenue and selling costs are calculated for each block, either for washable ore or direct shipping ore (DSO).

Bonus and penalties are also calculated into the block model to adjust the bauxite price in accordance with the product grades. Economics estimated for each block determines the process destination (washed and DSO) of each ore block.

The initial surface wireframe for Mauari (July 2017) and Capiranga Central (November 2018) were used to deplete the respective resource block models. Environmental constraints and limits linked to mining concessions were used to specify which blocks can be mined.

The economic value of each mining block is calculated by a script using mining costs, processing and General and Administrative (G&A) costs, process recovery factors, selling costs and a commodity selling price. The pit limits are generated, and the final pit limit is chosen based on the revenue factor equal to 1. Revenue factor 1 representing 100% of the commodity price.

From the ore contained within the final pit limit, a mine production schedule is generated. Mineral Reserves are reported as diluted tonnes and grade. The SLR QP confirmed that these were scheduled in an appropriate LOM plan and the physicals from the schedule were used in a discounted cash flow model to demonstrate that the estimated Mineral Reserves are viable for economic extraction.

The SLR QP is not aware of any risk factors associated with, or changes to, any aspects of the Modifying Factors such as mining, metallurgical, infrastructure, permitting, or other relevant factors that could materially affect the Mineral Reserve estimate.

13.2 Dilution

The dilution factors utilized for the Juruti Bauxite Mine are listed in Table 12-2. These have been used for the purposes of Mineral Reserves estimation.

Table 12-2: Dilution Factors

Planned Dilution (Washed + Unwashed Bauxite)	LOM	Source
Al_2O_3 grade (washed)	0.9950	Historical
Al_2O_3 grade (unwashed)	0.9427	Historical
Reactive SiO_2 grade (washed)	1.0482	Historical
Reactive SiO_2 grade (unwashed)	1.2187	Historical
Plant recovery (washed)	0.9667	Historical

The LOM dilution figures are supported by the reconciled production numbers reviewed by SLR. While the current dilution numbers are supported by the tonnage and grade reconciliation, in the SLR QPs' opinion, adjustments are required with respect to the procedures. Currently, for mining, polygons are used to define the lateral extents of the excavation whilst lithological surfaces are used to define the upper and lower boundaries for each lithology within the block model. Alcoa uses the sub-blocked resource model for pit optimization rather than determining the Selective Mining Unit (SMU) prior to the pit optimization.

SLR has reviewed dilution procedures and the current process and recommends that future adjustments should include dilution being accounted for during the block model regularization process rather than applying a global dilution figure to the scheduling results. Following the re-blocking process, the dilution should be quantified, reporting the average dilution incorporated into the new re-blocked model.

The tonnes and grade reconciliation should also take into consideration the final survey pickup after mining the waste and the ore, rather than evaluating using the panel edges alone. This would allow for a more accurate measurement of the actual mined tonnes and grade.

While increasing dilution could render some reserves below cut-off grade, SLR was not able to confirm the tonnage that might be removed from Mineral Reserves as a result. However, because a fixed dilution

factor is applied to the scheduling results based on reconciliation data of tonnes and grade against actual measured data, SLR does not consider the dilution factor to be a risk for Mineral Reserves estimation.

Overall, SLR considers that the estimated Mineral Reserves are relatively insensitive to dilution.

13.3 Extraction

The extraction (recovery) factors for mining are shown in Table 12-3.

Table 12-3: Extraction Factors

Factors	LOM	Source
Ore mass	0.9661	Historical
Waste mass	1.0041	Historical

The calculation of mining recovery is obtained through the reconciliation between the actual tonnes that are fed into the plant and the estimated tonnes which lie inside the mined polygons from the block model. Contributing factors to ore loss include, ore loss along an ore waste boundary, any roads in ore that are not recovered and inter strip losses.

13.4 Cut-off Grade

A cut-off value is determined using the Mineral Reserve bauxite price, recovery, transport, treatment and mine operating costs. The bauxite price used for the Mineral Reserves is based on contracts established with Alumar Refinery (Alcoa), as 90% of the production is shipped to this refinery. The contract is reviewed annually and based on factors relating to internal and external demand for bauxite as well as bonus and penalties associated with the quality of the product.

The cut-off value used for the reserves is based on profit or positive revenue for a block within the block model. The economic formula refers to “Benefit” which is revenue generated from sales less the ore related costs. Where “Benefit” is positive, or profit is greater than zero the material is considered to be ore.

$$Benefit = Revenue - Ore\ Related\ Costs$$

Costs and other parameters used to calculate the cut-off grade are shown in Table 12-4 andTable 12-5. The economic cut-off grade applied to the Mineral Reserve was estimated to be 37.62% Al_2O_3 for Capiranga Central and 36.71% Al_2O_3 for Mauari.

Table 12-4: Parameters Description

Description	Variables
Percentage of unwashed material/total production	DIF
Equipment working with Waste	
Percentage of bulldozer working on clay (%)	PercBuldClay
Percentage of bulldozer working on Laterite Type 1 (%)	PercBuldL1
Percentage of bulldozer working on Laterite Type 2a (%)	PercBuldL2a

Description	Variables
Percentage of Hydraulic Excavator working on clay (%)	PercHEClay
Percentage of Laterite Type 1 (%)	PercLat1
Percentage of Laterite Type 2 (%)	PercLat2
Price of Bulldozer on clay (R$/$m^3$)	PriceBuldClay
Price of Bulldozer on laterite type 1 (R$/$m^3$)	PriceBuldL1
Price of Bulldozer on laterite type 2a (R$/$m^3$)	PriceBuldL2a
Price of Hydraulic Excavator on Clay (R$/$m^3$)	PriceHEClay
Bauxite prices, bonus and penalties	
Al_2O_3 reference (contract) – not washed (%)	AAREFNW
Al_2O_3 reference (contract) (%)	AAREF
Average moisture – not washed (%)	AVGMONW
Average moisture (%)	AVGMO
Bauxite not washed Price (U$/tprod wet)	PriceBauxNW
Bauxite Price (U$/tprod wet)	PriceBaux
Bonus/Penalty Al_2O_3 – not washed (U$/tprod)	BPAANW
Bonus/Penalty Moisture – not washed (U$/tprod)	BPH2ONW
Bonus/Penalty Moisture (U$/tprod)	BPH2O
Bonus/Penalty SiO3 – not washed (U$/tprod)	BPRSNW
Fact Waste	FactWaste
Factor Al_2O_3	FactAA
Factor Al_2O_3 – not washed	FactAANW
Factor Bonus/Penalty Al_2O_3 (U$/tprod)	FBPAA
Factor Bonus/Penalty Moisture (U$/tprod)	FBPH2O
Factor Bonus/Penalty SiO3 (U$/tprod)	FBPRS
Factor Moisture	FactH2O
Factor Moisture – not washed	FactH2ONW
Factor Recovery	FactRecov
Factor recovery – not washed	FactRecovNW
Factor SiO3	FactRS
Factor SiO3 – not washed	FactRSNW
Mass Factor	FactMass
Moisture reference (contract) – not washed (%)	MOREFNW

Description	Variables
Moisture reference (contract) (%)	MOREF
Not washed ore Moisture (%)	MoistureONW
SiO3 reference (contract) – not washed (%)	SRREFNW
SiO3 reference (contract) (%)	SRREF
Washed ore Moisture (%)	MoistureO
Diesel and exchange rate	
Conversion reais to Dolar	Real2Dolar
Diesel Consumption of Bulldozer working on Laterite (l/m3)	DCLatBuld
Diesel Consumption of Bulldozer working on Clay (l/m3)	DCClayBuld
Diesel Consumption of Hydraulic Excavator working on Clay (l/m3)	DCClayHE
Diesel Consumption of Hydraulic Excavator working on Laterite (l/m3)	DCLatHE
Diesel Consumption on bauxite and nodular as waste (l/m3)	DieselWaste
Price Diesel in Reais (R$)	DieselReais
Fixed costs in reais	
Administrative Costs (R$/tprod)	PAE
Cost of Deforestation (R$/m350+35)	CoDefor
Crushing Costs (R$/tprod)	Crush
Engineering Services (R$/tprod)	Support
Fixed cost for mine (R$/tprod)	Cfixmine
Maintenance (R$/tprod)	RM
Ore density (t/m3 DRY)	DensOre
Other Fixed Costs (R$/tprod)	OtherC
Port Costs (R$/tprod)	Port
Rail Road Costs (R$/tprod)	RailRoad
Royalty (%REVENUE)	Royalt
Washing Plant Costs (R$/tprod washed)	Wash

Table 12-5: Parameter Values

Parameter	Value	Parameter	Value	Parameter	Value
AAREF	47.5	FactAA	0.995	PercBuldL2a	1
AAREFNW	47.5	FactAANW	0.9427	PercHEClay	0.2
AVGMO	13.35	FactH2O	1	PercLat1	0.93

Parameter	Value	Parameter	Value	Parameter	Value
AVGMONW	13.35	FactH2ONW	1	PercLat2	0.07
BPAANW	1.58	FactMass	0.9661	Port	2.88
BPH2O	0.58	FactRecov	0.9667	PriceBaux	27.18
BPH2ONW	0.61	FactRS	1.0482	PriceBauxNW	27.18
BPRSNW	2.49	FactRSNW	1.2187	PriceBuldClay	1.88
Cfixmine	3.99	FactWaste	1.0041	PriceBuldL1	1.88
CoDefor	2.41	FBPAA	1.58	PriceBuldL2a	9.38
Crush	2.4	FBPH2O	0.58	PriceHEClay	6.03
DCClayBuld	0.223	FBPRS	2.49	RailRoad	3.5
DCClayHE	0.48	MoistureO	0.87	Real2Dolar	5.34
DCLatBuld	0.65	MoistureONW	0.87	RM	3.33
DCLatHE	0.68	MOREF	13	Royalt	0.045
DensOre	1.29	MOREFNW	13	SRREF	4.1
DieselReais	3.4	OtherC	13.27	SRREFNW	4.5
DieselWaste	0.223	PAE	10.96	Support	1.53
DIF	17.7	PercBuldClay	0.92	Wash	7.26
		PercBuldL1	1		

Mining costs for all waste material are calculated within the block model. A mining cost is assigned to a waste block based on the material type and the mining equipment used to excavate the waste material. The formula for mining costs for each waste material combined with the selected mining equipment is described below.

C1BUW: Cost of bulldozer working on clay and yellow clay

$$C1BUW = (FBPH2O \times FactH2ONW \times MoistureONW \times (1 + PercBuldClay + PercBuldL1)) \div (AVGMONW^2)$$

C2HEW: Cost of hydraulic excavator working on clay and yellow clay

$$C2HEW = (FBPH2O \times FactH2ONW \times MoistureONW \times (1 + PercBuldClay + PercBuldL1)) \div (AVGMONW^2)$$

For laterite material costs, there are three main costs allocated by equipment type. There are different categories of laterite, based on hardness throughout the geological profile, which leads to different efficiencies and as such, to a different mining cost. The diesel consumption is not included into these cost and it is calculated separately.

C3BL1: Cost of bulldozer working on laterite

$$\text{C4BL2} = (\text{C\_BL\_2} \times \text{DSL\_BL} \times \text{C\_DSL} \times \text{DSL\_BL\_2} \times \text{C\_DSL\_2} \times \text{DSL\_BL\_2}) \div \text{C\_DSL\_2}$$

C4BL2: Cost of bulldozer working on laterite material category 2

$$\text{C5BL2} = (\text{C\_BL\_2a} \times \text{DSL\_BL} \times \text{C\_DSL} \times \text{DSL\_BL\_2a} \times \text{C\_DSL\_2a} \times \text{DSL\_BL\_2a}) \div \text{C\_DSL\_2}$$

C5BL2: Cost of bulldozer working on laterite material category 2a

In some instances, waste costs are attributed to bauxite and nodular bauxite blocks, in this case the calculation of the best value of the block indicates the block should be sent to the waste dump. As the block is waste the relevant mining equipment will be assigned to this block and described below.

CWA50: Cost of equipment working on bauxite as waste

$$\text{CWA50} = (\text{C\_BL} \times \text{BL\_50} \times \text{C\_DSL} \times ((\text{DSL\_BL\_1} \times \text{DSL\_BL\_1}) + (\text{DSL\_BL\_2} \times \text{DSL\_BL\_2} \times \text{DSL\_BL\_2})) \div \text{C\_DSL\_2}$$

CWA35: Cost of equipment working on nodular bauxite as waste

$$\text{CWA35} = (\text{P\_BL} \times \text{BL\_35} \times \text{C\_DSL} \times ((\text{DSL\_BL\_1\_2} \times \text{DSL\_BL\_1\_2}) + (\text{DSL\_BL\_2\_2} \times \text{DSL\_BL\_2\_2})) \div \text{C\_DSL\_2}$$

Regarding diesel costs, when working on waste, the financial model adopts a diesel cost when working on overburden and two others when working on bauxite and nodular bauxite, named CF3DW, CDW50 and CDW35 respectively.

There are two divisions to define the diesel consumption, one on clay and another on laterite. The total cost of diesel referring to overburden will be then the sum of them (CF3DW).

For bauxite and nodular bauxite blocks that may become waste, the cost is represented by CDW50 and CDW35 for each block based on the percentage contribution of each lithotype specified in the block.

The following formulas shows how diesel consumption are calculated in the block model.

CF3DW: Cost of diesel working on waste

$$\text{CF3DW} = ((\text{P_BL} \times (\text{BL_20} + \text{BL_30}) \times \text{C_DSL} \times \text{DSL_BL} \times

$$\text{[illegible]} \times \text{[illegible]}) + (P\_\text{[illegible]} \times (\text{[illegible]}\_20 + \text{[illegible]}\_30) \times \text{[illegible]} \times \text{[illegible]} \times \text{[illegible]} \times \text{[illegible]})) \div \text{[illegible]}2\text{[illegible]}$$

$$\text{[illegible]} = ((P\_\text{[illegible]} \times \text{[illegible]}\_40 \times \text{[illegible]} \times \text{[illegible]} \times \text{[illegible]} \times \text{[illegible]}1) + (P\_\text{[illegible]} \times \text{[illegible]}\_40 \times \text{[illegible]} \times \text{[illegible]} \times \text{[illegible]} \times \text{[illegible]}2)) \div \text{[illegible]}2\text{[illegible]}$$

$$\text{[illegible]} = \text{[illegible]} + \text{[illegible]}$$

CDW50: Cost of diesel working on bauxite as waste

□□□□□□□□□□□ = (P_□□□□□□□□□ × □□_50 × □□□□□□□□□□□□□ × □□□□□□□□□□□□□□□□□□□□□□□□□□ ×

□□□□□□□□□□□□□□□□□□□□□□□□□□) ÷ □□□□□□□□□2□□□□□□□□□□□

CDW35: Cost of diesel working on nodular bauxite as waste

□□□□□□□□□□□ = (P_□□□□□□□□□ × □□_35 × □□□□□□□□□□□□□ × □□□□□□□□□□□□□□□□□□□□□□□□□□ ×

□□□□□□□□□□□□□□□□□□□□□□□□□□) ÷ □□□□□□□□□2□□□□□□□□□□□

```
def diesel_consumption_ore(df_bf):
    df_bf.loc[df_bf['DMT'] <= 3500, 'DCORE'] = 1.039
    df_bf.loc[((df_bf['DMT'] > 3500) & (df_bf['DMT'] <= 4000)), 'DCORE'] = 1.064
    df_bf.loc[((df_bf['DMT'] > 4000) & (df_bf['DMT'] <= 4500)), 'DCORE'] = 1.077
    df_bf.loc[((df_bf['DMT'] > 4500) & (df_bf['DMT'] <= 5000)), 'DCORE'] = 1.094
    df_bf.loc[((df_bf['DMT'] > 5000) & (df_bf['DMT'] <= 5500)), 'DCORE'] = 1.108
    df_bf.loc[((df_bf['DMT'] > 5500) & (df_bf['DMT'] <= 6000)), 'DCORE'] = 1.117
    df_bf.loc[((df_bf['DMT'] > 6000) & (df_bf['DMT'] <= 6500)), 'DCORE'] = 1.127
    df_bf.loc[((df_bf['DMT'] > 6500) & (df_bf['DMT'] <= 7000)), 'DCORE'] = 1.139
    df_bf.loc[((df_bf['DMT'] > 7000) & (df_bf['DMT'] <= 7500)), 'DCORE'] = 1.144
    df_bf.loc[((df_bf['DMT'] > 7500) & (df_bf['DMT'] <= 8000)), 'DCORE'] = 1.156
    df_bf.loc[((df_bf['DMT'] > 8000) & (df_bf['DMT'] <= 8500)), 'DCORE'] = 1.167
    df_bf.loc[((df_bf['DMT'] > 8500) & (df_bf['DMT'] <= 9000)), 'DCORE'] = 1.177
    df_bf.loc[((df_bf['DMT'] > 9000) & (df_bf['DMT'] <= 9500)), 'DCORE'] = 1.189
    df_bf.loc[((df_bf['DMT'] > 9500) & (df_bf['DMT'] <= 10000)), 'DCORE'] = 1.212
    df_bf.loc[((df_bf['DMT'] > 10000) & (df_bf['DMT'] <= 10500)), 'DCORE'] = 1.224
    df_bf.loc[((df_bf['DMT'] > 10500) & (df_bf['DMT'] <= 11000)), 'DCORE'] = 1.237
    df_bf.loc[((df_bf['DMT'] > 11000) & (df_bf['DMT'] <= 11500)), 'DCORE'] = 1.249
    df_bf.loc[((df_bf['DMT'] > 11500) & (df_bf['DMT'] <= 12000)), 'DCORE'] = 1.262
    df_bf.loc[((df_bf['DMT'] > 12000) & (df_bf['DMT'] <= 12500)), 'DCORE'] = 1.274
    df_bf.loc[((df_bf['DMT'] > 12500) & (df_bf['DMT'] <= 13000)), 'DCORE'] = 1.287
    df_bf.loc[((df_bf['DMT'] > 13000) & (df_bf['DMT'] <= 13500)), 'DCORE'] = 1.299
    df_bf.loc[((df_bf['DMT'] > 13500) & (df_bf['DMT'] <= 14000)), 'DCORE'] = 1.312
    df_bf.loc[((df_bf['DMT'] > 14000) & (df_bf['DMT'] <= 14500)), 'DCORE'] = 1.324
    df_bf.loc[((df_bf['DMT'] > 14500) & (df_bf['DMT'] <= 15000)), 'DCORE'] = 1.337
    df_bf.loc[((df_bf['DMT'] > 15000) & (df_bf['DMT'] <= 15500)), 'DCORE'] = 1.349
    df_bf.loc[((df_bf['DMT'] > 15500) & (df_bf['DMT'] <= 16000)), 'DCORE'] = 1.362
    df_bf.loc[((df_bf['DMT'] > 16000) & (df_bf['DMT'] <= 16500)), 'DCORE'] = 1.374
    df_bf.loc[((df_bf['DMT'] > 16500) & (df_bf['DMT'] <= 17000)), 'DCORE'] = 1.387
    df_bf.loc[((df_bf['DMT'] > 17000) & (df_bf['DMT'] <= 17500)), 'DCORE'] = 1.399
    df_bf.loc[((df_bf['DMT'] > 17500) & (df_bf['DMT'] <= 18000)), 'DCORE'] = 1.412
    df_bf.loc[((df_bf['DMT'] > 18000) & (df_bf['DMT'] <= 18500)), 'DCORE'] = 1.424
    df_bf.loc[((df_bf['DMT'] > 18500) & (df_bf['DMT'] <= 19000)), 'DCORE'] = 1.437
    df_bf.loc[((df_bf['DMT'] > 19000) & (df_bf['DMT'] <= 19500)), 'DCORE'] = 1.449
    df_bf.loc[((df_bf['DMT'] > 19500) & (df_bf['DMT'] <= 20000)), 'DCORE'] = 1.462
    df_bf.loc[((df_bf['DMT'] > 20000) & (df_bf['DMT'] <= 20500)), 'DCORE'] = 1.474
    df_bf.loc[((df_bf['DMT'] > 20500) & (df_bf['DMT'] <= 21000)), 'DCORE'] = 1.487
    df_bf.loc[((df_bf['DMT'] > 21000) & (df_bf['DMT'] <= 21500)), 'DCORE'] = 1.499
    df_bf.loc[df_bf['DMT'] > 21500, 'DCORE'] = 1.499
    return df_bf
```

Figure 12-1: Formula used to calculate diesel cost (Alcoa, 2021)

Mining cost on waste (MCW_M) is one of main variables that impact the final pit boundaries, and it can be defined as the sum off all costs that will be mentioned below. The formula below defines the waste mining cost.

□□□□□□□__□□ = (□□□□□□□□□□□□□□□□□□□□□ × (□□□□□□□35 + □□□□□□□35 + □□□□□□□50 + □□□□□□□50 + □□5□□□□1 + □□4□□□□2 +

□□□□3□□□□ + □□3□□□□1 + □□1□□□□□□□ + □□2□□□□□□□)) ÷ (□□□□□□□□□□□□□□ × □□□□□□□□□)

Ore mine costs for bauxite and nodular bauxite blocks are determined by the sum of equipment and diesel costs, and calculated based on its lithology and named MCO_P.

□□□□□□□__□□ = (□□□□□□□35 + □□□□□□□35 + □□□□□□□50 + □□□□□□□50) ÷ (□□□□35□□ + □□□□50□□)

Each of the costs in the formula above are calculated as follows.

COR35: Haulage cost for nodular bauxite

COR35 *= (P__35×volume × (CoDefor+PRDMT) × FactMass) ÷ Real2Dolar*

COR50: Haulage cost for nodular bauxite

COR50 *= (P__50×volume × (CoDefor+PRDMT) × FactMass) ÷ Real2Dolar*

CDO35: Diesel cost for nodular bauxite

CDO35 *= (P__35×volume × DieselReais × DCOre) ÷ Real2Dolar*

CDO50: Diesel cost for bauxite

CDO50 *= (P__50×volume × DieselReais × DCOre) ÷ Real2Dolar*

Diesel consumption for ore is calculated based on the haulage distance of the block to the crusher feeder. The calculation is done by way of a formula in Python language and shown in Figure 12-2.

```
def upadate_haulageprice(df_bf):
    # Use current services contract
    df_bf.loc[df_bf['DMT'] <= 3500, 'PRDMT'] = 9.37
    df_bf.loc[((df_bf['DMT'] > 3500) & (df_bf['DMT'] <= 4000)), 'PRDMT'] = 9.59
    df_bf.loc[((df_bf['DMT'] > 4000) & (df_bf['DMT'] <= 4500)), 'PRDMT'] = 9.76
    df_bf.loc[((df_bf['DMT'] > 4500) & (df_bf['DMT'] <= 5000)), 'PRDMT'] = 9.98
    df_bf.loc[((df_bf['DMT'] > 5000) & (df_bf['DMT'] <= 5500)), 'PRDMT'] = 10.17
    df_bf.loc[((df_bf['DMT'] > 5500) & (df_bf['DMT'] <= 6000)), 'PRDMT'] = 10.28
    df_bf.loc[((df_bf['DMT'] > 6000) & (df_bf['DMT'] <= 6500)), 'PRDMT'] = 10.40
    df_bf.loc[((df_bf['DMT'] > 6500) & (df_bf['DMT'] <= 7000)), 'PRDMT'] = 10.52
    df_bf.loc[((df_bf['DMT'] > 7000) & (df_bf['DMT'] <= 7500)), 'PRDMT'] = 10.60
    df_bf.loc[((df_bf['DMT'] > 7500) & (df_bf['DMT'] <= 8000)), 'PRDMT'] = 10.77
    df_bf.loc[((df_bf['DMT'] > 8000) & (df_bf['DMT'] <= 8500)), 'PRDMT'] = 10.91
    df_bf.loc[((df_bf['DMT'] > 8500) & (df_bf['DMT'] <= 9000)), 'PRDMT'] = 11.16
    df_bf.loc[((df_bf['DMT'] > 9000) & (df_bf['DMT'] <= 9500)), 'PRDMT'] = 11.42
    df_bf.loc[((df_bf['DMT'] > 9500) & (df_bf['DMT'] <= 10000)), 'PRDMT'] = 11.88
    df_bf.loc[((df_bf['DMT'] > 10000) & (df_bf['DMT'] <= 10500)), 'PRDMT'] = 12.11
    df_bf.loc[((df_bf['DMT'] > 10500) & (df_bf['DMT'] <= 11000)), 'PRDMT'] = 12.31
    df_bf.loc[((df_bf['DMT'] > 11000) & (df_bf['DMT'] <= 11500)), 'PRDMT'] = 13.05
    df_bf.loc[((df_bf['DMT'] > 11500) & (df_bf['DMT'] <= 12000)), 'PRDMT'] = 13.26
    df_bf.loc[((df_bf['DMT'] > 12000) & (df_bf['DMT'] <= 12500)), 'PRDMT'] = 13.48
    df_bf.loc[((df_bf['DMT'] > 12500) & (df_bf['DMT'] <= 13000)), 'PRDMT'] = 13.72
    df_bf.loc[((df_bf['DMT'] > 13000) & (df_bf['DMT'] <= 13500)), 'PRDMT'] = 14.05
    df_bf.loc[((df_bf['DMT'] > 13500) & (df_bf['DMT'] <= 14000)), 'PRDMT'] = 14.28
    df_bf.loc[((df_bf['DMT'] > 14000) & (df_bf['DMT'] <= 14500)), 'PRDMT'] = 14.62
    df_bf.loc[((df_bf['DMT'] > 14500) & (df_bf['DMT'] <= 15000)), 'PRDMT'] = 14.88
    df_bf.loc[((df_bf['DMT'] > 15000) & (df_bf['DMT'] <= 15500)), 'PRDMT'] = 15.23
    df_bf.loc[((df_bf['DMT'] > 15500) & (df_bf['DMT'] <= 16000)), 'PRDMT'] = 15.58
    df_bf.loc[((df_bf['DMT'] > 16000) & (df_bf['DMT'] <= 16500)), 'PRDMT'] = 15.81
    df_bf.loc[((df_bf['DMT'] > 16500) & (df_bf['DMT'] <= 17000)), 'PRDMT'] = 16.04
    df_bf.loc[((df_bf['DMT'] > 17000) & (df_bf['DMT'] <= 17500)), 'PRDMT'] = 16.54
    df_bf.loc[((df_bf['DMT'] > 17500) & (df_bf['DMT'] <= 18000)), 'PRDMT'] = 16.97
    df_bf.loc[((df_bf['DMT'] > 18000) & (df_bf['DMT'] <= 18500)), 'PRDMT'] = 17.36
    df_bf.loc[((df_bf['DMT'] > 18500) & (df_bf['DMT'] <= 19000)), 'PRDMT'] = 17.72
    df_bf.loc[((df_bf['DMT'] > 19000) & (df_bf['DMT'] <= 19500)), 'PRDMT'] = 18.08
    df_bf.loc[((df_bf['DMT'] > 19500) & (df_bf['DMT'] <= 20000)), 'PRDMT'] = 18.43
    df_bf.loc[((df_bf['DMT'] > 20000) & (df_bf['DMT'] <= 20500)), 'PRDMT'] = 18.41
    df_bf.loc[((df_bf['DMT'] > 20500) & (df_bf['DMT'] <= 21000)), 'PRDMT'] = 18.67
    df_bf.loc[((df_bf['DMT'] > 21000) & (df_bf['DMT'] <= 21500)), 'PRDMT'] = 18.94
    df_bf.loc[(df_bf['DMT'] > 21500), 'PRDMT'] = 18.94
    return df_bf
```

Figure 12-2: Formula used to calculate haulage distance (Alcoa, 2021)

Finally, the processing cost for washed and unwashed bauxite is assigned to each block. CF1 represents the cost of washed material and CF1NW for unwashed product:

$$\text{[illegible]} = \text{[illegible]} + \text{[illegible]}h + \text{[illegible]}h + \text{[illegible]} + \text{[illegible]} + \text{[illegible]} +$$

$$\text{[illegible]} + \text{[illegible]} + \text{[illegible]}h\text{[illegible]}$$

$$\text{[illegible]} = \text{[illegible]} + \text{[illegible]}h + \text{[illegible]} + \text{[illegible]} + \text{[illegible]} + \text{[illegible]} +$$

$$\text{[illegible]} + \text{[illegible]}h\text{[illegible]}$$

Mining rights are included as mining areas limits. An internal offset of 50 m of the mining area is allowed for deforestation.

Costs are based on historical data, making adjustments for haulage distance. The plant recovery factor is estimated based on regression by analysing grades through laboratory work.

With all costs and revenues directly assigned to each block, the economic value is calculated for each block based on its process destination. Based on the process destination, another script is run to determine the blocks that are ore, the destination, and the boundary limit for the final pit shell.

With the final pit boundary, another script is run to adjust the proportion between washed and unwashed products based on the product budget for the following year. The same script will regularize the block height to only one block, with the height equal to the sum of the individual blocks in the same XY

coordinate. The block will be assigned a single grade and ore type. In this process, any waste block in the middle of this column, will be diluted into the new ore block. To determine the final values for the Mineral Reserves, all blocks with height below 1.0m are excluded whilst the dilution is applied for tonnes and grades.

14.0 MINING METHODS

Juruti has been operating since 2009, with average historical annual production rates of approximately 8 Mtpa of ROM. In recent years, approximately 5.4 Mtpa of washed bauxite and 1 Mt of Direct Shipping Ore (DSO) have been produced per year.

The mine is an open pit operation and uses on-road 8x4 40 t trucks, hydraulic excavators 66 t and 74 t operating weight and D6 to D11 size dozers.

The Capiranga plateau is currently being mined and will be shortly followed by Capiranga Central and Mauari plateaus.

The mining concept is based on conventional strip mining. Each plateau is divided into panels and regular strips of 20 m width x 200 m length which can be mined after lateral accesses and box cuts are developed in advance. The operations within a strip consist of a number of sequential mining activities including land clearance, topsoil removal, overburden stripping and waste backfill and bauxite mining. Some lateral accesses were used in the past as a tailings dam.

Overburden has an average thickness of 12 m of clay and laterite. The preferred waste removal method for a thickness less than 12 m involves the use of D11T-DC dozers which push the overburden directly into the adjacent mined out strip. Thicker layers will require excavators/trucks which will remove the excess overburden thickness (greater than 12 m) so the dozers can further complete the stripping.

A suitable period of drying and consolidation of the fines will be allowed before overburden from the adjacent panel is dozed over the fines. The returned overburden surface will be contoured with dozers to create an acceptable final topography. Shortly thereafter, topsoil will be distributed over the overburden in preparation for landform rehabilitation.

A plan view of the mines is presented as Figure 13-1 and Figure 13-2 shows the stripping mining method as used at Juruti.

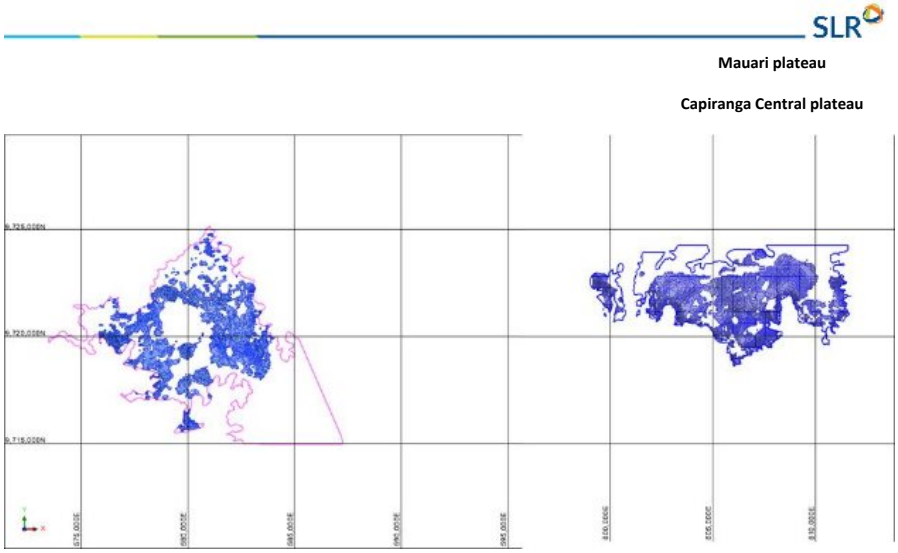


Figure 13-1: Mines at Juruti (Alcoa, 2021)

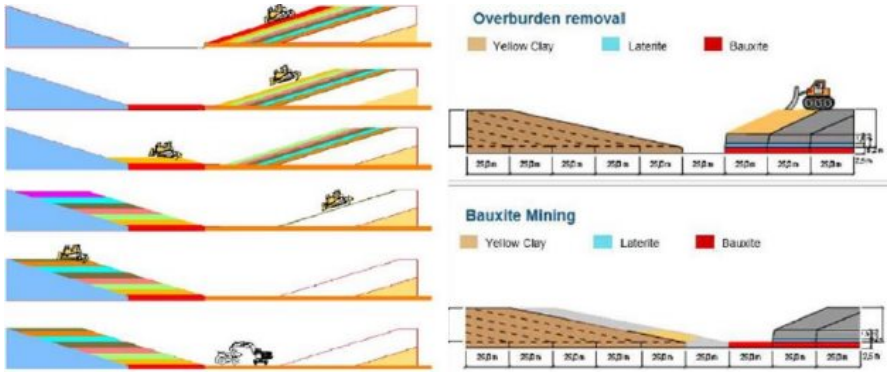


Figure 13-2: Schematic diagram of strip mining at Juruti (Alcoa, 2021)

Mining dilution and recovery associated with the adopted mining method are discussed in Section 12.0 above.

14.1 Geotechnical Considerations

The mining method for Juruti includes stripping an average thickness of 14.2 m for Capiranga Central and 14.7 m for Mauari of clay and laterite overburden by pushing back the material with dozers into the previously mined out strip. The bauxite is then mined out with backhoe excavators.

The Massive bauxite thickness averages 2.9 m for Capiranga Central and 2.8 m for Mauari with a maximum of 7.7 m at Capiranga Central and 5.5 m at Mauari. The depth of the bauxite pits is therefore shallow, and the slope angles low and dozers can be used to cut the slopes. The geotechnical Modifying Factor is not a major consideration; no geotechnical parameters are applied in the mine area.

Wash plant fines are returned to the mined-out strips and stored in containment dams formed by bund walls created with overburden and strips prepared by dozers.

Overburden is pushed directly back into the previously mined strips so ex-pit waste dumps are limited.

14.2 Geotechnical and hydrogeological models

No geotechnical and hydrogeological models are used for the pit designs at Juruti.

14.3 Geomechanics, Ground Support

The depth of excavation at Juruti is shallow (20 m or less) and the method of overburden removal by pushing with dozers results in shallow slope angles of no greater than 35°. The geotechnical aspect of mine design is therefore not a major consideration for the deposit and a formal geotechnical investigation has not been completed for the open pits. SLR is satisfied that this does not preclude the estimation of Mineral Reserves. The safe operation of the pits can be properly managed through the application of appropriate work procedures and training.

The majority of the waste is backfilled by pushing the overburden back into the previously excavated cut with dozers. The geotechnical implications are limited, and the safety aspect of this process can be adequately managed through appropriate work procedures and training. The barren waste pile for Mauari plateau is designed to be constructed in 3 m lifts to a total maximum height of 12 m and overall slope angle of 14°. This is not considered significant geotechnically.

14.4 Hydrogeology

Ground water is not an issue at Juruti, and no lowering of the water table is necessary because the pits are typically very shallow. Drainage channels are placed around the plateaus to avoid rainwater flowing into the pit.

The water within the mining areas is pumped to sumps nearby and after some time of settling the water flows to natural drainage.

14.5 Mine Design

Strip mining requires the distribution of the mineable inventories into panels and strips. Small unprofitable areas are occasionally incorporated into the inventory due the limited flexibility of the stripping method. Once the decision to mine an area has been made, some marginal ore not included in the estimated reserves may get included in the mined ore tonnages.

Alcoa created several strip geometries and mining directions for each panel, selecting the best configuration from the mine scheduling viewpoint as shown in Figure 13-3.

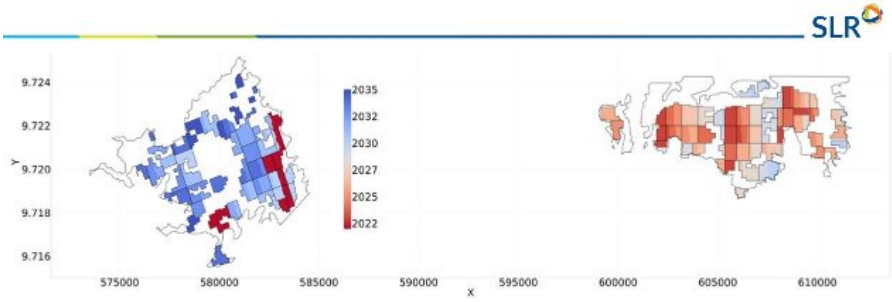


Figure 13-3: Mine design panels for Mauari (left) and Capiranga Central (right) plateaus by scheduled year (Alcoa, 2021)

The SLR QP is of the opinion that considering the style of mineralization, the average depth of the deposit, and the material characteristics of the overburden material whereby it is amenable to ripping / excavation using conventional earth-moving equipment, the strip mining method adopted at Juruti is the most appropriate method for the Mineral Reserves.

14.6 Life of Mine Plan

The current estimated life of mine (LOM) plan is shown in Table 13-2. The planned mine production from 2022 through 2035 is expected to total approximately 128 wet Mt of ROM, potentially producing 101 wet Mt of washed and unwashed saleable product with average grades of around 47.1 % Al_2O_3, 3.5 % R.SiO_2 and 16.5 % Fe. The strip ratio (SR) for the LOM is expected to be around 4.2 m^3/t.

Table 13-2: Juruti Life of Mine plan

Year	Product	ROM (t)	Waste (m3)	SR (m3/t)	Bauxite (t)	Al_2O_3 (%)	R.SiO_2 (%)	Fe (%)	Recovery (%)	Haul Distance (m)
	Washed	8,477,515	28,836,032	3.40	6,195,369	47.45	3.93	15.42	0.73	18,389
2022	DSO	812,051	4,449,920	5.48	812,051	42.57	2.91	20.97	1.00	15,958
	Total	9,289,566	40,236,207	4.33	7,007,419	46.88	3.81	16.07	0.75	18,107
	Washed	7,947,945	30,757,717	3.87	6,202,609	48.18	3.23	15.93	0.78	14,587
2023	DSO	1,300,550	7,253,179	5.58	1,300,550	42.96	3.13	21.61	1.00	15,875
	Total	9,248,495	42,881,797	4.64	7,503,159	47.28	3.21	16.92	0.81	14,810
	Washed	7,964,916	27,469,277	3.45	6,201,639	48.18	3.28	16.04	0.78	15,040
2024	DSO	1,309,555	7,538,519	5.76	1,309,555	43.05	3.15	21.63	1.00	14,776
	Total	9,274,471	39,742,755	4.29	7,511,194	47.29	3.25	17.01	0.81	14,994
	Washed	8,037,340	26,613,005	3.31	6,219,728	48.16	3.34	15.60	0.77	14,244
2025	DSO	1,290,222	8,017,726	6.21	1,290,222	43.09	3.12	21.51	1.00	16,461
	Total	9,327,562	37,658,344	4.04	7,509,950	47.29	3.30	16.62	0.81	14,625
	Washed	7,936,385	23,458,424	2.96	6,196,317	48.23	3.30	15.70	0.78	16,224
2026	DSO	1,306,462	7,795,795	5.97	1,306,462	42.73	3.24	21.97	1.00	17,213
	Total	9,242,847	36,696,943	3.97	7,502,779	47.27	3.29	16.79	0.81	16,396
	Washed	8,007,074	25,791,526	3.22	6,227,199	48.18	3.28	15.91	0.78	15,593
2027	DSO	1,284,775	6,802,790	5.29	1,284,775	42.93	3.15	21.70	1.00	15,449
	Total	9,291,849	35,469,205	3.82	7,511,974	47.29	3.26	16.90	0.81	15,568
	Washed	8,108,707	25,799,069	3.18	6,214,190	48.11	3.40	15.71	0.77	15,401
2028	DSO	1,300,911	6,926,872	5.32	1,300,911	43.26	3.14	21.14	1.00	16,957
	Total	9,409,618	35,870,845	3.81	7,515,100	47.27	3.36	16.65	0.80	15,670
	Washed	8,089,125	24,725,900	3.06	6,204,238	48.11	3.37	15.81	0.77	16,080
2029	DSO	1,298,804	7,633,683	5.88	1,298,804	43.29	3.09	21.34	1.00	16,054
	Total	9,387,930	34,553,478	3.68	7,503,042	47.28	3.32	16.77	0.80	16,076
	Washed	8,429,185	25,022,674	2.97	6,197,932	47.82	3.88	14.98	0.74	17,968
2030	DSO	1,303,225	7,619,839	5.85	1,303,225	42.47	2.73	21.73	1.00	19,096
	Total	9,732,410	38,571,071	3.96	7,501,158	46.89	3.68	16.15	0.77	18,164
	Washed	8,425,221	28,661,532	3.40	6,201,869	48.02	3.90	14.71	0.74	19,212
2031	DSO	1,298,806	8,451,648	6.51	1,298,806	41.52	2.87	22.38	1.00	19,628
	Total	9,724,027	42,860,912	4.41	7,500,674	46.89	3.72	16.04	0.77	19,284
	Washed	8,368,074	28,076,192	3.36	6,199,455	47.90	3.77	15.02	0.74	19,016
2032	DSO	1,299,520	8,350,711	6.43	1,299,520	41.99	3.03	21.62	1.00	17,933
	Total	9,667,594	42,686,186	4.42	7,498,976	46.88	3.64	16.16	0.78	18,828
	Washed	8,357,992	27,582,163	3.30	6,213,678	47.94	3.75	15.07	0.74	20,360
2033	DSO	1,292,260	8,902,551	6.89	1,292,260	41.73	2.96	21.41	1.00	20,467
	Total	9,650,252	44,918,966	4.65	7,505,937	46.87	3.62	16.16	0.78	20,378
	Washed	8,213,100	27,491,969	3.35	6,201,547	47.72	3.74	15.43	0.76	20,675
2034	DSO	1,311,130	7,732,562	5.90	1,311,130	42.93	3.10	19.68	1.00	21,233
	Total	9,524,230	39,928,990	4.19	7,512,676	46.88	3.63	16.17	0.79	20,773
	Washed	4,331,287	16,299,053	3.76	3,272,290	47.67	3.82	15.24	0.76	19,334
2035	DSO	535,688	3,459,890	6.46	535,688	43.53	3.14	18.91	1.00	19,764
	Total	4,866,976	24,367,612	5.01	3,807,979	47.08	3.73	15.75	0.78	19,395

14.7 Infrastructure

A description of surface infrastructure facilities and services is included in Section 15.0.

14.8 Mine Equipment

The estimated requirement for primary and auxiliary mining equipment is provided in Table 13-3.

Table 13-3: Mining Equipment

Equipment	Units
Excavator CAT 349D	4
Excavator CAT 345-GC	2
Excavator CAT 365C	7
Excavator CAT 374F	1
On road truck Actros 4844K 8x4	42
On road truck G500 B HT 8x4	30
Front End Loader CAT 950H	1
Front End Loader CAT 980H	8
Dozer D6T	6
Dozer D8T	3
Dozer D11	16
Auxiliary Equipment	28

14.9 Manpower

The workforce of Juruti consists of company personnel and contractors. The Alcoa personnel and main contractor lists for mining operations are presented in Table 13-4 and Table 13-5, respectively. The number of Juruti employees required for mining operations is not expected to change significantly for the foreseeable future.

Mine production is carried out by contractors, employed on a permanent basis, while company personnel carry out the geology, planning and grade control activities. Administrative works on a 5x2 roster of 8-hour shifts while mine production staff work on 12h x 36h shifts.

Table 13-4: Alcoa personnel

Juruti Alcoa	Total
Manager	12
Engineers and Geologists	38
Administrative Staff	77

Juruti Alcoa	Total
Technical Staff	141
Operators	191
Interns/apprentices	26
Total	**485**

Table 13-5: Contractors at Juruti

Juruti Contractors	No. of Personnel
Mine	1,136
Plant	781
Others	102
Total	**2,019**

15.0 PROCESSING AND RECOVERY METHODS

15.1 Process Description

The process plant has been in operation in 2009 and continues to produce bauxite ready for refining at an Al_2O_3 grade of 47.5%. The current production capacity of the process plant is 6.2 Mtpa of washed bauxite and 1.3 Mtpa of unwashed bauxite as a Direct Shipping Ore (DSO).

The overall processing requirements of bauxite from Juruti is limited and consists of primary and secondary ore crushing followed by washing. The principal objective of the processing flowsheet is to remove or reduce the fine silt and clay content within the run-of-mine material. The removed fines are initially deposited in a thickening pond for settling and water recovery (for reuse in the washing plant) then discarded in tailings ponds.

A block flow diagram of the process flowsheet is shown in Figure 14-1.

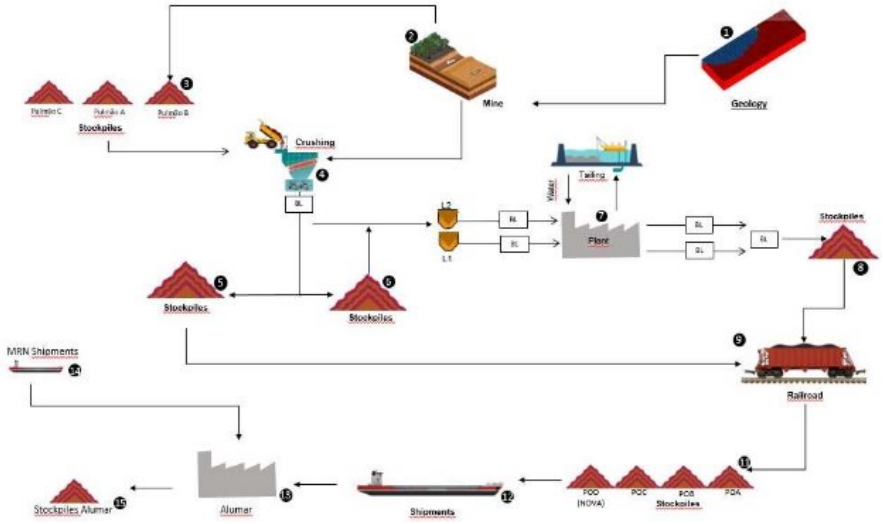


Figure 14-1: Block flow diagram of process (Alcoa, 2021)

15.1.1 Crushing

The bauxite, mined out in manageable pieces, is loaded into trucks, and transported to crushing circuit consisting of three stages of roller crushers. The crushed ore is transported by conveyor belts to the stockpiles, and later to the washing plant.

The run of mine feeds the crushing circuit consisted of two tooth roller crushers operating in series, with the same operational conditions, to guarantee the specified particle size of the product at P_{95}=75 mm. The capacity of the crushers is 844-1,097 tonnes per hour (tph). The crushing plant feed and the fine material content into the feed are controlled by mining sequencing rather than stockpiling. The crushed ore is then stockpiled and subsequently fed to the washing plant.

15.1.2 Washing

The washing plant is designed with the objective of separating the crushed bauxite into three separate size fractions (coarser than 1.18 mm, 38 µm to 1.18 mm and finer then 38 µm). The top two size fractions will constitute the washed product while the finest fraction will be final trails. The washing plant operates in two identical circuits with each circuit consists of scrubber/ trommel, screening, hydrocyclones, and filtering.

The crushed ore is washed in a scrubber with the objective of clay removal. The scrubber residence time and feed pulp density are approximately 3 minutes and 50% solids by weight. The scrubber discharge is screened at a 75 mm aperture trommel screen to remove the coarser particles from it.

The particles with size lower than 75 mm are screened in two stages with double deck screens while the particles size higher than 75 mm feed a tertiary crusher and then recirculated back to the trommel.

The oversize (+1.18 mm, -75 mm) of the secondary screening corresponds to the coarse product. The undersize (-1.18 mm) feeds a battery of hydrocyclones. The purpose of the hydrocyclones circuit is to remove the ultrafine material (-38 µm) that consisted of silica and other impurities. These ultrafine material reports to the cyclone overflow and pumped to the tailings disposal area of the circuit. The cyclone underflow is the fine product with a size distribution of +38 µm – 1.18 mm. This product is filtered in two belt filters, with 20 m^2 of area each. The filter cake (fine product) and the oversize (coarse product +1.18 mm, -75 mm) are considered as the washed bauxite products from the Juruti operation.

The tailings of the washing circuit (ultrafine material) are pumped as a dilute slurry at approximately 8 to 10% solids content to the tailing ponds.

The current global mass recovery of the plant is 75% ± 1%. The final product specification has 47.5 ± 1% of available alumina content (A.Al_2O_3) and 4.1 ± 0.5% of reactive silica (R.SiO_2) content. The residual moisture content of the final product is 13% ± 1%.

15.2 Primary equipment list

The primary equipment list of Juruti process operation is shown in Table 14-1.

Table 14-1: Primary equipment list

Equipment	Quantity	Installed Power (kW)
Primary crusher	1	634
Secondary crusher	1	532
Shoe feeder	1	159
Conveyor	1	158

Equipment	Quantity	Installed Power (kW)
Conveyor	1	129
Ore forklift	2	400
Conveyor	1	158
Belt feeder	1	120
Tertiary crusher	1	197
Conveyor	1	196
Rotary washer & fan	2	198
Rotary washer & fan	1	21
Shoe feeder	2	16
Slurry pump	2	196
Slurry pump	2	273
Slurry pump	1	80
Slurry pump	2	40
Slurry pump	2	33
Well pump	2	16
Vacuum pump for belt filter	2	121
Vibrating primary screen	4	16
Vibrating secondary screen	5	16
Vibrating screen	11	24
Belt conveyor	1	121
Belt conveyor	1	8
Belt filter	1	21
Belt conveyor	2	101
Coarse product conveyor	1	8
Belt conveyor	1	13
Belt conveyor	1	8
Intermediate Product conveyor	1	48
Fine product conveyor	2	20
Final product conveyor	1	121
Sampling belt conveyor	1	16
Runner feeder	1	24
Mobile feeder	1	20

Equipment	Quantity	Installed Power (kW)
Air compressor	1	60
Freight elevator	1	33
Belt conveyor	1	157
Service water pump	2	40
Sealant water pump	2	60
Overhead crane	1	240
Overhead crane	1	60

15.3 Process plant requirements

The average annual power and water consumptions of the process plant are approximately 47,000 MWh and 18 Mm^3.

Other consumables of the process plant include crusher liners, screen panels, cyclone liners, filter cloths and spares for feeders and conveyors. These are kept on site and replaced as part of the routine maintenance schedule according to manufacturers guidelines. The process plant is appropriately staffed with trained personnel and SLR has the opinion that the plant can continue to operate with the current staff levels.

15.4 Summary and QP opinion

The SLR QP is of the opinion that selected processing method and the flowsheet is suitable for Juruti operations. It is important to note that a significant proportion of the ore head grades meet the refinery specifications for processing in terms of $A.Al_2O_3$ grades and $R.SiO_2$ grades. This means the majority of the ore can be directly shipped to the refinery for downstream refining/smelting without any upgrading in the mineral processing plant. The crushing circuit reduces the particle size suitable for conveying as well as to meet particle size specified by the refinery.

The remaining ore, with higher $R.SiO_2$ content, is processed in a washing circuit to reduce the $R.SiO_2$ content to meet the refinery specifications.

16.0 INFRASTRUCTURE

Infrastructure associated with bauxite mining operations is generally all located within the area of the Juruti Bauxite Mine, approximately 55 km south of the town of Juruti. The required infrastructure includes the following:

- Rail siding and rail loading facilities
- Bauxite beneficiation plant comprising ore crushing (primary and secondary) and washing (scrubbing, screening, cyclone separation, filtering) plants
- Mine waste facilities including tailings thickening lagoons and tailings disposal ponds
- Stockpiles and material handling including conveyors
- Ancillary buildings including administrative and mine site offices, warehouses, laboratory, and workshops
- Fuel station
- Water supply system comprising water collection pumps installed on a raft in the Juruti Grande stream north on the mining infrastructure and plant area, and a water pipeline corridor of approximately 9 km. A portion of the water is also reclaimed from the tailings ponds and re-used by the beneficiation plant.
- Power generation through Thermoelectric Units (UTE) under a power purchase agreement with Petrobras Distribuidora S.A. (Petrobras). Two units are located at the mine site and port, each supplying 13.8 kV into dedicated electrical substations. Power is distributed by overhead insulated transmission lines installed by Alcoa and downrated by secondary substations.
- Surface water management and pumping systems, including a wastewater (effluent) treatment plant.
- 55 km off-site rail corridor connecting the mine to Juruti port and access road. The railroad is serviced by two locomotives and 26 wagons, each with a capacity of 81 tons.
- Port facilities including rail siding, materials handling equipment/conveyors, and 4,000 tph capacity ship loader. The port can receive vessels with capacity up to 75,000-tons.

Other available infrastructure in proximity to the Juruti Bauxite Mine include accommodation in Juruti town, which provides a portion of labour for the mine, and Juruti Airport.

The following figures provide aerial photographs of key areas of the Juruti Bauxite Mine and infrastructure areas including the materials handling facilities and processing plant (Figure 15-1), the product stockpiles and railroad (Figure 15-2), and the ship loader at Juruti port (Figure 15-3).



Figure 15-1: Aerial photograph of the crusher, stockpiles, washing plant and office facilities at the mine (Alcoa, 2021)



Figure 15-2: Aerial photograph of the railroad and bauxite product stockpiles (Alcoa, 2021)



Figure 15-3: Aerial photograph of the ship loader and port at Juruti town (Alcoa, 2021)

Figure 15-4 below illustrates the infrastructure layout of the Juruti Bauxite Mine, including the rail and road access points to the east, processing plant area, internal road networks, and the relative location of the thickening lagoon / settling pond and tailings ponds.

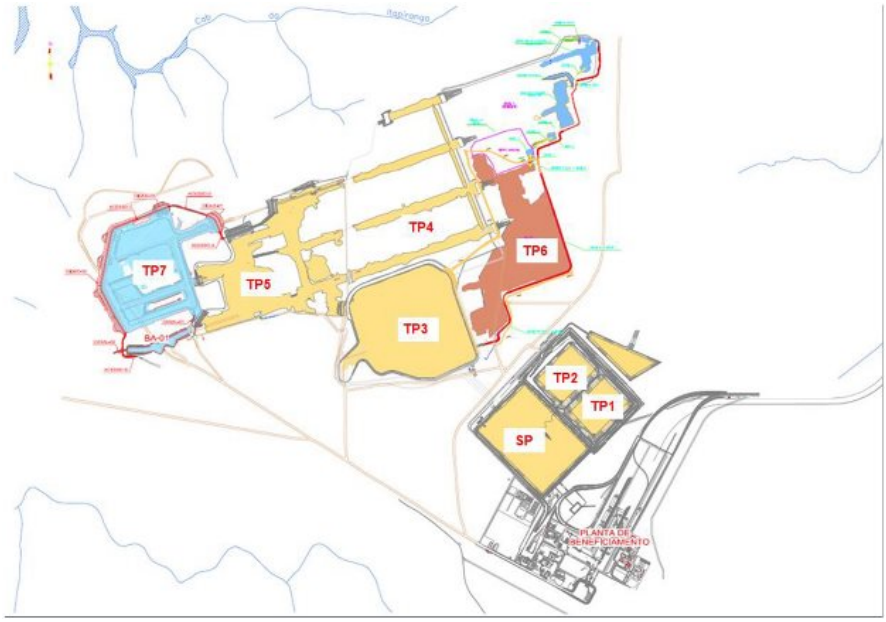


Figure 15-4: Juruti Infrastructure Layout (Alcoa, 2021)

Notes:

1. TP refers to Tailings Ponds
2. SP refer to Settling (Thickening) Pond

16.1 Mine Waste Management

16.1.1 Existing Tailings Storage Facilities

Tailings at the Juruti Bauxite Mine are generated from beneficiation of the bauxite ore at the processing plant which involves removing silt and clay (fine particles) by a simple washing process. The tailings of the overall washing circuit comprise the overflows of the hydrocyclones batteries. Based on an annual washed bauxite production of 6 Mtpa, the tailings generated annually are in the order of 1.93 Mtpa (dry tonnage).

The tailings disposal system from the bauxite process relies on the use of thickening ponds and tailings disposal ponds. The tailings produced in the processing of bauxite in the washing plant are fed into the thickening pond as a pulp with 6% to 8% of solid content on average. After a period of solid sedimentation, the water is pumped and reclaimed for reuse in the system. Settled solids are dredged and deposited into the tailings disposal ponds, see Figure 15-5. The solid content of the dredged tailings is 22%. The solid content of the deposited tailings reaches 46.4% after one year and 55% long term.

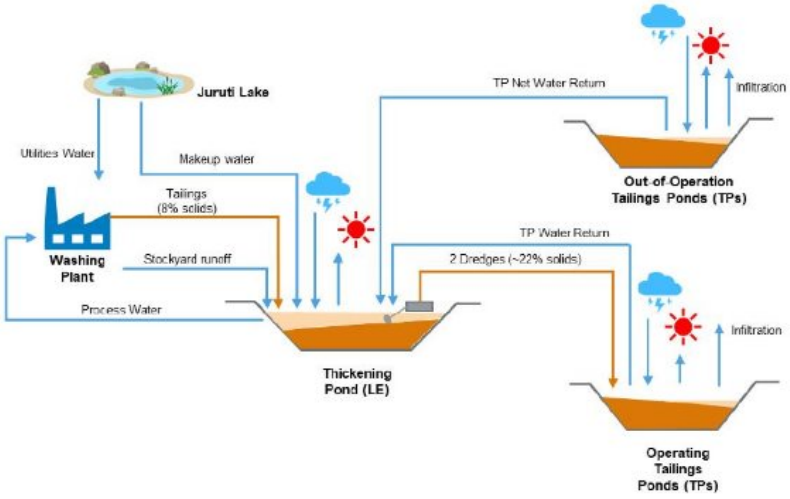


Figure 15-5: Juruti Tailings Process (Alcoa, 2021)

Typically, the mine tailings storage facilities (TSFs) are constructed of earthen embankments, or dikes, forming an enclosure. Some impoundments are maintained at their original height, with the perimeter embankment constructed to full height before deposition begins. Others are raised over time using downstream, upstream or centerline methods, depending on the type of tailings being stored and the method of deposition used.

The Juruti Bauxite Mine currently has eight tailings storage facilities, as listed in Table 15-1 below, which comprise one thickening pond and seven tailings disposal ponds in operation (TP1 to TP7), two of which are inactive (TP1 and TP2). The ninth tailings disposal pond (TP8) is under construction and will be delivered for operations in 2022.

Table 15-1: List of Existing Tailings Storage Facilities at the Juruti Bauxite Mine

TSF Name	Date of Initial Operation	Current Max Height (m)	Current Tailings Storage Volume (Mm^3)	5-yrs Tailings Storage Plan (Mm^3)	Consequence Classification
Thickening Pond (LE)	2008	9.0	4.3	4.4	Medium
Disposal Pond TP1	2008	24.0	2.7	3.0	Medium
Disposal Pond TP2	2008	24.0	2.5	3.4	Medium

TSF Name	Date of Initial Operation	Current Max Height (m)	Current Tailings Storage Volume (Mm3)	5-yrs Tailings Storage Plan (Mm3)	Consequence Classification
Disposal Pond TP3[2]	2013	10.0	4.8	5.5	Medium
Disposal Pond TP4	2016	14.0	2.0	2.4	Low
Disposal Pond TP5	2018	18.5	3.0	3.5	Medium
Disposal Pond TP6	2020	6.9	1.9	2.9	Medium
Disposal Pond TP7[3]	2021	18.0	0.8	4.8	Medium

Limited detailed design and/or construction documentation was available for the review, however, it is understood from the published Alcoa Corporate Tailings Impoundment Database (July 2021) that relevant engineering records including design, construction and closure are available for the facilities.

Information available on the governance of tailings management at the Juruti Bauxite Mine was initially limited to that publicly available, namely Alcoa policy documents, which were discussed via email correspondence with the Alcoa team (Alcoa, 2021) regarding current tailings management practice.

Alcoa's global impoundment policy requires all impoundments to be planned, designed, constructed, operated, maintained, and closed in accordance with the Alcoa mandated impoundment standards and guidelines, the International Council on Mining and Metals Global Tailings Standard, or the laws and regulations of the country in which the Impoundments are located (whichever are higher). It has not been possible to verify the extent to which the policy requirements have been implemented for the management of the Juruti tailings storage facilities.



Figure 15-6: Aerial photograph of the Tailings Lagoon (LE) and Tailings Disposal Ponds (TP1 to TP7), (Alcoa 2021)

It is understood from published information and email correspondence with Alcoa's team (Alcoa, 2021) that Alcoa applies a consequence rating system as guided by either local regulations or internal Alcoa requirements. For the case of the Juruti Bauxite Mine, the TSFs are classified and audited in accordance with Brazilian regulation and the Brazilian National Mining Agency standards are being used. Alcoa is currently in the process of reclassifying the consequence ratings of its tailings facilities to the Global Industry Standard on Tailings Management, with implementation planned to take place in 2025.

The tailings facilities, with the exception of TP7, which was not commissioned, were reviewed by independent experts in 2021. Updated dam-breach assessments for the TSFs were recommended in order to address the latest Brazilian Mining Agency regulation on the matter. This is currently being progressed.

It is noted that in November 2017, a partial overtopping of the crest took place in the southeast area of the thickening pond. There was no tailings flow downstream. Key stakeholders were engaged and remedial actions were implemented. SLR relies on the conclusions provided in the published database and email correspondence with Alcoa's team and therefore provides no conclusions or opinions regarding the stability of the listed dams and impoundments.

The tailings management governance structure involves three reporting levels: the owner's board of directors, an Accountable Executive Officer and a Responsible Person. An Accountable Executive has been appointed. A Senior Geotechnical Engineer is being appointed on site for the role of responsible tailings facility engineer (RTFE). The appointment of an engineer of record (EoR) is being considered as part of the implementation plan of GISTM requirements.

Email correspondence with Alcoa's team (Alcoa, 2021) indicates that TSFs have operations, maintenance and surveillance (OMS) manuals, developed based on local guidelines and international best practice, as

well as emergency response plans (ERP). Each TSF is inspected twice a month at a minimum. Triggers action response plans (TARP) are currently being updated in order to incorporate recently installed instruments as well as recent topographic survey and geotechnical data

16.1.2 Future Tailings Disposal Plan

The Juruti Tailings Master Plan (Alcoa, June 2021) for tailings management provides a 15-year plan for sustaining production with the current wet tailings disposal method. Alternative technology involving dry tailings disposal is being investigated. The base-case considers sustaining the production for at least 5 years with current technology. The potential technology switch to dry disposal is envisaged starting year 2026.

Table 15-2 below presents the scheduled tailings facilities from 2021 until 2036. One new tailings pond is planned every two years based on current technology.

Table 15-2: Planned Tailings Storage Facilities

Disposal Pond	Type	Capacity (Mm^3)	Life (months)	Design & Construction	Operation Start
TP 8	In-pit with bauxite	6.7	26.8	2021/22	2022
TP 9	In-pit with bauxite	7.9	31.7	2022/24	2024
TP 10	Already Mined	6.4	25.6	2024/26	2026
TP 11	In-pit with bauxite	6.0	24.0	2026/28	2028
TP 12	Already Mined	6.0	24.0	2028/30	2030
TP 13	In-pit with bauxite	6.1	24.4	2030/32	2032
TP 14	Already Mined	6.0	24.0	2032/34	2034
TP 15	In-pit with bauxite	5.9	23.6	2034/36	2036
Total		**51.0**			

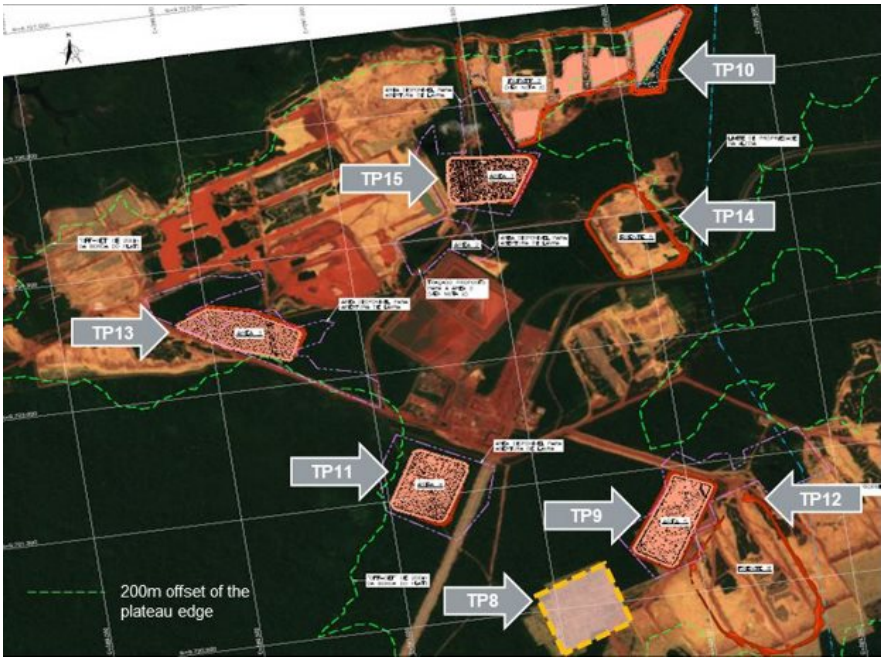


Figure 15-7: Planned Tailings Storage Facilities construction sequence (Alcoa, 2021)

As an alternative to the base case scenario of tailings ponds construction, Alcoa is assessing other technologies to dewater and dispose of Juruti bauxite tailings. Preliminary studies show that the "dry backfill" alternative has technical and financial potential to be competitive and field tests need to be done in Juruti to confirm the assumptions and to substantiate a FEL2 development.

The "dry backfill" consists of excavated areas receiving tailings from the dredges or mechanical thickener which are disposed as a slurry in layers over large areas for solar drying for a certain period (it can vary from 30 to 90 days, depending on the seasonality). After that, the "dried tailings" are excavated, hauled to the mined areas and disposed with the overburden (Figure 15-8). A field test is expected to take place by 4Q2022.



Figure 15-8: Alternative dry disposal technology (Alcoa, 2021)

16.1.3 Closure of Tailings Facilities

Alcoa's 15-year Master Plan provides for closure of twelve tailings facilities, TP1 to TP12. Closure concepts and cost estimates based on preliminary assessment have been developed for TP1 and TP2 which will be the first facilities to be closed. The rest of the facilities will be closed progressively throughout the mine life.

The closure concept involves reshaping and capping of the tailings body with a conforming soil-fill and then topsoil before planting. External drainage and storm water management will be provided. The main objective of the closure design is geotechnical, geochemical, and biological stability.

16.1.4 Waste Rock Disposal

Disposal of mine waste involves backfilling of previously mined panels. The mining operations involve dividing the entire plateau in 200 m x 25 m panels. The overburden stripped from the panel being mined out is pushed by dozers into the previously excavated panel.

Only a small volume of the overburden excavated from the first panel is deposited in a waste dump in the Mauari Plateau. The dump is constructed in 3 m lifts to a total maximum height of 12 m and overall slope angle of 14° (Figure 15-9).

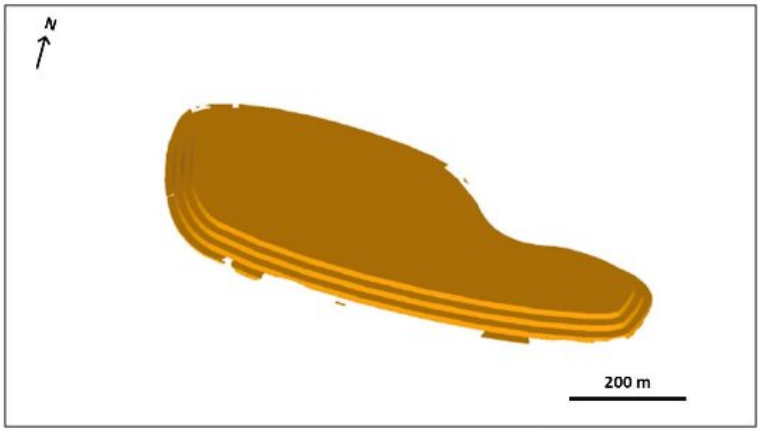


Figure 15-9: Mauari Waste Dump (Alcoa, 2021)

16.2 Access Roads

As described in Section 4.0, the Juruti Bauxite Mine site is serviced by a local access road (PA-257) that heads south from Juruti town. After approximately 20 km, the road splits with the national road continuing eastwards and the mine access road continuing southwest for approximately 35 km. The final 17 km of the access road to the mine site follows the route of the dedicated rail corridor that connects the mine to Juruti port.



Figure 15-10: Juruti Bauxite Mine Access (SLR, 2021)

The Juruti Bauxite Mine site also has several internal site roads which have been constructed to interconnect the infrastructure and processing plant area and each of the individual mining areas (plateaus). The layout of these internal site roads is illustrated in Figure 15-11 below.

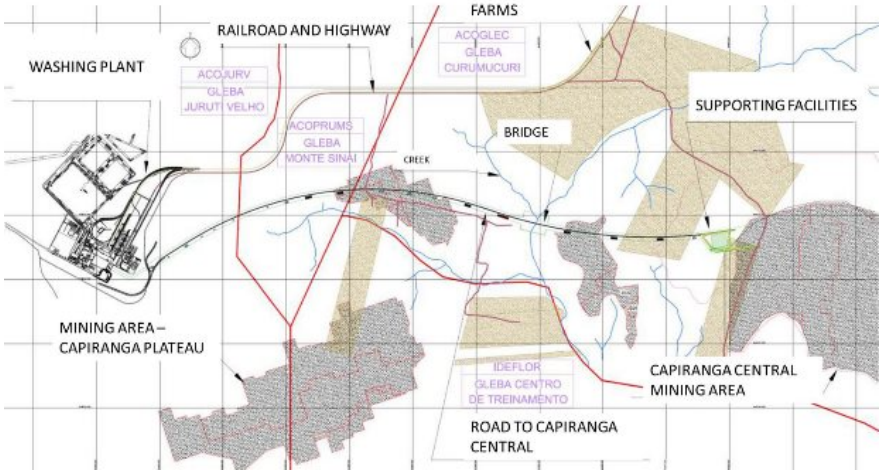


Figure 15-11: Juruti Bauxite Mine internal site road layout (Alcoa, 2022)

16.3 Power

Power generation is available from two separate sources for the infrastructure area at the mine site and at the port site in Juruti town. Electrical power is provided by Thermoelectric Units (UTE) under a power purchase agreement with Petrobras Distribuidora S.A. (Petrobras), with one unit located at the processing plant facilities at the mine site and one unit located at the port facilities in Juruti town.

Electrical power is delivered at 13.8 kV, and Alcoa has installed insulated overhead transmission lines which distributes this incoming power to secondary substations. Substations lower the incoming voltage to 4.16 kV for high-power loads and 0.44 kV for low-power loads.

Electrical consumption is monitored by Soenergy, a subsidiary of Petrobras, jointly with AWA Brasil, from distribution boards on the substations located at the mine site and at the port. Secondary substations at the mine and port are also monitored for electrical consumption by Alcoa World Alumina Juruti.

16.4 Water

The primary source of water for the Juruti mining operations is the Juruti Grande stream north of the mining infrastructure and plant area, and which empties into the Amazon River, along with the Aruá River to the south of the mining areas, which empties into the Arapinus River at Cochoeira do Aruá. The Juruti Grande stream is known to represent the primary drainage system for surface water across the majority of the Juruti mining areas, with minor drainage into the Aruá River.

Figure 15-12 below shows the raw water collection system on the Juruti Grande stream north of the infrastructure area. The collection system comprises vertical pumps installed on a raft and a water pipeline corridor of approximately 9 km.



Figure 15-12: Aerial photograph of the Juruti Grande water intake, looking southeast (Alcoa, 2021)

Water is collected, recycled, and reused across almost areas of the Juruti mining operations to ensure water demand can be met year-round. As described previously, tailings from the processing plant facilities are initially fed into a thickening lagoon as a pulp / slurry with typically 6-8% solids. The purpose of the thickening lagoons is to allow for sedimentation of solids and the recovery / reclaim of water. Tailings solids are dredged and deposited into separate tailings disposal ponds, at which time any additional water from further settling is also reclaimed where possible.

It has previously been demonstrated through an evaluation of the seasonal and steady-state recovery of water from the thickening pond that the system is sufficient to provide the required quantity of water for normal operation of the process (washing) plant.

Wastewater from the port and processing plant areas is managed by two effluent treatment stations (ETE). Raw and treated wastewater qualities are monitored on a monthly basis, with more detailed physical, chemical, and bacteriological parameters analysed on a quarterly basis by a certified laboratory. Analysis results are compared to values established by CONAMA (Brazilian National Environment Council) Resolution 430/2011 that provisions the conditions and standards of effluents, to ensure the discharged wastewater meets the required quality standards.

Wastewater discharge is reported to be from a single discharge point at the Port Sanitary Effluent Treatment Station into the Amazon River. This is reported by Alcoa to be in accordance with Ordinance no. 118/2011 by the ANA (National Water Agency). Other effluents are disposed of into the soil, however, in absence of reference values for this practice, Alcoa uses CONAMA 430/2011 as a reference.

16.5 Site Buildings

Mine site buildings are principally located around the process plant area and include mine services offices, workshops, warehouses, and an on-site analytical laboratory. Additional administrative offices are located at the port in Juruti town.

16.5.1 Workshops

The Juruti area has a complete Maintenance Workshop equipped with bays for medium mobile equipment. Its construction is in a metallic structure and there is an office and a dressing room attached to the shed, built with masonry. Other facilities include the Lube Bay, the Vehicle Washing Bay, the Tire Shop, the Heavy and Light Vehicle Refueling Station, the Parking Lot, and the patio, all of which are in proximity to the General Maintenance Workshop.

16.5.2 Laboratory

All the quality control of the ore is carried out using the structures of the Juruti plant laboratory, where physical tests and assays of the entire production chain are carried out.

16.5.3 Offices

Masonry offices are grouped in the administrative areas of Juruti and its contractors. It is made up of offices for senior management, management, coordination, meetings, technicians, files, reception, and restrooms, which serve all administrative personnel.

16.5.4 Warehouses

The warehouse, built partly in masonry and partly in metallic structure, is surrounded by an outdoor area surrounded by gates. The covered area includes service desks, offices, and restrooms, and the external area for storage of materials at this time includes annexes for the storage of lubricants, fuels, and tires. The fuel storage is equipped with horizontal tanks for filtered diesel, with drainage basins and a water-oil separation system.

16.5.5 Meal Room

There is a cafeteria that serves all staff, both in-house and outsourced, and provides lunch, dinner, and snacks. Its operation is outsourced by Alcoa as is the case in Alcoa's other operating units of the company.

16.5.6 Fire Fighting System

The firefighting water is stored in metal tanks and directed to the entire area of the Juruti plant, crusher, stock yard and offices through a pipe network.

16.5.7 Housing

Part of Alcoa's staff resides in the urban center of Juruti so there is no need to build new accommodation in the industrial area.

17.0 MARKET STUDIES

17.1 Overview

Alcoa Corporation is a vertically integrated aluminum company comprised of bauxite mining, alumina refining, aluminum production (smelting and casting), and energy generation.

Through direct and indirect ownership, Alcoa Corporation has 28 operating locations in nine countries around the world, situated primarily in Australia, Brazil, Canada, Iceland, Norway, Spain, and the United States. Governmental policies, laws and regulations, and other economic factors, including inflation and fluctuations in foreign currency exchange rates and interest rates, affect the results of operations in these countries.

There are three commodities in the vertically integrated system: bauxite, alumina, and aluminum, with each having their own market and related price and being impacted by their own market fundamentals. Bauxite, which contains various aluminum hydroxide minerals, is the principal raw material used to produce alumina. Bauxite is refined using the Bayer process to produce alumina, a compound of aluminum and oxygen, which in turn is the raw material used by smelters to produce aluminum metal.

Alcoa obtains bauxite from its own resources and processes over 85% of its combined bauxite production into alumina. The remainder is sold to the third-party market. In 2021, total Alcoa production was 47.8 M dmt.

Aluminum is a commodity that is traded freely on the London Metal Exchange (LME) and priced daily. Pricing for primary aluminum products is typically comprised of three components:

(i) The published LME aluminum price for commodity grade P1020 aluminum;

(ii) The published regional premium applicable to the delivery locale; and

(iii) A negotiated product premium that accounts for factors such as shape and alloy.

Further, alumina is subject to market pricing through the Alumina Price Index (API), which is calculated by Alcoa based on the weighted average of a prior month's daily spot prices published by the following three indices: CRU Metallurgical Grade Alumina Price; Platts Metals Daily Alumina PAX Price; and Metal Bulletin Non-Ferrous Metals Alumina Index. As a result, the price of both aluminum and alumina is subject to significant volatility and, therefore, influences the operating results of Alcoa Corporation.

Unlike alumina and aluminum, bauxite is not a standard commodity traded on an index. Bauxite's grades and characteristics vary significantly by deposit location and the value of bauxite deposits for each downstream refinery could be different, based upon:

- refinery technology;
- the location of each refinery in relation to the deposit; and
- the cost of related raw materials to each refinery.

As such, there is no widely accepted index for bauxite. Most bauxite traded on the third-party market is priced using a value-in-use methodology. The key assumption for the value-in-use methodology is that both the (1) offered bauxite and the (2) comparative bauxite being used in the target refinery will generate the same refining cost. As such, using the known price for the comparative bauxite used in the target

refinery, the offered bauxite price will then be derived by considering the bauxite characteristics and quality differences between the offered and comparative bauxite.

17.1.1 Market Fundamentals

Bauxite is the principal ore of alumina (Al_2O_3), which is used to produce aluminum. Bauxite mining and alumina refining are the upstream operations of primary aluminum production. China is the largest third-party seaborne bauxite market and accounts for more than 90% of all bauxite traded. Bauxite is sourced primarily from Australia, Guinea, and Indonesia on the third-party market. In the long run, China is expected to continue to be the largest consumer of third-party bauxite with Guinea expected to be the majority supplier. Further, third-party traded bauxite is expected to be in surplus over the next decade, with most new mining projects announced recently being located in Guinea.

Bauxite characteristics and variations in quality heavily impact the selection of refining technology and refinery operating cost. A market bauxite with high impurities could limit the customer volume an existing refinery could use, resulting in a discount applied to the value-in-use price basis.

Besides quality and geography, market fundamentals, including macroeconomic trends; the prices of raw materials, like caustic soda and energy; the prices of alumina and aluminum; and, the cost of freight, will also play a role in bauxite prices.

17.2 Market: Juruti

17.2.1 Operation

The Juruti Bauxite Mine, located in the Amazon region of Brazil, serves primarily to supply bauxite to the integrated Alumar refinery, a joint venture between Alcoa, South32 and Rio Tinto (also located in the Amazon region of Brazil) as well as to supply third-party customers in the Atlantic region. The market for Amazon bauxite is used primarily to supply Atlantic region refineries with demand expected to be slightly in surplus over the next decade.

17.2.2 Sales Contract

The majority of Juruti bauxite is shipped internally to Alumar. The Alumar refinery has been designed to consume Amazon bauxite for its unique quality, composition, and other characteristics. In 2021, approximately 76% of Juruti bauxite was shipped to supply Alcoa's share of the Alumar refinery. A further 13% of Juruti bauxite was shipped to meet the other Alumar partners' obligations of the refinery. In total 89% of Juruti bauxite was shipped to the Alumar refinery. The remaining Juruti bauxite was sold externally to the third-party market. The sales contracts for these third-party sales include both near-term (1 year) and long-term (exceeding 1 year) contract terms, or spot prices.

17.2.3 Pricing

As bauxite is not reliant on an index to negotiate price, the value-in-use methodology is used as the starting point of pricing negotiations which also consider the MRN partner price formula as well as certain fixed- and formula-based prices negotiated with individual customers. Mineração Rio Do Norte (MRN) is a Brazilian bauxite mine in which Alcoa has an ownership interest. MRN bauxite price is set using the MRN

partner price formula, which considers bauxite quality and mineralization and is linked to LME aluminum and API alumina prices. MRN partner price provides a benchmark for Juruti bauxite sales to third parties.

The transfer price mechanism from Juruti to Alumar is determined by a weighted-average price of the previous year's third-party sales. For example, the 2021 internal transfer price from Juruti to Alumar will be the weighted-average price of 2020 third-party sales.

The average LOM selling price, for washed and unwashed bauxite product $31.66/tonne.

17.3 Contracts

Shipping contracts: The majority of Juruti volume used to supply its integrated demand is reliant on the Cabotage Model (Brazilian coastal) delivered via Panamax vessel. The cargoes/shipments are managed by Alcoa, but the services and vessels are provided by a third-party, covered mostly by long-term contracts with a few spot contracts, aiming to guarantee the number of shipments expected for the year.

Juruti volume shipped to the third-party market are usually negotiated on Free On Board (FOB) terms.

Electric power generation contract: Alcoa has a mid-term contractual agreement with a third-party to supply energy for mining operations. Pricing is based on market pricing for fuel, payable on volume consumed.

Mining contractor contract: Alcoa has a long-term contractual agreement with a third-party to perform bauxite and overburden extraction. Pricing is based on a fixed rate schedule, payable based on volume extracted.

Pre-mining clearing contract: Alcoa has a long-term contractual agreement with a third-party to provide vegetal suppression services to enable mining. Pricing is based on a fixed rate schedule, payable on area of work completed.

18.0 ENVIRONMENTAL STUDIES, PERMITTING, AND PLANS, NEGOTIATIONS, OR AGREEMENTS WITH LOCAL INDIVIDUALS OR GROUPS

The 2020 Alcoa Annual Report states that Alcoa is a values-based company and strives to protect the environment and work with communities where Alcoa operates. Advancing sustainability of operations is listed as one of three strategic priorities. Alcoa's sustainability guidelines support its strategic priorities through three pillars:

- Create shared value with the communities where Alcoa operates.
- Reduce environmental impacts to improve the efficiency of operations.
- Differentiate products to better meet sustainability demands.

The Juruti operations are reported by Alcoa to be certified by the Aluminum Stewardship Initiative (ASI). ASI is a comprehensive global sustainability certification program for the entire aluminum value chain. Alcoa is also a member of the International Council on Mining and Metals (ICMM), an organization focused on improving the contribution of industry to society with safe, fair, and sustainable practices.

The Juruti Bauxite Mine and supporting services areas of operations include the open cast mine and residue facility, mineral processing plant, rail, highway and harbor or port operations. The port area comprises offices, maintenance areas, a fuel station, thermoelectric power plant, seedling nursery and water and wastewater treatment plant. Mining commenced in September 2009. The mine feeds the Alumar alumina refinery in Maranhão State.

18.1 Environmental Studies

The Environmental Impact Assessment (EIA) Report for Juruti Bauxite Mine was compiled in 2004 by CNEC Engenharia SA (CNEC) to obtain a Preliminary Environmental License (LP). The EIA provided detailed baseline descriptions of the physical, biological and socio-economic environment. The report included an impact assessment which assessed all project phases and assessed impacts in terms of the nature of the impact (positive or negative), type (direct or indirect), duration, spatial extent, reversibility, temporal scale and occurrence. Alcoa provided an impact assessment matrix which is understood to match this EIA. The following impacts were noted as having a high significance:

- Vegetation clearing (referred to as vegetation suppression in the documents reviewed).
- Vegetation degradation by increased human activity in the area.
- Decrease in local fauna populations due to habitat reduction.

The main mitigation measures listed are preventative and corrective and include conservation of vegetation where possible, management of vegetation clearing, rehabilitation and recovery of degraded areas, and environmental education.

Environmental Control information is presented in the annual Environmental Reports submitted to the regulator. The annual reports refer to a Social and Environmental Management Plan (PGSA), which was prepared by Alcoa based on the requirements of its operation license. SLR was not provided with this

PGSA, however the annual reports include information on the control plans for air quality, water quality and drainage, solid waste management, ecology, heritage resources, erosion management and social aspects. The controls mentioned are mainly monitoring, and dust suppression in the air quality control information section. Juruti has implemented management processes for vegetation removal and rescue of fauna and for rehabilitation and recovery of degraded areas and monitoring thereof. These management processes therefore focus on the impacts that were identified as having a high significance in the EIA. The annual reports provide a significant level of detail on these activities.

18.2 Environmental Monitoring

Environmental monitoring is described in the 2020 and 2021 Annual Environmental Reports. This is summarized below.

18.2.1 Climatic

Climatological monitoring is conducted at the port facility and at the mineral processing facility.

18.2.2 Air Quality

Air quality monitoring includes:

- Dust monitoring at the port area and Capiranga Base occurs every 6 days and every 3 months at the Jauari Community.
- Carbon monoxide, nitrogen oxides (NO_x), and sulphur dioxide (SO_2) emissions are determined at Alcoa's Port and Beneficiation power generation units monthly through estimates by mass balance.
- Particulate matter is monitored at the generators and mobile sources (vehicles and diesel equipment) through visual inspection made with reference to the Ringelmann scale.
- Measurements of NO_x and SO_2 gases from diesel used in locomotives is determined quarterly, with the use of testing equipment, aiming at controlling the emissions of pollutants from the burning of diesel.

Air quality monitoring was suspended in September 2019 at two monitoring points due to the position of the Association of Communities of the Juruti Velho Region (Acorjuve). Monitoring resumed in April 2021 when an agreement was apparently reached between the parties. In 2020 the pandemic further impacted monitoring activities. Air quality monitoring data is analyzed using the Pollutant Standards Index (PSI) of the United States Environmental Protection Agency (US EPA). Air quality monitoring data is compared with the legal limits for inhabited areas aiming at community comfort as specified in CONAMA Resolution No. 1/1990. Alcoa reported no exceedance of these limits when sampling was possible.

18.2.3 Noise

Noise monitoring is conducted on a quarterly basis during the day and night at six monitoring points in surrounding communities. These include the Terra Preta, Lago Preto, Jauari Community, Capiranga, São Pedro and Café Torrado. Noise monitoring was suspended in September 2019 for approximately 18 months at two monitoring points due to the position of the Association of Communities of the Juruti Velho Region (Acorjuve), as described above. In 2020 the pandemic further impacted monitoring activities. Noise monitoring data is compared with the legal limits for inhabited areas aiming at community comfort

as specified in CONAMA Resolution No. 1/1990. Alcoa reported some exceedances of these limits but attributed these to community and traffic noise not associated with the Juruti operations.

18.2.4 Surface Water

Surface water monitoring includes monthly in-situ monitoring for pH, dissolved oxygen, electrical conductivity and turbidity; and quarterly sampling and lab analysis of a set a parameters including metals and salts at 35 monitoring points. These monitoring points are located upstream (reference points) and downstream of operations and activities, not just at the mine site but at the port, along railway and highways used, and in communities. Water quality results are compared with the water quality guidelines for Class 2 watercourses specified in CONAMA Resolution No. 357/2005. Two monitoring points are in the Amazon River and show different results when compared to the other monitoring points. Alcoa reported that monitoring results complied with the maximum allowed values in CONAMA Resolution No. 357/2005. It was noted that some monitoring results were influenced by the geology of the area and the natural characteristics of the Amazon River. Monitoring was disrupted on a few occasions due to health and safety risks.

Effluent is discharged from the domestic or sewage wastewater treatment plant into the Amazon River at the port in accordance with Ordinance n. 118/2011 issued by the National Water Agency. This effluent is monitored monthly using in-situ monitoring for pH, dissolved oxygen, and electrical conductivity, and quarterly sampling is conducted when samples are sent for lab analysis. Monitoring results are compared with the limits specified in CONAMA Resolution No. 430/2011 and Alcoa reported no exceedances. The mining area also has a sewage wastewater treatment plant, and this effluent is discharged to land. There are no effluent quality requirements specified in the law for land disposal, however Alcoa monitors the effluent quality and uses the CONAMA Resolution No. 430/2011 limits to compare with the results of this monitoring and noted some exceedance of ammonia and nitrogen.

Monitoring is also conducted within the mine water circuit in the operational areas, but this monitoring is aimed at understanding the quality of water for reuse within the water circuit. These include:

- Fines retention pond which receives runoff from the port area.
- Waste disposal site treatment ponds.
- Mineral processing plant sewage treatment plant.
- Mineral processing plant oil separation system.
- Bauxite washing plant (no chemicals used in this process).
- Port oil separation system.

18.2.5 Groundwater

Groundwater monitoring is conducted in the shallow aquifer using in-situ monitoring for pH, dissolved oxygen, electrical conductivity and turbidity; and quarterly sampling and lab analysis of a selected metals and salts, as well as coliforms at 18 monitoring points. The monitoring points are located at the mining area, processing plant and port operations. Water quality results are compared with the water quality guidelines for Class 2 watercourses specified in CONAMA Resolution No. 396/2008. Alcoa reported that monitoring results generally complied with the maximum allowed values in CONAMA Resolution No. 396/2008, although aluminum and iron concentrations exceeded the limits but are ascribed to the natural geology in the area.

18.2.6 Ecology

Detailed ecological monitoring is conducted following specific procedures developed by Alcoa as referenced in the 2021 Annual Environmental Report. Fauna inventories and periodic seasonal surveys to trap, mark and release fauna are conducted. Animal mortalities are recorded as well. Vegetation monitoring is conducted in affected areas as well as in rehabilitated or recovered areas. Aquatic fauna monitoring is conducted at 17 monitoring points.

18.3 Waste and Tailings Disposal, and Site Monitoring

The tailings storage facilities are covered by the National Dam Safety Policy (PNSB). According to Art. 16 and Art. 18 of Ordinance No. 70,389/2017, the operator must carry out routine inspections of the facilities under his responsibility, at least once every two weeks. Inspections are recorded in a Regular Inspection Form. They are performed by qualified staff trained to identify deviations from standards and anomalies that could potentially or immediately affect the safety of the TSF.

Visual inspections are essential activities for the assessment of the safety status of structures, since they allow the detection of signs of potential instabilities, as well as any other anomalies. The Regular Safety Inspection Form is filled in the SIGBM (Integrated Mining Dam Safety Management System), a management system which has been developed with the objective of managing mining dams in the national territory by the Brazilian National Mining Agency.

The frequency of visual inspections is necessary to maintain adequate operation of the tailings disposal system and to obtain a history of the behavior of the structures. In the event of an anomaly, the inspection frequency is intensified. Visual inspections are classified according to the level of complexity and severity of the situation being faced. In the event of a trigger anomaly, emergency actions will follow the procedures established in the Emergency Action Plan for Mining Dams.

To comply with Law 12,334, of the 20th of September 2010, TSF safety audits must be carried out every six months. Declarations of Stability are presented on by the 30th of March and the 30th of September each year.

As part of its Environmental Education Program, the company has a specific campaign on TSF safety. The campaign's objective is to inform internal staff and the external public about the TSFs function as part of the company's operation, their structures, the risks they pose, the safety control procedures and monitoring carried out by the company to ensure the integrity of the TSFs and the environmental protection.

Alcoa samples the tailings in the thickening pond to characterize this waste material on an annual basis. According to a report dated October 2021, the results comply with the Brazilian Association of Technical Standards 10004 (November 2004) and the tailings material was determined to be inert.

Juruti has a small waste rock dump from the first boxcut. This facility does not have stability concerns due to its limited size. No further information is available on this facility.

18.4 Water Management

Juruti has a mine drainage or stormwater management plan for three phases, pre-mining, operations, and post-mining (Alcoa, 2021). The 2021 Annual Environmental Report describes mining progress for the period and states that there were no issues of excessive water accumulation. The report describes

maintenance activities completed and the construction of drainage basins in the operational areas as required by the plan. The report also describes water balance and stability monitoring in the main containment dams as required by the operating licence.

Alcoa provided a brief presentation file which describes water management focussed on the tailings and impoundments. Wastewater is generated in the washing plant. This flow is monitored and there are control measures to ensure that there is no discharge, and the water is reused. Some effluent is discharged to the Amazon River, this is understood to be from the sewage treatment plant at the port, and the effluent meets applicable discharge criteria. Alcoa provided a water balance flow diagrams for the mine and the port and these confirm the discharge of treated sewage effluent into the Amazon River, and additional discharge of treated sewage effluent to land in the mining area. It should be noted that there are various uncertainties and limitations noted in the water balance and supporting information. Notably, infiltration and evaporation data are highly uncertain, and these have been balanced so that inputs equal outputs. The densification of tailings in the ponds is also noted to be variable. The information made available in the water balance cannot be verified by SLR.

The hydrogeology section 13.4 describes water management in the mining areas. The operation does not lower the groundwater level because the mine in shallow. Instead, water inside the mining areas is pumped to sumps nearby, allowed to settle out and then released to natural drainage.

18.5 Waste (Non-Mineralized) Management

Alcoa reports in the 2021 Annual Environmental Report that the Juruti Solid Waste Management Program addresses all phases of waste management, namely waste generation, separation, collection, reuse and recycling, temporary storage and final disposal. A licenced contractor with extensive experience in the field of waste management implements the program under supervision from Alcoa.

Alcoa has a solid waste management team comprising company representatives. This group meets monthly, and their main activities include education campaigns, field inspections, identification of non-conformances and preparation of correction action plans, and mapping opportunities for waste reduction. Alcoa has developed and regularly updates a detailed waste inventory. The 2021 Annual Environmental Report lists a series of procedures for waste management.

The waste disposal area is located between the port and the beneficiation plant. It is approximately 50 hectares in size. Sorting is conducted at the waste site to separate out recyclable materials. Hazardous waste is stored in metal drums in a designated shed until collection by a licenced contractor for treatment. Organic material is used in compost and in a landfill cell with effluent collection and treatment systems. The landfill ultimately receives solid waste classified as non-recyclable and non-hazardous and includes dehydrated sludge from the sewage treatment plants. Waste is covered with soil daily.

18.6 Project Permitting

18.6.1 Legal framework

In Brazil, Mineral Resources are the property of the Federal Government. The Mineral Resource rights are separated from surface property ownership. Exploration and mining activities can be executed by private entities, through an authorization or a concession granted by the Federal Government, thereby offering to the concessionaire the guarantee of ownership of the mining product.

The Mining Code (Decree No. 227, dated February 28, 1967 - Mining Code (modified by Law 7.805 dated 18 July 1989 and recently modified by Law 14.066 dated 30 September 2020) and its regulation (Decree No. 9.406 dated June 12, 2018) provide for the rights related to Mineral Resources, the legal regimes for their exploration and development, and establish the norms on government inspection of the mineral industry. Furthermore, the Mining Code and its regulations establish, among other things, the classification of mines, exploration, mining, surface owner rights, sanctions, and cancellation.

Resolution No. 237 of the Conselho Nacional de Meio Ambiente (CONAMA, the National Environmental Council), dated December 19, 1997, provides that any mineral activity shall be subject to:

- An environmental licensing process.
- An environmental impact assessment.
- Restoration of degraded areas.

Companies which conduct activities considered as potentially polluting or utilizing natural resources, such as mining, must be registered with the Federal Environmental Agency called Agência Ambiental Federal (IBAMA), as per IBAMA Normative Instruction No. 6 dated March 15, 2013. Companies must hold the applicable Technical Registers and pay the environmental fees (TCFA – Taxa de Controle e Fiscalização Ambiental) on a quarterly basis. Annual reports must be submitted to the federal agency by March every year.

Environmental permitting is required for the following project phases:

- A Preliminary Permit (LP – Licença Prévia) must be obtained prior to the planning stage. An Environmental Impact Assessment (EIA – Estudo de Impacto Ambiental) must be conducted, and the respective Environmental Impact Report (Relatório de Impacto Ambiental - RIMA) must also be completed. The EIA/RIMA must be submitted for approval by the competent environmental agency, together with a plan for recovery of degraded areas.
- At the development stage, the Installation Permit (LI – Licença de Instalação) must be obtained to allow the installation of all buildings, equipment, machines, etc.
- At the mining stage, another permit must be obtained, the Operating Permit (LO – Licença de Operação), which must be issued authorizing the mining operations. Permit renewals must be applied 120 days prior to the permit expiration and any modifications or expansions must be preceded by permitting, as legally required.

18.6.2 Juruti approvals

SLR and Brazilian consultancy Antithesis reviewed the Juruti approvals and gained an understanding of the Juruti areas of operations and activities by reviewing the 2021 Annual Environmental Report. The table below lists the approvals currently held by Juruti. One permit listed was not provided for review, namely the Vegetation Suppression (clearing or removal) Authorization No. 4332/2020 (item 22 in the table below).

Table 17-1: Environmental Approvals

Item #	Permit	Validity	Regulation	Description
1	Authorization # 4726/2021	February 25, 2022	Law 5457/1988, Law 5752, 1993, 7.026/2007 and 5.887/1995	Suppressing (clearing or removal) vegetation in an area of 5,669.77 ha at Juruti Bauxite Mine.
2	Operating Permit # 1658/2008	October 10, 2012 (renewal lodged)	State Laws 5752/1993, 7026/2007 and 5887/1995	Water and wastewater treatment at the beneficiation area
3	Operating Permit # 3262/2010	February 07, 2014 (renewal lodged)	State Laws 5752/1993, 7026/2007 and 5887/1995	Class II Industrial Landfill and a screening and compost plant operated by Omnia Minérios Ltda.
4	Operating Permit # 7405/2015	August 27, 2018 (renewal lodged)	State Laws 5752/1993, 7026/2007 and 5887/1995	Mineral research (exploration) referring to DNPM process # 808.953/1975, 751.777/1996 and 850.580/2003.
5	Operating Permit # 8105/2013	December 19, 2016 (renewal lodged)	State Laws 5752/1993, 7026/2007 and 5887/1995	Water Treatment Plant to treat water abstracted from two groundwater wells (240m³/day) at the Port.
6	Operating Permit # 12148/2020	March 31, 2024	State Laws 5752/1993, 7026/2007 and 5887/1995	Wildlife Recovery Center at Juruti Bauxite Mine.
7	Operating Permit # 11122/2018	April 26, 2019 (renewal lodged)	State Laws 5752/1993, 7026/2007 and 5887/1995	Disposal Pond No. 3 (LD 3) after the first increase in capacity (2,710,000 m³ capacity).
8	Operating Permit # 10606/2017	March 28, 2019 (renewal lodged)	State Laws 5752/1993, 7026/2007 and 5887/1995	Disposal Pond No. 4 (LD 4) (2,360,639.37 m³ capacity).
9	Operating Permit # 11658/2019	May 01, 2022	State Laws 5752/1993, 7026/2007 and 5887/1995	Disposal Pond No. 5 (LD 5) (3,504,352.00 m³ capacity)
10	Operating Permit # 8629/2014	May 15, 2016 (renewal lodged)	State Laws 5752/1993, 7026/2007 and 5887/1995	Disposal Pond Nos. 1, 2 and 3 (LD 1, LD 2 and LD 3) + Thickening Pond (total operational volume of 12.15 million m³)
11	Operating Permit # 3113/2009	September 17, 2013 (renewal lodged)	State Laws 5752/1993, 7026/2007 and 5887/1995	Mineral Research (exploration) referring to DNPM process # 808.954/1975, 850.010/1991 and 850.011/1991

Item #	Permit	Validity	Regulation	Description
12	Operating Permit n. 9638/2015	January 28, 2018 (renewal lodged)	State Laws 5752/1993, 7026/2007 and 5887/1995	Bauxite Extraction (9.2 Mtpa of bauxite ore) and disposal of constructio debris (*lavra 04*)
13	Operating Permit n. 9636/2015	December 01, 2017 (renewal lodged)	State Laws 5752/1993, 7026/2007 and 5887/1995	Bauxite Beneficiation (5.0 Mtpa of bauxite – washed dry base and 2.5 Mtpa of bauxite – crushed dry base)
14	Operating Permit n. 9273/2015	May 26, 2018 (renewal lodged)	State Laws 5752/1993, 7026/2007 and 5887/1995	Port operations at the Juruti Bauxite Mine, including equipment require for the operations.
15	Operating Permit n. 8995/2015	January 27, 2018 (renewal lodged)	State Laws 5752/1993, 7026/2007 and 5887/1995	Railway operations (55 km expansion).
16	Operating Permit n. 12858/2021	June 25, 2023	State Laws 5752/1993, 7026/2007 and 5887/1995	Disposal Pond 6 – LD 6 with a capacity of 3,001,330 m³
17	Operating Permit n. 12986/2021	August 30, 2022	State Laws 5752/1993, 7026/2007 and 5887/1995	Disposal Pond 7 – LD 7 with a capacity of 4,648,164 m³
18	Operating Permit n. 12444/2020	October 14, 2025	State Laws 5752/1993, 7026/2007 and 5887/1995	Wastewater Treatment Plant located at Juruti Bauxite Mine
19	Operating Permit n. 12437/2020	October 14, 2025	State Laws 5752/1993, 7026/2007 and 5887/1995	Fuel Station at the beneficiation area, including two aboveground storage tanks with 15 m³ each.
20	Operating Permit n. 12440/2020	October 14, 2025	State Laws 5752/1993, 7026/2007 and 5887/1995	Fuel Station at the Juruti Bauxite Mine, including two aboveground storage tanks with 15m ³ each.
21	Vegetation Suppression Authorization n. 3826/2018	**November 21, 2021**	State Laws 5752/1993, 7026/2007 and 5887/1995	Supressing (removal of) vegetation for mineral exploration activities (125.20 ha)
22	Vegetation Suppression Authorization n. 4332/2020	February 26, 2022	State Laws 5752/1993, 7026/2007 and 5887/1995	Supressing (removal of) vegetation for mineral operations, exploratior and geotechnical drilling for CAPEX project (bridge).

Item #	Permit	Validity	Regulation	Description
23	Fauna Authorization n. 4471/2020	August 25, 2021 (Replaced by Authorization 4825/2021)	State Laws 5752/1993, 7026/2007 and 5887/1995	Fauna activities at the Juruti Bauxite Mine.
24	Fauna Authorization n. 4578/2020	November 27, 2021 (Replaced by Authorization 4873/2021 which expires November 30, 2022)	State Laws 5752/1993, 7026/2007 and 5887/1995	Fauna activities at the Juruti Bauxite Mine.
25	Fauna Authorization n. 4825/2021	October 01, 2022	State Laws 5752/1993, 7026/2007 and 5887/1995	Fauna activities at the Juruti Bauxite Mine.

Juruti also has an Exemption Certificate issued by the Federal Water Agency (ANA) on February 18, 2021, exempting Alcoa from requiring a discharge permit as the discharge was considered as "not having a significant impact". The certificate specifically allows the discharge of a maximum of 1.44 kg/day of organic matter into the Amazonas River within the Juruti municipal area.

The following conclusions are made regarding the Juruti approvals:

- 24 approvals were provided for review and 14 were noted to have reached the expiry dates on the permits.
- Alcoa indicated that renewal applications were lodged within the legal timeframe for renewals (120 days prior to expiration) for approvals 2 – 5, 7, 8, 10 and 12 – 15. These permit renewals are long overdue. Alcoa has indicated that the company does engage with the regulators regularly on these overdue renewals and includes a list of these in the annual report submitted to the regulators, however the lack of capacity at the regulator is a significant issue in the State of Pará.
- Alcoa has confirmed that replacement permits were not required for the vegetation suppression permits once vegetation removal was completed (items 21 and 22). These permits cannot be renewed but must be applied for each year they are required.
- Items 9, 17 and 25 have expiry dates in 2022 and therefore renewals must be lodged 120 days prior to expiry.
- Alcoa has indicated that all the required permits are in place. It is noted that the two thermo-electric plants (one at the beneficiation plant and the other at the port) are operated and licensed by Petrobras, a separate company. Alcoa has additionally indicated that no specific licence is required for the seedling nursey at the port.

18.6.3 Compliance

Alcoa submits an Annual Environmental Report in compliance with the Juruti operating licenses and approvals. This report includes detailed descriptions of activities undertaken for the year and environmental and social monitoring. No significant compliance issues were identified in the 2019/2020 and 2020/2021 Annual Environmental Reports.

Alcoa conducted an environmental assessment on the impacts of two environmental incidents that occurred in December 2020 and March 2021. These incidents occurred during heavy rainfall over 24 hours which led to siltation of downstream watercourses. The assessment was comprehensive and addressed ecology, water, and social impacts. Alcoa has therefore demonstrated that the mine reports and addresses non-compliance issues and incidents.

18.7 Social or Community Requirements

18.7.1 Stakeholders

Alcoa has defined its area of influence, and this includes the municipality of Juruti and communities surrounding the Grande River. The nearest major urban center is Santarém which lies some 200 km away from the mine by boat. Alcoa has not provided information on stakeholders identified other than Alcoa technical teams. The external audit report compiled in 2019 indicates that there are no influences of the project operations on indigenous areas.

18.7.2 Indigenous Communities

The external audit report compiled in 2019 indicates that there are no influences of the Project operations on Indigenous areas. Alcoa has confirmed that are no Indigenous Communities or escaped slave (Quilombola) communities directly affected by the Juruti Mine. However, there are agro-extractive traditional communities that are affected and are included in the list of groups covered by the concept of “Indigenous people” in terms of the Indigenous and Tribal Peoples Convention (ILO Convention) 169 of 1989, to which Brazil is a signatory. Alcoa therefore consulted with and established agreements with the traditional communities in Juruti Velho. These communities are represented by the Association of Communities of the Juruti Velho Region (Acorjuve) and this representation includes landownership rights. Juruti Velho has a population of approximately 9,900 people (21% of the overall population of the municipality of Juruti) and includes 56 settlements located near the mining operations (Alcoa, 2020).

In February 2018, Acorjuve, the National Institute of Colonization and Agrarian Reform (INCRA), federal and state regulators and Alcoa signed a social, environmental, and economic agreement on common land use, shared value and sustainable mining in the Amazon region. This followed a comprehensive study to evaluate compensation for loss and damages that was completed in late 2014. Alcoa agreed to pay US$ 5.3 M in compensation for the 2006 to 2010 period. The parties agreed that this amount and the royalties paid to Acorjuve would be managed by a foundation to ensure transparency and good governance in accordance with recommendations issued in February 2015 by federal and state regulators. Alcoa indicated that INCRA also granted land titles to the communities through the agreement process.

Alcoa states in its 2020 Sustainability report that in the third quarter of 2019, the representatives of Acorjuve decided not to follow the agreed-upon path to transition proceeds to the foundation. In 2020, Alcoa again approached the association to return to the negotiation table and work toward the execution

of the agreement signed in 2018, but the association declined. Along with the other participants in the negotiations, Alcoa states that it continues to urge the association to engage in dialogue with the expectation of completing the foundation's by-laws as soon as possible.

According to the 2020 Sustainability Report, from mine start-up in October 2009 through December 2019, Alcoa paid US$ 25.1 M in royalties to Acorjuve (Alcoa, 2020). Alcoa provided SLR with an updated figure of US$ 27.2 M paid in royalties until December 2021.

18.7.3 Land use agreements

The external audit report compiled in 2019 indicates that Alcoa has mining concessions and agreements with surface owners for implementation of activities. Alcoa works with the consent of the surface owners and there is no current need to purchase third-party land. In February 2018 Alcoa entered into an agreement on shared land use as described in the section above.

18.7.4 Resettlement

Port development necessitated the relocation of 32 families. Alcoa reports on monitoring of three families who remain vulnerable in the 2019/2020 and 2020/2021 Annual Environmental Reports. This monitoring is required by the operating license. Each family's employment and income are monitored. Alcoa makes some effort to obtain employment for some family members in contracted companies.

18.7.5 Social or community relations

SLR conducted an internet search and found an account of land protests launched by the traditional riverine settlers represented by Acorjuve against Alcoa in 2009. Approximately 1,500 people blockaded the road linking the town of Juruti to the mine on 28 January 2009. The government was reported to grant full collective land rights, and Alcoa agreed to pay rent for occupying community land, compensate for losses and damages, and give locals an annual share in the mine profits. Alcoa has shared information on the compensation programs implemented with SLR and this is discussed at the end of this section.

The 2021 Annual Environmental Report describes how Alcoa disseminates information to communities using advertising, social media platforms and radio. Information on COVID-19 has been disseminated in this way. Alcoa also conducts environmental education campaigns in local communities. SLR understands that communities can raise grievances via a formalised complaint system. It is noted that Acorjuve remains active in the area and submitted a letter in September 2019 in which the community objected to the social programs and dissemination of information from Alcoa, stating that the company used photos of their communities and children without authorization in the information Alcoa disseminated. In this letter Acorjuve requested a meeting with Alcoa representatives to address these issues. Alcoa reportedly came to an agreement with the parties and environmental monitoring and dissemination of information resumed in April 2021.

18.7.6 COVID-19 pandemic response

Alcoa conducted internal campaigns on COVID-19 aimed at educating its employees on the illness and prevention measures. Alcoa reported that it mobilized to transport oxygen cylinders between Juruti and Belém to support the treatment of patients.

18.7.7 Local hiring

The EIA identified the needs for strengthening education levels in the municipal area and promoting employability of professionals in the region. Alcoa therefore developed and implements a labor training program in partnership with the National Industrial Apprenticeship Service of Pará (SENAI). The 2021 Environmental Report includes information on training completed and planned. Examples of these courses include functional English, administrative assistant, technician courses in mining mechanics and electronics, as well as a technical qualification in chemistry. All professionals who complete the courses are evaluated by SENAI and Alcoa with the aim of including them in Alcoa's and SENAI's talent pool. As of August 2021, 10,089 students were trained by the partnership, in more than 100 different courses, distributed in 606 classes, in a total 113,652 hours/class. Among the students from Juruti, 36% are women and 64% men.

Regarding employment of local people, the 2021 Annual Environmental Report provides information on the workforce and how employment of local skilled and unskilled labor is being achieved. There were 464 jobs at the mine with 33% of these being held by people in the municipal area, and 39% held by people within the State of Pará. The report indicates that there were 1,961 indirect jobs with 52% being held by people in the municipal area, and 31% held by people within the State of Pará. These percentages have increased slightly from those reported in the 2020 Annual Environmental Report. Alcoa therefore reports that the labor training program is resulting in more local hiring.

18.7.8 Local Procurement

Alcoa has a draft Local Procurement Policy aimed at adding value to Indigenous and land-connected people and the local economy. Alcoa implements a program to promote the participation of local and regional suppliers in economic activities resulting from the mining activities. Some detail is provided in the 2021 Annual Environmental Report. Alcoa reported that it invested approximately US$ 213 M in local and regional services in that year. Alcoa provided a list of activities to be initiated in 2022 to support local supplier capacity building and partnering with local businesses.

18.7.9 Socio-economic programs

In response to an information request from SLR, Alcoa has indicated that it implements a "Positive Agenda" which corresponds to a series of complementary actions that have been developed jointly with the Juruti town administration and the local community to improve the quality of life of the local population by supporting and encouraging the carrying out of rural and urban infrastructure building works and other actions for strengthening health, education, culture, the environment, public security and justice and social assistance. This is referred to as a Collective Compensation Matrix. Participants in the implementation and monitoring of these programs include APRAS (Association of Rural Producers of the Socó I settlement), INCRA, workers union, Juruti Municipality and Alcoa. Completed actions include training of the community for agriculture, forest and timber management, infrastructure maintenance, monitoring of surface water, recover of degraded areas, construction and equipping of a hospital in Juruti, expansion of St. Peters school and construction of a new school in Café Torrado, construction of roads, construction of a community center in St. Peters amongst others. Alcoa indicated that 50 initiatives were concluded and four are still in progress. The 50 initiatives are listed in the 2020 closure plan. The four in progress include the labor training and local supplier initiatives discussed above, and these three programs:

- Support for family farming: This program is aimed at encouraging and supporting family farming in the region, promoting agricultural diversification, and keeping the families in the countryside by using rational and environmentally sustainable practices.
- Non-Timber Forest Management Program: This program aims to conserve natural resources and the generation of income for rural communities, this program encourages the sustainable exploitation of forest resources. Nurseries are used to source vegetation for the rehabilitation of mined-out areas.
- Heritage education: this program was developed by Scientia Consultoria Científica (a scientific consultancy) in a partnership with Alcoa and conducts heritage education activities in Juruti. The activities were carried out jointly with the Municipal Departments of Education with the active participation of teachers, students, and communities.

18.8 Mine Closure Requirements

All mines must have a Mining Closure Plan, known as a Plano de Fechamento de Mina (PFM), which is required by the National Mineral Agency (ANM) Resolution #68/2021. This plan must include all procedures to be followed for the decommissioning of the mine operations after the end of beneficiation and extraction activities, including the removal of all structures and recovery and preparation of the area for further use. This plan must also include the financial aspects related to the mine rehabilitation and closure. According to ANM Resolution, this plan must include maps and photographs of the area, pictures presenting the current situation of the area, description of the historical activities, existing structures, decommissioning project, planned monitoring activities, rehabilitation actions done and planned, financial schedule including pre-closure, closure and post-closure, general characterization of the area, risks evaluation, plans for structures removal and stabilization, measures to avoid unauthorized access and guidelines for the future use of the area.

Alcoa has compiled a 2020/2025 updated closure plan which addresses closure and post-closure. This plan also discusses the management measures being implemented during operations to manage impacts with a view towards closure. Closure objectives are not clearly stated in the plan. In general, most structures will be removed, and the areas rehabilitated. Waste will be disposed of responsibly. Key infrastructure will be dealt with as follows:

- Open cast mine: The mining area is progressively rehabilitated during strip mining and rehabilitation of mined-out areas during operations. Post-closure monitoring will be implemented but has not yet been defined.
- Mineral processing plant: The plant will be disassembled, and structures and equipment will be removed, concrete and masonry structures will be demolished. The area will be rehabilitated and revegetated with native plant species. Post-closure monitoring will be implemented but has not yet been defined.
- Class II industrial landfill: The landfill will be sealed to prevent water ingress and the pollution control dam will be drained and the area rehabilitated and revegetated with native plant species. Post-closure monitoring will be implemented but has not yet been defined.
- Effluent treatment plant: Concrete structures will be demolished, and ponds will be drained. The area will be rehabilitated and revegetated with native plant species. Post-closure monitoring will be implemented but has not yet been defined.

The closure plan does not describe how the tailings storage facilities or the waste rock dump will be decommissioned and closed. The tailings closure is however described in Section 15.1.3 of this report.

The closure plan lists potential socio-economic impacts from closure and indicates that a management plan will be developed to manage these impacts.

Post-closure monitoring will include surface and groundwater, soil and fauna and flora in rehabilitated areas. The specific monitoring plans will be developed in the future.

The closure plan concludes that Alcoa aims to close the Juruti Bauxite Mine and supporting infrastructure in accordance with best practices and respond adequately to the demands of environmental protection and social responsibility, meeting legal obligations and contributing to the sustainability of the Juruti municipality and surroundings. Alcoa participates in and contributes to funding of sustainability project of the Sustainable Juruti Institute (IJUS), a civil society organization of public interest.

The 2020 closure plan does not include a rehabilitation and closure cost. Alcoa has however provided a separate cost in excel format. A mine closure plan has been prepared by Alcoa and total LOM costs are estimated to be $62.0 million.

The closure plan will be revised every five years or when changes are made to the mining activities or legal requirements to warrant an update sooner.

19.0 CAPITAL AND OPERATING COSTS

19.1 Capital Costs

The operation is well-established and since the LOM plan does not envisage any significant change of the mining and production rate, capital expenditures anticipated by Alcoa are related to sustaining the current operations.

An estimated $183.5 million is required for the construction of new tailings storage facilities, of which one new facility is needed every two years of future mine life. Other sustaining capital over the remaining LOM is estimated to be $135.4 million. Allowances are included for the construction of new haul roads and the costs of establishing future mining operations on the Capiranga Central Plateau.

The operational costs for opening up new box cuts to sustain production amount to $114.6 million.

Alcoa's sustaining and capital estimates for Juruti are derived from annual budgets and historical actuals over the long life of the current operation. According to the American Association of Cost Engineers (AACE) International, these estimates would be classified as Class 1 with an accuracy range of -3% to -10% to +3% to +15%.

The mining area is progressively rehabilitated during mining with on-going rehabilitation of mined-out areas. A mine closure plan has been prepared by Alcoa and total LOM costs are estimated to be $62.0million.

19.2 Operating Costs

Mine production is carried out by contractors. Company personnel carry out the geology, planning and grade control activities. Administrative and technical support personnel work on a five by two, 8-hour shift roster while mine production staff work 12-hour shifts.

Operating expenditures include labour, fuel, energy, contracted services, mining contracts, maintenance, processing, transportation and offsite services.

Table 18-1: LOM Operating Costs

Cost Centre	2022 ($/t product)	LOM Average ($/t product)
Mining	5.56	5.91
Processing	1.78	2.11
General & Administration	2.97	3.54
Concentrate Rail Freight Cost	0.61	0.75
Transportation Cost	2.17	2.59
Total Cost	**13.09**	**14.90**

The workforce of Juruti consists of company personnel and contractors. The Alcoa personnel and main contractor lists for mining operations are presented elsewhere in Table 13-4 and Table 13-5, respectively. The number of Juruti employees required for mining operations is not expected to change significantly for the foreseeable future.

20.0 ECONOMIC ANALYSIS

20.1 Economic Criteria

Alcoa prepares a rolling annualised LOM plan for the Juruti operations, which is updated annually. The current LOM plan for 2022 to 2035 is shown in Table 13-1: Mining Equipment

Table 13-2.

An un-escalated technical-economic model was prepared on an after-tax discounted cash flow (DCF) basis, the results of which are presented in this subsection.

Annual estimates of mine production with associated cash flows are provided for years 2022 to 2033, based on Proven and Probable Reserves only. The presented economic analysis is based on 100% attributable Mineral Reserves (Alcoa Corporation owns 60%),

The assumptions used in the analysis are current at the end of December 2021.

Alcoa uses a 9% discount rate for DCF analysis. SLR is of the opinion that a 9% discount/hurdle rate for after-tax cash flow discounting for the well-established, large-scale bauxite operations at Juruti is reasonable and appropriate.

Key criteria used in the analysis are discussed elsewhere throughout this TRS. General assumptions used are summarized in Table 19-1.

Table 19-1: LOM Technical-Economic Assumptions

Description	Value
Start Date	January 1, 2022
Mine Life based on Mineral Reserves	11 years
Average LOM Price Assumption	$31.66/t
Average LOM Operating Costs per tonne sold	$14.90/t
Sustaining Capital	$330.1 million
Production Box Cuts	$114.6 million
Mine Closure/Reclamation Costs	$62.0 million
Discount Rate	9%
Discounting Basis	Beginning of Period
Inflation	0%
Royalty + CFEM	4.5%

Table 19-2 provides a summary of the mine physicals over the 11-year mine life.

Table 19-2: LOM Production Summary

Description	Units	Value
Mine Life	Years	11
Total Mined	Mt	113.3
Waste Mined	Mm^3	472.1
Average Strip Ratio	m^3/t	3.61
Average LOM Annual Mining Rate	Mtpa	9.4
Average LOM Annual Product Tonnage	Mtpa	7.4
LOM washed Product	Mt	72.4
LOM Unwashed (DSO) Product	Mt	16.0
Total Product (washed +unwashed) sold	Mt	88.5
Average Product Available Al_2O_3 Grade	%	47.12
Average Product Reactive SiO_2 Grade	%	3.45

20.2 Cash Flow Analysis

The indicative economic analysis results, presented in Table 19-3, indicates an after-tax free cash flow of $343.2 million and an after-tax Net Present Value (NPV), using a 9% discount rate of $224.0 million at an average selling price of $31.66/tonne.

Capital expenditure identified in the economics is for the continuation of the operations over the mine life and covers construction costs for new tailings storage facilities (TSF), capitalised costs for excavation of future box cuts, haul roads and the set up and start of mining operations on the Capiranga Central plateau.

Project economic results and estimated cash costs are summarized in Table 19-3. Annual estimates of mine production with associated cash flows are provided for years 2022 to 2033, the current LOM based on Proven and Probable Reserves only.

The economic analysis was performed using the estimates presented in this TRS and confirms that the outcome is a positive cash flow that supports the statement of Mineral Reserves.

20.3 Sensitivity Analysis

Project risks can be identified in both economic and non-economic terms. Key economic risks were examined by running cash flow sensitivities. The operation is nominally most sensitive to market prices (revenues) followed by operating cost.

Table 19-3: Life of Mine Indicative Economic Results

Economic Model Annual Summary

SLR

Company: 0
Project Name: Alcoa Juruti
Scenario Name: Base Case
Analysis Type: 0

Project Timeline in Years				0	1	2	3	4	5	6	7	8	9	10	11
Commercial Production Timeline in Years				2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Time Until Closure in Years		US$ & US Units	LoM Avg / Total	12	11	10	9	8	7	6	5	4	3	2	1
Market Prices															
AKSI		US$/tonne	831.66	27.55	28.89	29.82	30.11	32.27	32.54	33.40	33.98	32.68	33.01	33.67	34.34
Physicals															
Total Ore Mined		kt	119,247	9,259	9,248	9,274	9,128	9,243	9,292	9,410	9,388	9,732	9,724	9,868	9,650
Payable Bauxite		tonne	58,496	7,522	7,545	7,568	7,568	7,615	7,635	7,655	7,679	7,702	7,501	7,490	4,960
Cash Flow															
Gross Revenue	1	$000s	2,800,687	207,242	215,953	225,691	228,433	245,634	246,934	255,665	257,704	247,088	247,570	252,464	170,309
Bauxite Gross Revenue		$000s	2,800,687	207,242	215,953	225,691	228,433	245,634	246,934	255,665	257,704	247,088	247,570	252,464	170,309
Gross Revenue		$000s	2,800,687	207,242	215,953	225,691	228,433	245,634	246,934	255,665	257,704	247,088	247,570	252,464	170,309
Mining Cost		$000s	(853,188)	(64,140)	(71,850)	(72,194)	(68,667)	(70,609)	(69,030)	(68,251)	(67,307)	(73,477)	(77,282)	(75,324)	(76,908)
Process Cost		$000s	(190,436)	(13,369)	(19,400)	(15,046)	(19,723)	(16,821)	(16,018)	(16,172)	(16,203)	(15,915)	(16,219)	(16,064)	(16,020)
Maintenance Cost		$000s	-	-	-	-	-	-	-	-	-	-	-	-	-
G&A Cost		$000s	(346,517)	(16,139)	(28,831)	(28,864)	(31,735)	(30,269)	(32,543)	(31,453)	(31,581)	(20,465)	(27,858)	(20,403)	(28,456)
Concentrate Rail Freight Cost		$000s	(88,057)	(4,508)	(5,536)	(5,560)	(5,641)	(5,889)	(5,747)	(5,801)	(5,848)	(5,901)	(5,900)	(5,900)	(5,934)
Transportation Cost		$000s	(238,350)	(16,327)	(18,950)	(19,128)	(19,304)	(19,483)	(19,688)	(19,848)	(20,025)	(20,209)	(20,209)	(20,208)	(20,210)
Royalty - CFEU		$000s	(126,031)	(9,329)	(9,718)	(10,159)	(10,275)	(11,054)	(11,112)	(11,505)	(11,597)	(11,119)	(11,141)	(11,361)	(7,664)
Subtotal Cash Costs Before By-Product Credits		$000s	(1,817,788)	(125,925)	(148,149)	(151,508)	(151,690)	(152,843)	(152,017)	(153,067)	(152,641)	(155,717)	(158,909)	(158,709)	(155,693)
By-Product Credits		$000s	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Cash Costs		$000s	(1,817,788)	(125,925)	(148,149)	(151,508)	(151,690)	(152,843)	(152,017)	(153,067)	(152,641)	(155,717)	(158,909)	(158,709)	(155,693)
Operating Margin	35%	$000s	982,900	81,317	67,804	74,183	76,743	92,791	94,917	102,598	105,063	90,371	88,661	93,754	14,617
EBITDA		$000s	982,900	81,317	67,804	74,183	76,743	92,791	94,917	102,598	105,063	90,371	88,661	93,754	14,617
Depreciation/Amortization Allowance		$000s	(502,748)	(36,697)	(42,018)	(42,562)	(42,493)	(42,192)	(41,611)	(41,637)	(41,743)	(42,772)	(41,641)	(42,023)	(42,120)
Depletion Allowance		$000s	-	-	-	-	-	-	-	-	-	-	-	-	-
Earnings Before Taxes		$000s	480,151	41,620	25,787	31,621	34,250	50,599	53,306	60,961	63,319	47,600	46,720	51,731	(27,503)
Payable Taxes		$000s	(132,895)	(7,253)	(4,513)	(5,544)	(6,001)	(8,856)	(10,124)	(20,727)	(21,529)	(16,184)	(15,885)	(17,582)	9,241
Net Income		$000s	347,256	34,336	21,274	26,137	28,249	41,744	35,182	40,234	41,791	31,416	30,835	34,149	(18,262)
Non-Cash Add Back - Depreciation		$000s	502,748	36,697	42,018	42,562	42,493	42,192	41,611	41,637	41,743	42,772	41,641	42,023	42,120
Operating Cash Flow		$000s	850,004	71,033	63,292	68,699	70,743	83,937	76,793	81,871	83,534	74,188	72,476	76,172	23,858
Sustaining Capital		$000s	(330,127)	(47,002)	(30,057)	(25,413)	(22,484)	(19,503)	(25,225)	(26,047)	(35,330)	(14,635)	(26,737)	(26,737)	(26,737)
Closure/Reclamation Costs		$000s	(176,668)	(15,330)	(17,747)	(13,122)	(13,314)	(13,986)	(14,886)	(11,568)	(15,176)	(14,182)	(15,573)	(15,617)	(16,437)
Total Capital		$000s	(506,795)	(62,332)	(47,804)	(38,535)	(35,797)	(33,201)	(40,120)	(37,616)	(50,506)	(33,027)	(42,310)	(42,354)	(43,174)
LoM Metrics															
Economic Metrics															
Discount Factors (DCF) @		8%		1.0000	0.9074	0.8417	0.7722	0.7084	0.6499	0.5963	0.5470	0.5019	0.4604	0.4224	0.3875
b) After-Tax															
Proc Cash Flow		$000s	343,208	11,681	19,488	30,105	34,980	50,735	36,673	44,255	33,028	41,161	30,466	33,818	(19,180)
Cumulative Proc Cash Flow		$000s		11,681	27,169	57,274	92,255	142,994	179,667	223,922	256,951	298,111	328,577	362,394	343,208
NPV @ 8%		$000s	224,010	11,681	14,209	25,338	27,012	35,942	23,830	26,388	18,068	23,607	14,027	14,285	(7,436)
Cumulative NPV		$000s		11,681	25,890	51,229	78,244	114,186	138,021	164,409	182,478	206,133	217,161	231,445	224,010

21.0 ADJACENT PROPERTIES

There are no mineral properties immediately adjacent to those licenses / permits which comprise the Juruti Bauxite Mine, and as such the SLR QPs have not reported any other relevant information in this Technical Report Summary.

22.0 OTHER RELEVANT DATA AND INFORMATION

No additional information or explanation is necessary to make this Technical Report Summary understandable and not misleading.

23.0 INTERPRETATION AND CONCLUSIONS

23.1 Geology and Mineral Resources

- As of December 31, 2021, exclusive of Mineral Reserves, Measured Mineral Resources are estimated to total 5.66 Mt at 44.53% available alumina ($A.Al_2O_3$) and 5.28% of reactive silica ($R.SiO_2$) for washed and unwashed material, and Indicated Mineral Resources are estimated to total 58.59 Mt at 45.34% $A.Al_2O_3$and 4.42% $R.SiO_2$ for washed and unwashed material. In addition, Inferred Mineral Resources are estimated to total 563.79 Mt at 45.69% $A.Al_2O_3$and 4.72% $R.SiO_2$. Mineral Resources are reported on a 100% Alcoa attributable ownership basis for consolidated reporting purposes.
- Juruti is a lateritic bauxite deposit formed through a combination of intense weathering and geochemical alteration, leaching by meteoric waters, and accumulation of alumina and iron-rich horizons. Periodic erosion and redeposition is also known to have occurred.
- The lateritic deposits have originated from the Alter-do-Chao Formation; Cretaceous fluvial-lacustrine deposits of sandstone, siltstones, mudstones, and quartz breccia. Weathering and alteration of these parent rocks is estimated to have taken place during the Eocene.
- Bauxitization has occurred through the formation of gibbsite crystals which form massive bauxite horizons which exist as plateaus across the Juruti region. In comparison to their lateral extent over tens of kilometers, the overall thickness of the bauxite deposits are relatively thin being only several metres thick.
- Geological interpretation of the Juruti deposit has been possible through extensive exploration drilling, detailed geological logging, sampling, and the results of chemical analysis.
- Mutum, Santarém, São Francisco and Nhamundá are plateaus drilled by auger, and to a less extent wells which support the estimation of Mineral Resources. SLR has reviewed this information and it is reasonable, but there is not a complete statistical study comparing these methodologies with more accurate drilling procedures (AC). The R.SiO2 bias identified in a preliminary comparison approach, is a known risk which can impact the Mineral Resources definition of these plateaus.
- Protocols for drilling, sampling preparation and analysis, verification, and security meet industry standard practices and are appropriate for the purposes of Mineral Resource estimation.
- Juruti technical staff do not use the short-term drilling information for the long term models due to different QA/QC and sampling methodologies used. Therefore the long term models do not have any detailed information that can confirm the continuity of the bauxite layer or change the KEV grades.
- In the SLR QPs' opinion, the QA/QC program as designed and implemented at Juruti is being improved continuously, and the assay results within the database are suitable for use in a Mineral Resource estimate.
- The drill hole database used for geological modelling has been reviewed by the SLR QP and is deemed suitable for Mineral Resource estimation.
- For the Mineral Resources classification IK and conditional simulations are used to quantify the uncertainty related with geological modelling and grade estimation.
- The final Mineral Resource estimate is obtained through a benefit calculation that considers a future bauxite price, exchange rate, the three key economic variable grades, 100% of the metal recovery, and maximum mining selectivity, without consideration of a minimum thickness.

- The SLR QP reviewed the Mineral Resources assumptions, geological modelling and estimation workflows, data consistency and reporting procedures, and is of the opinion that the Mineral Resource estimate is appropriate for the style of the mineralization, and that the block model is reasonable and acceptable to support the December 31, 2021 Mineral Resource estimate.

23.2 Mining and Mineral Reserves

- As of December 31, 2021, Proved Reserves are estimated to total 50.94 dry Mt at 47.68% available alumina ($A.Al_2O_3$) and 3.52% of reactive silica ($R.SiO_2$) for washed and unwashed material and Probable Reserves are estimated to total 37.94 dry Mt at 46.32% $A.Al_2O_3$and 3.41% $R.SiO_2$ for washed and unwashed material.
- A cut-off value is determined using the Mineral Reserve bauxite price, recovery, transport, treatment and mine operating costs. The bauxite price used for the Mineral Reserves is based on contract established with Alumar Refinery (Alcoa), as 90% of the production is shipped to this refinery, annually updated, upon which are considered clients characteristic, offer and demand for internal consumption and exported bauxite, bonus, and penalties according to the quality of the product.

The Juruti Mine operations are based on the use of conventional strip mining. Each plateau is divided into panels and regular strips of 20 m width x 200 m long within which a number of sequential mining activities including land clearance, topsoil removal, overburden stripping and waste backfill, and bauxite mining take place. The life of mine (LOM) plan is shown in Table 13-1: Mining Equipment

- Table 13-2.
- The production from 2022 through 2035 will include approximately 127.6 wet Mt of ROM, 100.9 wet Mt of bauxite with average grades of 47.10% Al_2O_3, 3.48% $R.SiO_2$ and 16.47% Fe. Strip ratio for the LOM is 4.2 (m^3/t).
- Dilution and extraction factors follow the historical trend and are considered appropriate for the type of mining methods employed at Juruti.
- The level of dilution will likely increase if the methodology is changed to the use of survey pickups also for the floor and by creation of solids by lithology as the current process. This does not represent a significant risk to the Mineral Reserve estimate, as the dilution should just be adjusted to more accurate values. The level of extraction will likely decrease under similar circumstances as more care will be required to avoid excess dilution in the ore.

23.3 Mineral Processing

- The Juruti Bauxite Mine's processing plant has been in operation since 2009 and uses a simple comminution (crushing), washing, and wet screening circuit to produce washed bauxite for shipping, in addition to an unwashed bauxite product (direct shipping ore). The plant flowsheet is designed for the removal of silt and clay (fine particles) using a scrubber and hydrocyclone which are subsequently deposited into tailings storage facilities.

- The production capacity of the process plant is 6.2 Mtpa of washed and 1.3 Mtpa of unwashed bauxite. The current global mass recovery of the plant is approximately 75% and the final product specification has 47.5 ± 1% of available alumina content ($A.Al_2O_3$) and 4.1 ± 0.5% of reactive silica ($R.SiO_2$) content.
- The SLR QP is of the opinion that the process flowsheet is straightforward as it comprises only comminution and washing and that it is appropriately aligned to the ore feed material.
- The SLR QP is also of the opinion that the samples previously used for comminution test work were representative of the Juruti project ore at the time, and that test work results indicated that the ore is moderately hard and can be ground to the required product sizes without any challenges. More complex or extensive test work is deemed not to be required given the simple process flowsheet. The comminution results are sufficient for the initial mill sizing and ongoing benchmarking exercises.
- On the basis that the process plant at the Juruti Bauxite Mine has been in operation since 2009, the SLR QPs are satisfied that the existing flowsheet is appropriate for the continued processing of Juruti ore.
- The SLR QP is satisfied that according to Alcoa, plant consumables are kept on site and replaced as part of the routine maintenance schedule.

23.4 Infrastructure and Tailings

23.4.1 Infrastructure

- The required infrastructure to support the ongoing mining operations at the Juruti Bauxite Mine are well established. Most of the required infrastructure is located within the surface infrastructure area at the mine site itself, including the bauxite processing / beneficiation plant, bulk power generation and water supply, mine waste facilities, railroad siding and materials handling/loading equipment, in addition to ancillary buildings.
- Power to the mine site is supplied by fuel oil generators, while the port is connected to the commercial grid from Juruti town. Water for the mine site, principally used in the processing plant, is supplied from water collection pumps installed in the Juruti Grande stream to the north then via an approximately 9 km overland pipeline. Water is also recovered from the tailings ponds where possible and recirculated for use in the plant. SLR is satisfied that the power and water supplies to the Juruti Bauxite Mine are in place and have been demonstrated through past production to be sufficiently reliable to support ongoing operations.
- Off-site infrastructure is similarly well established and comprises the materials handling and ship loading equipment at Juruti port used for bauxite product export along the Amazon River. The mine site is connected to the port by a dedicated railroad approximately 55 km in length, serviced by two locomotives.
- The Juruti Bauxite Mine is accessible via a public road from Juruti town which connects to a mine access road. This road provides the primary means of access to the site for personnel living in Juruti town. Given the remote location of Juruti within Pará State, access to other regions by road is limited. Juruti port therefore, in addition to Juruti Airport, serves as the primary transportation route for equipment, materials and supplies from other regions of Brazil, or internationally.

- SLR has been able to confirm the suitability of infrastructure during a site visit conducted by the QPs and is satisfied that the equipment and facilities required to sustain the proposed bauxite mining activities are available.

23.4.2 Tailings

- Based on an annual washed bauxite production of 6 Mtpa, the tailings generated annually are in the order of 1.93 Mtpa (dry tonnage). The Juruti Bauxite Mine currently has eight tailings storage facilities which comprise thickening ponds and tailings disposal ponds.
- No design or construction documentation was made available for the review, however, it is understood that relevant engineering records are available. It has not been possible to verify the extent to which Alcoa's corporate policy requirements have been implemented for the management of the Juruti tailings storage facilities.
- The TSFs are classified and audited in accordance with Brazilian regulation and the Brazilian National Mining Agency standards are being used. SLR relies on the conclusions provided in the published database and correspondence with Alcoa's team, and therefore provides no conclusions or opinions regarding the stability of the listed dams and impoundments.
- To support ongoing operations, one new tailings pond is planned every two years based on current disposal technology i.e., the use of thickening and disposal ponds. The total planned disposal capacity is 51 Mm^3. Alcoa is assessing other technologies to dewater and disposal Juruti bauxite tailings. Preliminary studies show that the "dry backfill" alternative has technical and financial potential to be competitive.
- Closure concepts and cost estimates based on preliminary assessment have been developed for TP1 and TP2 which will be closed first. The rest of the facilities will be closed progressively throughout the mine life.
- Overall, the SLR QP is of the opinion that the current method of tailings disposal is conventional and that alternative technologies for future disposal are being considered by Alcoa. SLR is also satisfied that Alcoa has established or plans to establish sufficient tailings disposal capacity requirements for the next 15 years of operation and is actively addressing the closure of existing facilities at full capacity.

23.5 Environment

- Juruti has several permit renewals that are long overdue, however Alcoa has confirmed that applications for renewal were lodged 120 days prior to expiry as required by law. Alcoa follows up on these overdue permits with the regulators, but the renewal processes are hampered by capacity limits of the authorities. Evidently this is a widespread problem affecting many other companies in Pará state. The permits remain valid because renewal applications have been submitted, unless the regulators issue a negative decision. It does seem unlikely that a negative decision would be issued years after the renewals were lodged, however the risk cannot be ruled out.
- Alcoa reports annually to the regulators in compliance with operating licence requirements and no compliance issues were identified with regards to compliance with licence conditions. Alcoa reported

two environmental incidents to the regulators which occurred in Dec 2020 and March 2021 which caused siltation of downstream watercourses. These incidents were fully investigated and addressed.

- The water balance provided to SLR for review does not include all Project facilities and there are several uncertainties in the input data. There is risk in the lack of understanding the water management and water balance at the operations that could lead to unplanned discharge of excess and potentially contaminated water to the environment. Pollution incidents would result in non-compliance events and represent a risk of potential fines and costs associated with investigation and remediation. Pollution events also has the potential to impact negatively on the operations relationships with affected communities.

- SLR has made recommendations regarding continuing to follow up with the regulators on permit renewals that are long overdue, updating environmental and social management plans, improving the water balance accuracy, and adding information in the closure plan on the management of mine tailings and waste rock facilities and to state the closure objectives.

- The Association of Communities of the Juruti Velho Region (Acorjuve) has been active in the area since 2005 and disrupted environmental monitoring, a routine operational activity, as recently as 2019. The community objected to the social programs and dissemination of information from Alcoa and stated that the company used photos of their communities and children without authorization in the information Alcoa disseminated. Alcoa reportedly came to an agreement with the parties and environmental monitoring and dissemination of information resumed in April 2021. However, another community issue arose in 2020 when Acorjuve representatives decided not to follow the agreed-upon path to transition mining proceeds to the foundation. This agreement was reached between Alcoa, community representatives and regulators in February 2018 in which Alcoa agreed to pay compensation and royalties to the community through a foundation to ensure transparency and good governance. Alcoa has stated that it continues to urge the association to engage in dialogue with the expectation of completing the foundation's by-laws as soon as possible. Community disruptions and a lack of progress in setting up the community foundation represent some risk, likely low, to the operations.

In SLR's opinion Alcoa manages permitting adequately within the context of the regulator's capacity limitations by applying for renewals according to legal requirements and following up on overdue renewals. Provided that Juruti personnel maintain auditable records of written and verbal communication with authorities regarding the overdue renewals and respond promptly to any requests for additional information, this risk should be appropriately managed. Alcoa continues to negotiate on the key issue of setting up a foundation to manage royalty payments to the communities.

24.0 RECOMMENDATIONS

24.1 Geology and Mineral Resources

1. SLR has reviewed and agrees with Alcoa's proposed plan to convert the historical exploration drilling data from auger and wells in Mutum, Santarém, São Francisco, and Nhamundá plateaus with air core (AC) drill hole data. Phase I of the recommended work program will include a significant amount of exploration and infill AC drilling and Phase II a Preliminary Economic Assessment (PEA) also called an Initial Assessment (currently in progress).
2. Review the grade restriction approach for all variables, and implement a procedure to avoid the estimation of values outside the low and top cut range.
3. Review wireframe parameters to improve the modelled bauxite layer continuity and address gaps in the mineralization layer where there are no drill holes. In some areas the drill hole spacing is not regular resulting in incorrect geological interpretation of the continuity of the bauxite layer.
4. For the future works, revise Mineral Resource classification criteria to correlate with drill hole spacing as it relates to geological and mineralization continuity.
5. Use the short-term drill hole information to update the long-term models, with consideration of the quality and confidence of the database.
6. Investigate the discrepancies between the samples and block model results for reactive silica, as well as the high dispersion in the standards Quality Assurance/Quality Control (QA/QC) charts for this variable. As mining commences at Capiranga Central and Maurari, work should be carried out to improve the accuracy and precision of the reactive silica testwork in both the analytical results and in the short-term model, and carefully monitor performance.
7. Develop a robust monthly QA/QC report, which includes a summary of performance and related actions to improve results as needed.
8. Work towards Brazilian and/or international accreditation for quality management (such as ISO 9001) and analytical techniques (such as ISO 17025 or ISO 14000) at the onsite Juruti laboratory.
9. Continue to work with an inter-disciplinary team to develop and improve the reconciliation process and establish reconciliation factors to consider for model calibration of all relevant model pair comparisons, e.g. long and short-term block models
10. Continue to explore prospective plateaus with mineralization indicated through well or auger drill hole results (historical information) and to replace them with AC drill holes.
11. Develop a statistic and geostatistical study with twin holes to calculate the real bias between methodologies for all the plateaus where the samples are from auger or wells. After that define correction factors or penalties for the biased variables.

24.2 Mining and Mineral Reserves

1. SLR recommends converting the sub-cell Resource block model to a SMU regularised block model with the ore lithology. This will account for the operating dilution prior calculating the NSR value. Current process calculates the NSR for each sub-cell block not accounting for operating dilution.

2. SLR recommends an application of the dilution and mining recovery factors prior pit optimization and mining scheduling.

3. SLR recommends implementing a proper reconciliation process, taking in consideration the creation of 3D solids of each type of material is mined, increasing the accuracy of dilution and mining recovery factors. Those modifying factors should be calculate by each panel and a weight average should be calculated for each plateau and applied respectively on the block with the plateau.

4. Haulage distance is calculated based on regressions. SLR recommends using the entrance haul roads design for plateau and use the entry point as the reference point to be used for each block, increasing the level of calculation.

5. SLR recommends an economical trade-off study to define of what is the best percentage between washed and unwashed product.

24.3 Mineral Processing

1. SLR recommends reducing the reactive SiO_2 grades by potential process improvements such as reverse flotation to increase the quality of the product.

2. SLR understands that all of the analysis for the Juruti operation is conducted internally by Alcoa and recommends that independent verification of the sample analysis by a certified laboratory. This program can be conducted on a structured basis to ensure the QA/QC aspects of the internal analysis.

24.4 Infrastructure and Tailings

1. Updated dam breach assessments for the TSFs were previously recommended during independent reviews in 2021. These were ongoing at the time of reporting and therefore SLR recommends that the outcome of these assessments is evaluated for adherence to existing designs and ongoing monitoring/maintenance requirements.

2. Continue with the implementation of the GISTM requirements, the assessment of alternative dry tailings disposal technologies, as well as the closure plan of the facilities that reach their full capacity.

24.5 Environment

1. Continue to regularly update the Social and Environmental Management Plan in response to monitoring information to ensure that environmental and social impacts are managed as effectively as possible.

2. Continue to ensure that renewal applications are lodged for all approvals that are due to expire soon and continue to follow up on renewals that are long overdue with the regulator.

3. Develop an integrated water balance and management plan that includes all Project facilities. This is necessary because the current water balance does not include all Project facilities and has various uncertainties. Maintaining an accurate water balance is imperative to understand how water is stored in the various facilities and identify when there is risk of overflows or unplanned discharge.

4. It is recommended as per industry good practice that the mine develop and maintain a list of external stakeholders and their interests, and setup and maintain a system to receive, document and address community complaints or grievances.

5. Continue negotiations with Acorjuve to set up the foundation to manage royalties paid to the communities.

6. SLR recommends that Alcoa develop an integrated Mine Closure Plan (MCP) and associated cost estimate for closure, covering all mine facilities including mining areas, tailings and waste rock facilities, process plant and other infrastructure. The integrated MCP should include land use objectives for closure and should address social aspects of closure.

25.0 REFERENCES

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26.0 RELIANCE ON INFORMATION PROVIDED BY THE REGISTRANT

This report has been prepared by SLR for Alcoa. The information, conclusions, opinions, and estimates contained herein are based on:

- Information available to SLR at the time of preparation of this report,
- Assumptions, conditions, and qualifications as set forth in this report, and
- Data, reports, and other information supplied by Alcoa and other third-party sources.

For the purpose of this report, SLR has relied on ownership information provided by Alcoa in a legal opinion by Luciano Amaral, Legal Manager – Brazil, dated February 10, 2022 entitled Alcoa World Alumina Brasil Ltda. to SRL executed. SLR has not researched property title or mineral rights for the Juruti Bauxite Mine as we consider it reasonable to rely on Alcoa's legal counsel who is responsible for maintaining this information.

SLR has relied on Alcoa for guidance on applicable taxes, royalties, and other government levies or interests, applicable to revenue or income from the Juruti Bauxite Mine in the Executive Summary and Section 19. As the Juruti Bauxite Mine has been in operation for over ten years, Alcoa has considerable experience in this area.

The SLR QPs have taken all appropriate steps, in their professional opinion, to ensure that the above information from Alcoa is sound.

Except for the purposes legislated under provincial securities laws, any use of this report by any third party is at that party's sole risk.

27.0 DATE AND SIGNATURE PAGE

This report titled “Technical Report Summary on the Juruti Bauxite Mine, Brazil
S-K 1300 Report” with an effective date of December 31, 2021 was prepared and signed by:

SLR International Corporation **(Signed) *SLR International Corporation***

Dated in WA, USA
February 24, 2022